LOCAL ROAD SAFETY PLAN

2024 UPDATE

City of Kenmore

Department of Public Works

April 2024

TABLE OF CONTENTS

SECTION 1: INTRODUCTION

1.1 HISTORY OF THE LRSP

The City of Kenmore has a strong commitment to the safety of all road users and supports the safe and efficient travel for diverse modes of transportation.

- **In 2014** Kenmore's City Council passed the resolution to implement the City's Target Zero Initiative and adopt the Target Zero goal of zero pedestrian or bicycle deaths or serious injuries by 2025.

- **In 2016** Kenmore's City Council adopted the City's Complete Streets Policy by ordinance to "provide a future transportation system that allows users of all ages, abilities and financial resources to safely and efficiently use the public right-of-way to drive, access public transit, bicycle, walk or use any other chose mode of travel."

- **In 2018** The City of Kenmore published its first Local Road Safety Plan, including both systemic safety projects to address risk factors in the City's transportation network as well as projects identified to address site-specific crash patters based on analysis of crash history of the City's transportation facilities.

The Local Road Safety Plan (LRSP) continues to serve as a living document and safety management tool for documenting and communicating the City's commitment, policies, processes, and successes in identifying and addressing factors which contribute to crash risk for travelers in the City of Kenmore. The LRSP contains programs that are responsive to crash patterns which are observable in our transportation network's historic crash data, as well as programs which are proactive with the goal of addressing the risk of future crashes before they have a chance to occur.

1.2 SCOPE AND LIMITATIONS

This document endeavors to be objective and data-driven. To that end, there are several areas where the scope of this document is unavoidably restricted, as well as limitations on the quality of data which is available and rigor of analysis which is possible.

Effects of the COVID-19 Pandemic

The COVID-19 pandemic had severe and lasting impacts on every aspect of life, and the impact on travel was no exception. Dramatic changes in travel volume, as well as changes in driver behavior, make pandemic-affected years substantively different than all other years in recent history[1]. The years of 2020 and 2021 are unmistakably colored by the effects of the pandemic, and the years that follow have a great deal of uncertainty regarding whether the emergent patterns in travel are lingering effects or a "new normal". Because analysis of traffic safety patterns and trends relies a great deal on the history of observed

[1] Or perhaps all of history, considering the comparatively short period of time where personal travel has been dominated by motor vehicle travel.

crashes and travel volumes, the analysis based on these recent years must be acknowledged to have a great deal less confidence than analysis done with similar rigor in more stable periods.

Limitations on Traffic Volume Collection

Travel volume is the unit of exposure to crash risk, and without high-quality travel data it is difficult to distinguish between changes in crash frequency which are attributable to changes in volume, and those which are attributable to changes in crash risk. In addition to the difficulties in assessing travel volumes which were introduced by the COVID-19 pandemic, Kenmore is also limited in its scope of data collection, and, on low volume roads especially, travel volumes must be estimated, or may be less recent than other data used for analysis.

Limitations on Traffic Active Modes Volume Collection

While Kenmore's data collection efforts are extensive, collecting broad and high-quality data on active mode travelers (e.g. cyclists, pedestrians) is difficult, costly, and labor intensive, and so the City of Kenmore's available data on travel by active modes is necessarily limited. Because travel volume is a measure of exposure, and because bicycle and pedestrian crashes are relatively rare compared to motor vehicle crashes, the relative risk experienced by active mode users is difficult to asses with a great deal of confidence.

Unreported Crashes

The crash data used for analysis is necessarily drawn only from crashes which have been reported to the police. Estimates of unreported crashes range from 40% to 60%, and potentially much higher in the case of bicycle and pedestrian crashes. Most unreported crashes are Non-Injury crashes, and the confidence in the completeness of crash data is higher for higher severity crashes, but since sever crashes represent a small fraction of the reported crashes that occur, it must be assumed that a tremendous number of crashes, and factors contributing to crashes, are not represented in the data available for analysis.

1.3 Stewardship and Implementation

Kenmore Target Zero Committee

Maintaining the Local Road Safety Plan and its supporting programs is the responsibility of the City of Kenmore's Public Works Engineering Group and is under the direct management of the City Traffic Engineer with oversight by the City Engineer. However, identifying and assessing the diverse factors which affect the safety of travelers in Kenmore, and creating and maintaining a travel environment that can be used safely, is not a goal that can be accomplished by engineering alone.

Beginning with the 2024 update to the Local Road Safety Plan, the City of Kenmore will implement the Target Zero Committee to provide stewardship and facilitate implementation of the Local Road Safety Plan. The City of Kenmore Target Zero Committee serves as the stewardship and implementation group for the LRSP. Committee membership is representative of all roles required to provide a safe travel environment in Kenmore: Community Engagement, Engineering, Law Enforcement, Maintenance, Planning, and Policy. The Target Zero Committee allows the LRSP to draws on diverse stakeholders both to grow the resources and experiences which support the success of LRSP goals, as well as to foster ownership of the safe travel environment and target zero goals across all those who contribute to creating and maintaining that environment.

The Target Zero Committee meets twice annually, once in the fall, and once in the spring, and provides steering and implementation strategy for the Local Road Safety Plan at critical milestones. The Local Road Safety Plan consists of two over-arching phases: risk assessment, and risk mitigation. These phases repeat

on an annual cycle, and each committee meeting convenes at a time which corresponds to the end of one phase and the beginning of the other.

Spring Committee Meeting: Risk Implementation Strategy and Risk Assessment Scoping

The spring committee meeting aligns with the completion of the draft LRSP update for the previous calendar year; the Engineering group prepares the draft LRSP update and disseminates the draft plan to committee members for review in advance of the spring committee meeting. At the meeting, the committee provides discussion and comments which are then represented in the final draft of the LRSP update. The LRSP update includes risk mitigation strategies such as traffic safety improvement projects, policy recommendations, and program goals – the Target Zero Committee is tasked with implementation of these strategies, either through enacting policies or practices, initiating the project delivery process, identifying implementation or funding partners, or through other appropriate action.

The spring committee meeting also marks the beginning of the risk assessment process for the next annual update of the LRSP. At the spring meeting, staff responsible for preparing the next update to the LRSP will share information with the committee regarding sources used for risk assessment and methods of analysis used to assess and prioritize the severity of risk. Through this review, the Committee has the opportunity to participate in shaping the scope and methods of risk assessment and contribute the representation of risk experienced by broad groups of transportation users and identify partners and methods which can contribute to the assessment of risk in diverse ways.

Fall Committee Meeting: Risk Assessment Review and Mitigation Strategy

The fall committee meeting aligns with the completion of the risk assessment phase of the LRSP, which is described in the LRSP Section 2: Safety Performance Analysis. The engineering group provides the results of the risk assessment to committee members in advance of the spring meeting, and during the meeting provides a review of the assessment to provide context for interpretation and solicit feedback to help inform future risk assessment.

After reviewing the results of the city-wide risk assessment, the committee provides input on mitigation strategies for factors which have been identified as providing systemic risk, and for treatments to address site-specific risk. This input draws on the broad scope of resources and partnerships available to the committee, and is not focused on engineering-based strategies alone. Committee input ensures that diverse users and stakeholders are represented in the implementation of risk mitigation strategies across all facets of providing and maintaining a safe travel environment, including engineering solutions, community engagement, enforcement activities, maintenance operations, and safety-forward policy. Committee input is reflected in the systemic and site-specific risk mitigation strategies presented in the final draft of the LRSP.

1.4 Changes and Updates Since Previous LRSP

The 2024 update to the LRSP represents a substantial revision to the document, incorporating new, data-driven analysis processes and multidisciplinary input. As the LRSP process evolves based on practitioner experience and input from internal and external partners, this section will review changes which have been incorporated since the last major update.

SECTION 2: SAFETY PERFORMANCE ANALYSIS

2.1 ANALYSIS METHODOLOGY

Crash Severity

The fundamental goal when identifying and delivering traffic safety improvement projects is to reduce the risk of crashes occurring and reduce the severity of crashes that do occur. Crash severity is hierarchical: when a crash occurs, there is a risk that the crash will result in injury; when crashes result in injury, there is a risk that those injuries will be severe or debilitating; when serious injury occurs, there is a risk that those injuries will be fatal. In this way, crash severity, and the risk of fatal and serious crash injuries, cannot be separated from the overall risk of crashes occurring.

Crash Severity 2018 - 2022		
Severity	**% Crashes**	**Total**
No Injury	73.7%	508
Possible Injury	15.4%	106
Evident Injury	7.1%	49
Severe Injury	0.6%	4
Fatal Injury	0.1%	1
Unknown Severity[2]	3.0%	21
All Crashes	**100%**	**689**

For this reason, crash analysis is inclusive of all levels of crash injury severity, and not limited to analysis of serious injury or fatal crashes only. Nevertheless, in addition to examining factors which contribute to the risk of crash occurrence, it is also important to examine factors which contribute to heightened severity of crashes which do occur. In this way, crash severity is incorporated into the safety performance analysis

Crash Frequency

Prediction of the frequency of future crashes is the primary goal of safety performance analysis. Crashes are the result of both random and deterministic processes; analysis of historical crashes can help to determine the mean and variance of crash occurrence which informs the future expected crash occurrence. Before-and-after analysis of traffic safety improvement projects allow us to estimate the effect they have on crash frequency, which can then be used to estimate the effect of similar improvements made on other facilities. Crash frequency is the strongest predictor of severe and fatal crashes, and system-wide crash frequency is the strongest predictor of system-wide occurrence of rare crash types such as crashes involving cyclists and pedestrians.

Crash Rate

Crashes cannot occur without road users traveling through the traffic environment. The more total distance traveled across all road users, the more frequently crashes will occur. For this reason, it is critical to account for the volume of travel occurring when determining the relative crash risk of a facility – if a high-risk facility sees reduced travel, it is important to determine that the risk experienced by road users on the facility has not changed, even if the frequency of crashes has decreased. Normalizing crash frequency by volume provides important insight into which facilities may have elevated crash risk, even if they have a lower frequency of crashes when compared to higher-volume facilities.

[2] "Unknown Severity" is typically the case for hit-and-run crashes where the victim is not injured or crashes which are reported based on observed evidence of a crash occurring, e.g. a driver rear-ends a car and leaves, but there is no injury to the victim, a parked car is sideswiped overnight, etc. In these cases, it is impossible to make a statement about any injuries the unknown driver may have suffered.

Excess Crashes

"Excess Crashes" is the primary criteria for identifying and prioritizing traffic safety projects. Excess crashes are determined using the following methodology:

- Crash frequency prediction methods are used to determine the number of crashes which are likely to occur on a facility based on its facility type and travel volume. This crash frequency is called "predicted crashes."
- The variability of predicted values is used to determine a confidence interval for variable crash frequencies which may still be consistent with typical safety performance.
- A facility which experiences a crash history in excess of the upper ranges of the confidence interval for predicted crashes is experiencing "excess crash frequency".
- The number of excess crashes is the difference between the number of observed historical crashes and the upper limits of the confidence interval for predicted crashes

Crash frequency prediction draws on the crash experience of a large number of similar facilities. When a facility has a safety performance that differs greatly from the safety performance of typical facilities, that is expressed in the number of excess crashes experienced by that facility. Identifying the facilities with poorer-than-typical safety performance identifies areas where "something is off", and is likely to help identify areas where traffic safety projects will be both effective and cost-efficient.

Facilities with excess crashes are not necessarily those with the highest crash frequency overall – they are the facilities with an "unusually high" number of crashes for every mile traveled on those facilities. Facilities with higher overall crash frequency may also present opportunities for safety improvement, but if those facilities do not also have excess crashes, then the crash risk per mile traveled on those facilities is lower than on facilities with excess crashes.

The number of excess crashes on a facility may appear low, but this number only represents the number of crashes which exceed a threshold of significance. Example:

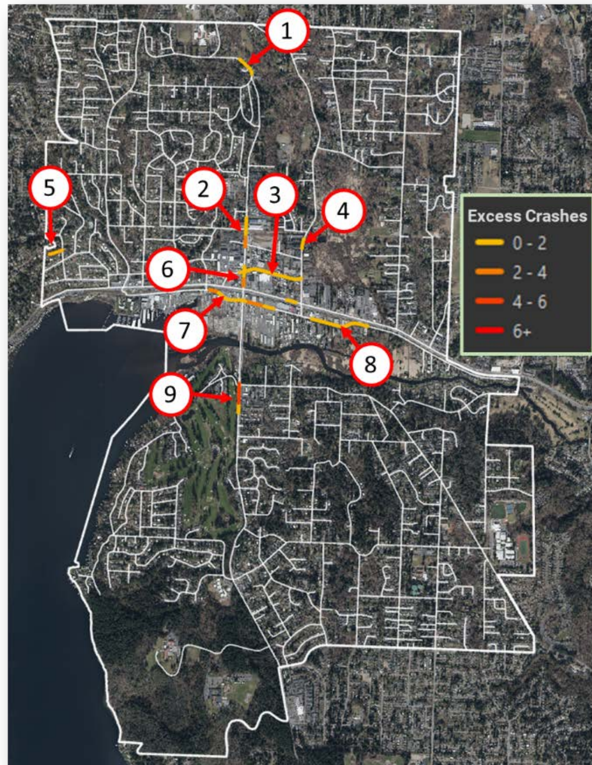
- Crash prediction methods may indicate that a facility of a certain type and volume is likely to experience **12 crashes** in a 5-year period.
- For that facility, historical crash frequencies of **8 to 16 crashes** may be consistent with a facility which experiences **12 crashes** "on average".
- Historically, the facility has been observed to experience **22 crashes** over a 5-year period.
- Because **16 crashes** is the highest frequency which would have been "normal" for this facility, the facility is determined to have an excess crash frequency of **22 – 16 = 6 excess crashes**.

2.2 Performance of Roadway Segments

Overall Crash Frequency

The following roadway segments experience an elevated crash rate:

	Segment	Characteristic Factors
1	202nd St North of 198th St	Nighttime, Roadway Departure
2	68th Av Near 185th St	Left-Turn, Rear-End
3	181st St From 68th Av to 73rd Av	Nighttime, Left-Turn, Right-Turn, Roadway Departure, Parked Car
4	73rd Av North of 185th St	Nighttime
5	183rd St West of 57th Av	Roadway Departure, Parked Car
6	68th Av Near 181st St	Rear-End, Sideswipe
7	175th St East and West of 68th Av	Right-Turn, Sideswipe
8	175th St East of 73rd Av	Roadway Departure, Parked Car
9	Juanita Dr South of 170th St	Left-Turn, Right-Turn, Rear-End, Sideswipe



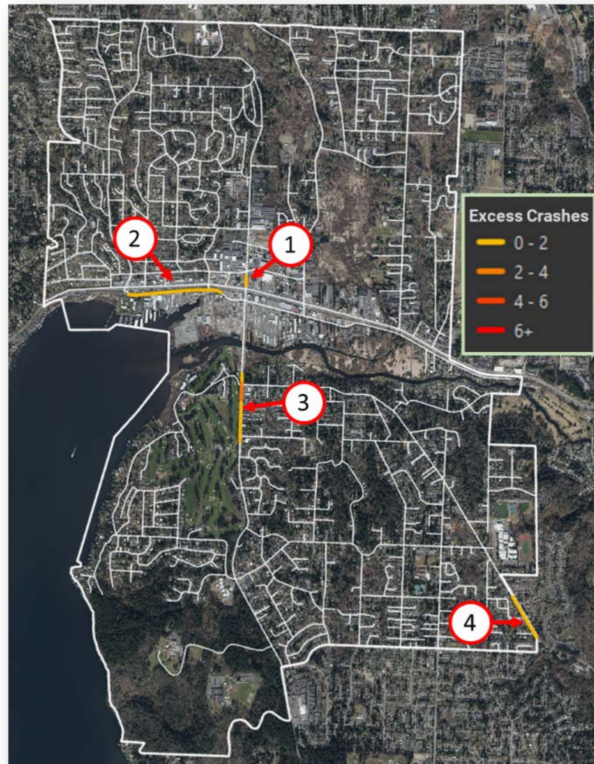
Related Projects

	Project Description	Status	Proj. No
1	Speed management, curve visibility	Planned	PPL 3
2	Speed management Sight-line improvements	Planned In-progress	PPL 4 NA
3	Speed limit reduction, speed management	Planned	PPL 4
4	Curve visibility improvements, lighting improvements Speed management	Planned In-Progress	PPL 9 NA
5	Sightline improvements	Planned	PPL 10
6	Speed limit reduction, speed management Channelization improvements	Planned In-Progress	PPL 4 NA
7	Speed management Bicycle facility improvements	Planned Recently Completed	PPL 6 NA
8	Sight line improvements, curve visibility improvements	Planned	PPL 6
9	Speed Management Bicycle facility improvements	Planned Recently completed	K1 NA

Injury Crash Frequency

The following roadway segments experience an elevated rate of injury crashes:

	Segment	Characteristic Factors
1	68th Av Near 181st St	Rear-End, Sideswipe
2	175th St From 61st Av to 65th Av	Right-Turn
3	Juanita Dr South of 170th St	Increased Severity, Rear-End, Sideswipe
4	Simonds Rd From 152nd Pl to 92nd Av	None



Higher travel speeds increase crash frequency as well as crash severity, but crash severity increases with speed at an exponential rate. Areas which experience an elevated rate of injury crashes even when the overall crash rate is not elevated are likely to be suffering from increased crash risk due to high travel speeds.

Locations which experience an elevated crash rate for crashes involving vulnerable road users are likely to also show an elevated rate of crashes resulting in injury. Bicycles and pedestrians are highly vulnerable to sever injuries in crashes involving motor vehicles, and crashes with vulnerable road users which do not result in injury are often unreported.

Related Projects

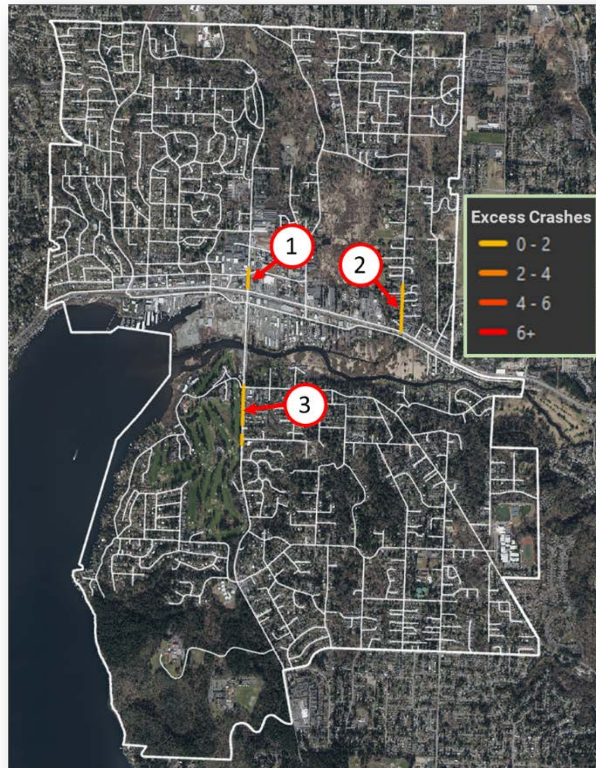
	Project Description	Status	Proj. No
1	Speed limit reduction, speed management Channelization improvements	Planned In-Progress	PPL 4 NA
2	Speed management	Planned	PPL 6
3	Speed Management Bicycle facility improvements	Planned Recently completed	K1 NA
4	Speed Management	Planned	K4

Vulnerable Road User Crash Frequency

Bicycle Crash Frequency

The following roadway segments experience an elevated rate of bicycle crashes:

Segment		Characteristic Factors
1	68th Av Near 181st St	Rear-End, Sideswipe
2	80th Av From SR 522 to 179th Pl	None
3	Juanita Dr South of 170th St	Rear-End, Sideswipe



Bicycle crashes, like motor vehicle crashes, will occur in proportion to bicycle travel volumes. Areas where bicycle crashes occur are likely to indicate areas where bicycle travel volumes high, and conflicts with motor vehicles are frequent.

Pedestrian Crash Frequency

No roadway segments demonstrated an elevated rate of pedestrian crashes.

Related Projects

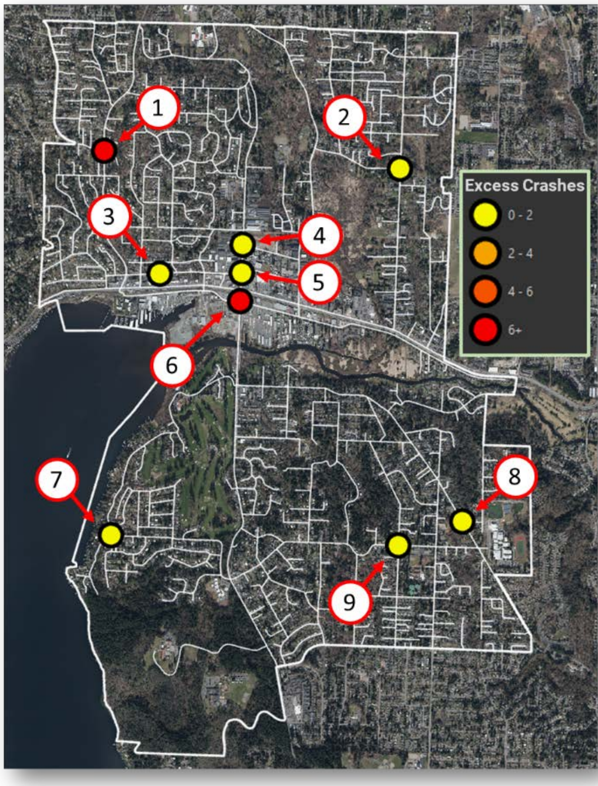
	Project Description	Status	Proj No.
1	Speed limit reduction, speed management Channelization improvements	Planned In-Progress	PPL 4 NA
2	Bicycle facility improvements, speed management	In-Progress	NA
3	Speed Management Bicycle facility improvements	Planned Recently completed	K1 NA

2.3 Performance of Intersections

Overall Crash Frequency

The following roadway segments experience an elevated crash rate:

	Intersection	Characteristic Factors
1	NE 193rd St & 61st Av NE	Left-Turn, Right-Turn, Rear-End, Angle
2	NE 192nd St & 80th Av NE	Nighttime, Left-Turn, Roadway Departure, Angle
3	NE 181st St & 63rd Av NE	Left-Turn, Angle
4	NE 182nd St & 68th Av NE	Left-Turn, Right-Turn, Angle
5	NE 181st St & 68th Av NE	Nighttime, Left-Turn
6	NE 175th St & 68th Av NE	Left-Turn, Head-On, Angle, Construction[3]
7	61st Av NE & NE Arrowhead Dr	Roadway Departure
8	NE 157th St & Simonds Rd NE	Left-Turn, Angle
9	NE 155th St & 81st Av	Angle



Related Projects

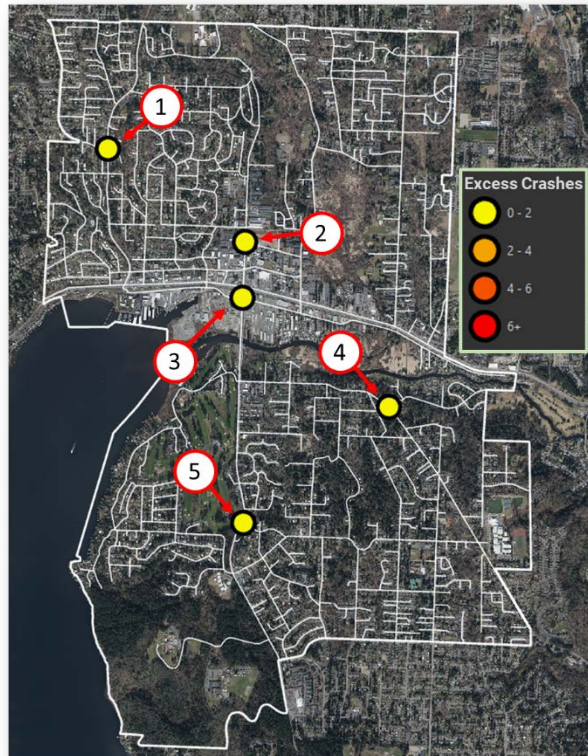
	Project Description	Status	Proj. No
1	Roundabout Slip-lane closure	Planned Recently Completed	PPL 8 NA
2	Roundabout, speed management	Planned	PPL 1
3	Sight-line improvements, speed management	Planned	PPL 5
4	Roundabout, speed limit reduction, speed management Sight-line improvements	Planned In-progress	PPL 4 NA
5	Roundabout, speed management Channelization improvements, reduced crossing distance	Planned In-progress	PPL 4 NA
6	Access control, turning restrictions, signal coordination Channelization improvements	Planned In-progress	PPL 6 NA
7	Channelization improvements, lighting improvements	Planned	PPL 10
8	Speed management, lighting, reduce crossing distance	Planned	K1
9	Speed management, raised intersection	Planned	PPL 7

[3] Note: A substantial portion of the 5-year crash history at NE 175th St & 68th Av NE is related to the West Sammamish Bridge Project construction zone which affected this intersection from 2020 through 2022. Excluding the construction, this intersection still demonstrates an elevated risk of crashes, though to a lesser degree.

Injury Crash Frequency

The following roadway segments experience an elevated crash rate:

	Intersection	Characteristic Factors
1	NE 193rd St & 61st Av NE	Left-Turn, Right-Turn, Rear-End, Angle
2	NE 182nd St & 68th Av NE	Left-Turn, Right-Turn, Angle
3	NE 175th St & 68th Av NE	Left-Turn, Head-On, Angle, Construction[4]
4	NE 169th St & Simonds Rd NE	Rear-end
5	NE 153rd St & Juanita Dr NE	None



Related Projects

	Project Description	Status	Proj No.
1	Roundabout Slip-lane closure	Planned Recently Completed	PPL 8 NA
2	Roundabout, speed management Sight-line improvements	Planned In-progress	PPL 4 NA
3	Access control, turning restriction, signal coordination Channelization improvements	Planned In-progress	PPL 6 NA
4	Speed Management	Planned	K2
5	Speed Management Access Control	Planned Recently Completed	K1 NA

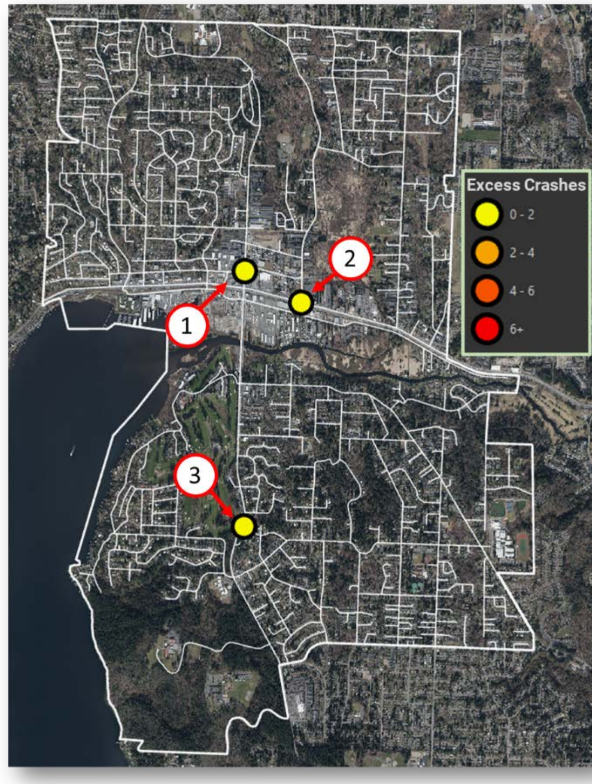
[4] See (2) on previous page.

Vulnerable Road User Crash Frequency

The following roadway segments experience an elevated rate of bicycle crashes:

	Intersection	Characteristic Factors
1	NE 181st St & 63rd Av NE	Bicycle, Pedestrian, Left-Turn, Right-Turn
2	73rd Av NE & SR 522	Pedestrian, Right-Turn
3	NE 153rd St & Juanita Dr NE	Bicycle, Left-Turn

Bicycle crashes, like motor vehicle crashes, will occur in proportion to bicycle travel volumes. Areas where bicycle crashes occur are likely to indicate areas where bicycle travel volumes high, and conflicts with motor vehicles are frequent.



Related Projects

	Project Description	Status	Proj. No.
1	Roundabout, speed management Channelization improvements, reduce crossing distance	Planned In-progress	PPL 4 NA
2	Leading Pedestrian Interval, No Right on Red	Planned	SSPL 15
3	Speed Management Access Control	Planned Recently Completed	K4 NA

2.4 SYSTEMIC PERFORMANCE

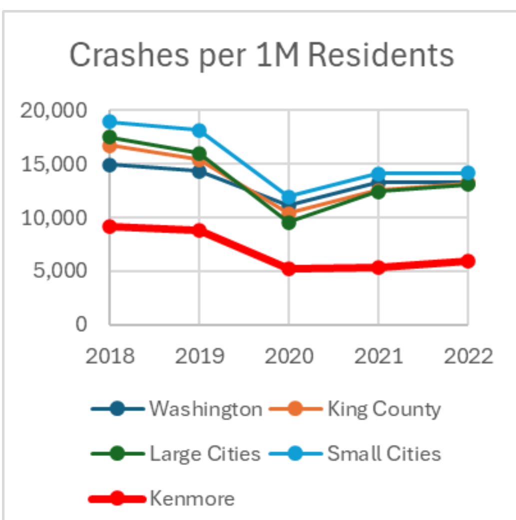
Aggregated City-wide Crash Frequency

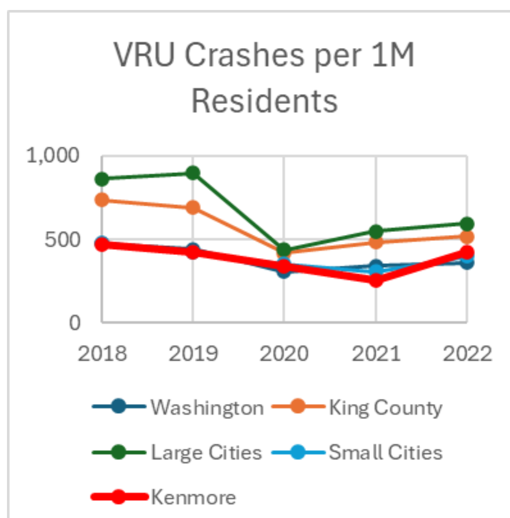
Crashes in the City of Kenmore most often result in no injury. Although the City has made tremendous progress in reducing crash frequency and crash severity in the past decade, though sustained and dedicated effort, the risk of fatal and serious crash injuries is an ongoing risk to road users traveling through the City of Kenmore.

2018 - 2022	Segment		Intersection		Overall	
Fatal Injury	1	0%	0	0%	1	0%
Serious Injury	4	1%	0	0%	4	1%
Evident Injury	19	7%	30	8%	49	7%
Possible Injury	37	13%	61	15%	98	14%
Non-Injury	231	79%	306	77%	537	78%
Total	292		397		689	

Intersection		292	42%
Segment		397	58%
Total		689	

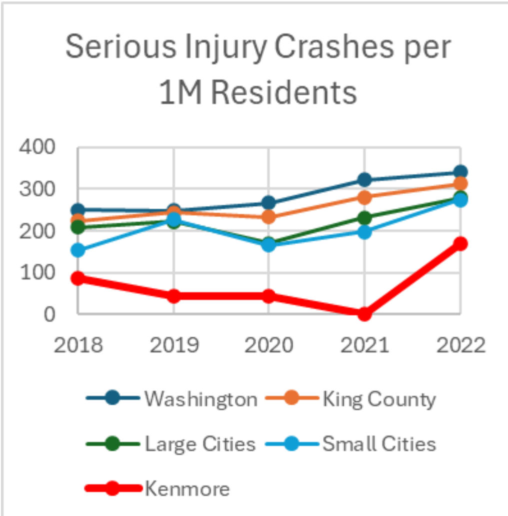
Regional Crash Comparison

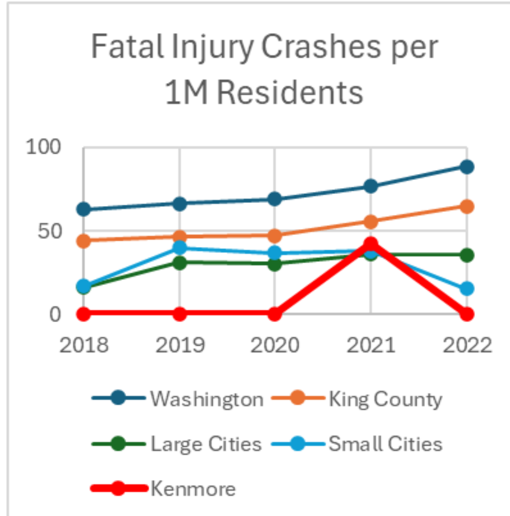




Overall crash frequency per capita in Kenmore (scaled to Crashes per 1M Residents) is substantially lower than crash frequency in large and small regional cities, King County overall, and the State of Washington overall as well. When isolated crashes involving vulnerable road users (e.g. cyclists, pedestrians), however, Kenmore's safety performance is similar to other cities of similar size, and to the State of Washington overall. What is not represented, however, is the travel volume of vulnerable road users – as Kenmore continues to invest in multimodal safety and protected facilities for vulnerable road users, it is likely that travel volumes by vulnerable modes, and crash frequency, may continue to rise even in the case that road

users experience less risk individually. High-quality travel data on travel by vulnerable modes is rarely available, and assessing Kenmore's safety performance in this category is difficult to do with confidence.





The fatal and serious injury crash frequency per capita in Kenmore is substantially lower than the county, state, and small and large regional cities. Nevertheless, Kenmore has not been entirely insulated from the increase in frequency of severe injury crashes experienced regionally during the periods when travel was dramatically affected by the COVID-19 Pandemic. Future data years will help indicate whether this trend is isolated to the years when travel was most affected, or if the increase in severe injury crashes has continued even after substantial recovery of traffic volumes. Regardless of cause, an increase in severe injury crashes is a sobering reminder that investment in safe infrastructure is work that is never done.

SECTION 3: PRIORITY PROJECT IDENTIFICATION

3.1 UNDERSTANDING THE PRIORITY PROJECT LIST

Projects addressing areas with elevated crash risk are listed in Priority Project List. These projects are a priority for delivery because they represent opportunities to address the areas in the City which present the greatest risk of crash injury to road users. The Project Priority List has the following fields for each project:

PPL No.
This is the project number; projects are listed in the order they are identified (that is to say that the order does not represent the priority of the project), and projects numbers increment in future years as new projects are added. A project will retain its unique PPL No. throughout its life cycle, including during the before / after analysis after project delivery.

Estimated Project Cost
The project cost may represent a very rough estimate of the cost of the project, and may be refined at a later date as project scoping and pre-design progresses, or changes based on other factors. This is estimate is based on the cost to the City of Kenmore, and the project cost may be reduced based on other funding sources available – a high-cost grant-funded project with a small matching contribution may be favorable compared to a moderate cost project which is funded completely by the City.

Crash Reduction
This section identifies at-a-glance the expected annual reduction in Fatal (K), Injury (ABC), and Non-Injury (PDO) crashes. Labels on the severity of scale use the KABCO scale with K referring to fatal crashes, ABC referring to descending levels of injury severity, and O referring to "Property Damage Only" or "PDO".

Crash Prevention Annual Benefit
The value of crash prevention is based on the FHWA scale for value of prevention by severity of the crash prevented:

- Fatal Crash $4,008,900
- Injury Crash $158,200
- PDO Crash $7,400

The expected reduction in each crash severity level is multiplied by the value of prevention, and summed to determine the crash prevention annual benefit

Project Life 20 yr Benefit
The annual benefit of a project is accumulated across an expected project life of 20 years to arrive at a rough estimate of the project lifecycle benefit.

Estimated Benefit / Cost
The ration of project benefits to project costs is used as a rough assessment of the project priority. As projects are refined and funding sources are identified, the benefit cost of a project will change. Many important infrastructure improvements and systemic safety benefits may add

cost to the project without directly changing the calculated benefit, resulting in a low benefit / cost ratio, especially for larger, more complex projects. Lower cost projects achieve a high benefit / cost ratio by being targeted, and maybe remain small enough to deliver without outside funding. Larger projects achieve high benefit / cost ratio through project scope refinement and incorporating grant-competitive project elements to help solicit outside funding. Adding sidewalks to a project, for example, will increase the cost of a project, but because pedestrian crashes are relatively rare, the systemic benefits of sidewalks will not be well-represented in the calculated benefit. Sidewalks may, however, also make a project attractive for grant funding, which effectively reduced the cost of a project and thereby increases its benefit cost ration relative to the City's expense.

Priority
Project priority is roughly reflected in the priority rank, but projects may not always be delivered in priority-order. The goal of the City's safety programming is to achieve the highest program-wide benefit cost ration, which may have a higher composite benefit / cost ratio than a combination of projects some of which have higher priority ranking. Nonetheless, projects with a high priority rank are likely to be very attractive and have favorable benefit / costs, making it easier to fit them into the City's safety programming.

Project select strategy is a critical role of the multidisciplinary Target Zero committee, and the Project Priority List does not set the project delivery priority in and of itself, but rather consolidates several factors which are important to the committee's decision making process.

3.2 LRSP Priority Project List

PPL No.	Priority Project List	Estimated Project Cost	Crash Reduction K	Crash Reduction ABC	Crash Reduction PDO	Crash Prevention Annual Benefit	Project Life 20 yr Benefit	Estimated Benefit / Cost	Priority
1	80th Av Corridor Multimodal Safety Improvements	$ 35,000,000	0.00	1.11	2.44	$ 194,105	$ 3,882,100	0.11	7
2	73rd Av / 203rd St Traffic Calming & Pedestrian Facilities	$ 3,000,000	0.00	0.00	0.62	$ 4,557	$ 91,137	0.03	9
3	Northwest Kenmore Collector Calming	$ 433,985	0.00	0.31	1.67	$ 60,699	$ 1,213,989	2.80	3
4	Downtown Core Slow Zone	$ 7,105,213	0.00	1.75	5.91	$ 320,904	$ 6,418,083	0.90	5
5	181st St Traffic Calming & Pedestrian Facilities	$ 11,500,000	0.00	0.09	0.69	$ 18,594	$ 371,877	0.03	8
6	175th St Corridor Multimodal Safety Improvements	$ 4,532,000	0.00	0.48	1.45	$ 85,845	$ 1,716,901	0.38	6
7	Southeast Kenmore Collector Calming	$ 23,129,000	0.00	0.18	0.69	$ 34,097	$ 681,949	0.03	10
8	193rd St & 61st Av Roundabout	$ 1,400,000	0.00	0.68	1.22	$ 116,574	$ 2,331,488	1.67	4
9	73rd Av Curve Visibility	$ 28,031	0.00	0.27	0.09	$ 42,802	$ 856,032	30.54	1
10	Local Road Support Channelization	$ 18,350	0.00	0.04	0.11	$ 6,506	$ 130,125	7.09	2

SECTION 4: SYSTEMIC PROJECT IDENTIFICATION

4.1 SYSTEM SAFETY POLICIES AND STANDARDS

Proactive Projects

Systemic safety projects are proactive: they are warranted based on the risk of future crashes, independent of the history of crashes that have occurred historically on a given facility. Systemic projects address the distributed risk in our traffic environment – the goal of systemic safety is not to reduce the crash risk at a specific location, but instead to reduce the crash risk inherent in exposure to the greater traffic environment. Priority project locations target locations which are performing worse than typical facilities, while systemic projects endeavor to shift the performance of all typical facilities. Although the specific locations of systemic projects are not warranted based on crash history, crash risk is expressed as expected crashes annually based on the City-Wide crash rate. In this way, the risk reduction and volume of road users benefiting from that risk reduction are introduced as factors used to prioritize systemic projects.

Because proactive projects are often less suitable for competitive grants, projects on the Systemic Safety Project List are often limited in funding, relying on the City's general fund, or revenue from the Kenmore Automated Photo Enforcement Program. Additionally, systemic safety improvements, even when identified as independent projects, are often incorporated into other infrastructure projects (safety related or otherwise), and so the System Safety Project List serves as resource for projects of opportunity, when opportunities arise.

Systemic Safety Through Road Standards

The City of Kenmore strives to create a safe and efficient network of multi-modal transportation throughout the City which serves the needs of its residents and businesses. The City seeks to balance the needs of pedestrians, bicyclists, transit users, freight vehicles, emergency services, and drivers of personal vehicles to create a vibrant and mobile community. The City is also conscious of its long-term maintenance needs and must pair future development with a sustainable maintenance program for public improvements. Every two years, the City thoroughly evaluates its road standards and modifies as needed to support its Target Zero goal and to keep up with the latest transportation needs. In between these thorough evaluations, targeted adjustments to the City's road standards are made as needed to address critical changes that impact safety. In addition to the Road Standards, other city documents such as the Traffic Calming Policy and the municipal code, are reviewed annually for changes needed to improve safety and to keep up with the changing transportation environment. If, upon review, changes are needed, those changes are implemented either through direct authority of the City Engineer or by ordinance passed by the City Council. If a new standard or policy needs to be developed, an internal committee consisting of city staff is gathered to evaluate the issue and develop draft language, public outreach is conducted to inform and to something seek input, and a final policy/standard is eventually adopted by the City Council or directly approval by the City Engineer. The City seeks to develop in a manner which provides comfort and aesthetic value to our community while also maintaining a safe and efficient transportation network. The City's Road Standards are intended to ensure that future improvements are planned, designed, constructed, and maintained in a manner which best meets the City's safety and operational goals and best serves the needs of our community.

4.2 Systemic Safety Programs

Caveat Regarding Bicycle and Pedestrian Safety Improvements

Overall, it is widely acknowledged that cyclists and pedestrians will select a route which is a compromise between least distance and greatest "comfort", with comfort representing a summary over a myriad of criteria, with relative priorities varying between individuals, such as perceived safety of the route, exposure to motorized traffic, exposure to the elements, difficulty of terrain (e.g. hills, shoulder type), and so on. In the absence of high-comfort facilities, cyclists and pedestrians self-select a wide range of possible routes, resulting in a low concentration of pedestrians or cyclists on any given possible route.

Dedicated, improved bicycle or pedestrian facilities provide safer routes and often are also substantially higher-comfort than other route options. The effect of providing new bicycle and pedestrian facilities is often that bicycle and pedestrian activity is aggregated and concentrated onto the higher comfort facility. Because crash frequency is proportional to travel volume (i.e. more travelers means more travelers exposed to crash risk), aggregating bicycle and pedestrian traffic often has the paradoxical effect of increasing the bicycle and pedestrian crash rate on the new facility, even if that facility is safer than facilities which may have otherwise served that traffic. Furthermore, higher-quality bicycle and pedestrian facilities may influence choice of travel mode, further increasing bicycle and pedestrian volumes and in turn further increasing the potential for the bicycle and pedestrian crash rate to increase.

The ideal measure for assessing relative crash risk is to normalize crash frequency by travel volume (i.e. assess the number of crashes expected per mile traveled on a facility); high quality travel volume data is, however, in most cases very difficult and expensive to obtain for bicyclists and pedestrians. An imperfect proxy is to compare crash rates in regions wide enough to capture facilities which would have previously been preferred routes, e.g. assessing the bicycle crashes occurring in Southern Kenmore before and after the completion of the Juanita Dr Bicycle and Pedestrian Improvement project, in lieu of assessing bicycle crashes occurring only on Juanita Dr before and after the project. This approach, nevertheless, still does not account for increases in bicycle and pedestrian activity resulting from influence on mode choice – that effect can be teased out only by investing in high-quality data collection before and after project completion; an investment which is often prohibitive, especially for smaller projects.

In all cases where the comfort and safety of bicycle and pedestrian facilities is improved as a result of a project, the travel-aggregating effect and the influence on mode-choice which result from providing high-quality, low-risk bicycle and pedestrian facilities must be kept in mind when evaluating the safety value of new facilities, and especially so when crash frequency on those facilities increases in the years following project completion, potentially masking the true safety value of that facility.

Improved Street Crossings

Crossing the street inherently puts vulnerable road users in conflict with motor vehicles. In Kenmore, one out of six crashes involving a pedestrian happen when a pedestrian is outside of the traveled way, with another one out of six occurring while crossing a driveway, and four out of six crashes occurring while crossing a street (midblock or at an intersection).[5] Making street crossings safer, and identifying what type of crossing is right for each location is an important systemic approaching to improving pedestrian safety.

Which type of crossing results in the lowest crash risk can be unintuitive, and the relative safety value of one type of crossing can vary dramatically based on who is using it. The Federal Highway Administration (FHWA) guidance on pedestrian crossing safety references a 1996 study of pedestrian crashes in five cities

[5] Based on crash data from 2016 through 2020.

over six years (normalized by pedestrian and motor vehicle volume) which illustrates one dimension of the complexity inherent in selecting the most appropriate crossing type for a location (Fig. 1).

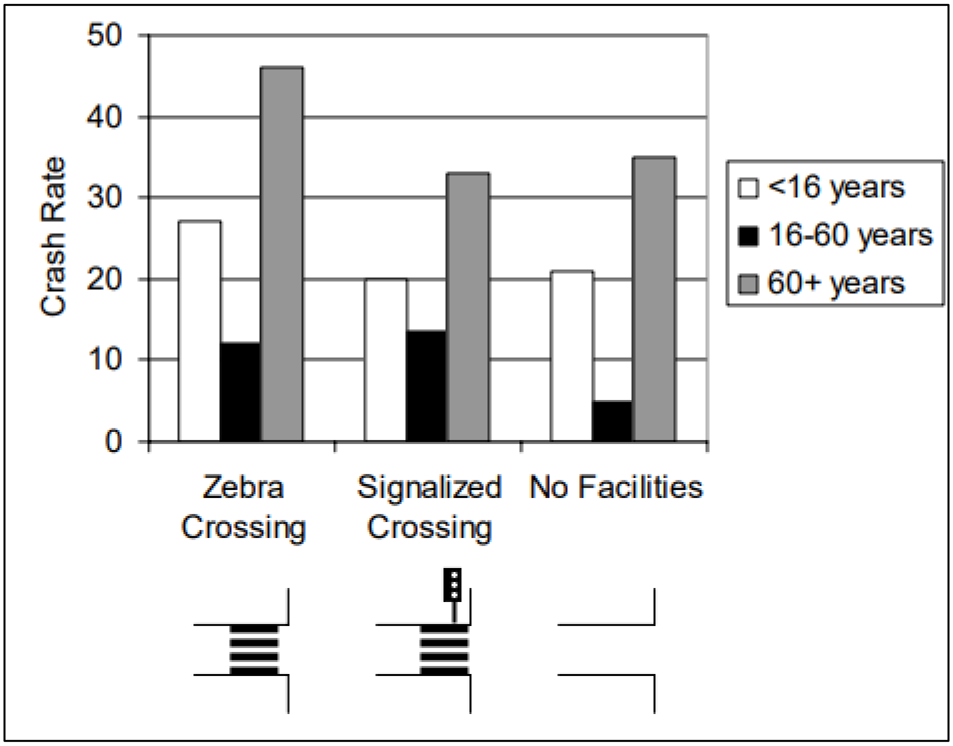


Figure 1. Pedestrian crash rates by crossing type and age group, Ekman, 1996.

Most noteworthy is that for all road users, from a safety standpoint, the complete absence of any crossing facility is preferable to a marked "zebra" crosswalk with no additional improvements. Although human factors and the psychology of road users is difficult to elucidate even with rigorous study, the general consensus among traffic safety professionals is that facilities which provide a sense of safety or protection (e.g. a marked crosswalk) without providing real change in driver behavior (e.g. reliably eliciting stop / yield compliance from divers) reduce a pedestrian's reliance on their own safe-crossing evaluation without providing any substantive safety improvement in crossing safety, thereby effectively goading pedestrians into engaging in higher-risk, lower-caution behavior. Put another way, a pedestrian may "trust" a marked crosswalk even when drivers have low or no compliance with stopping for pedestrians crossing in the crosswalk.

Following this reasoning, and considering also that street crossings are single largest contributor to pedestrian crashes, it is imperative that the City of Kenmore be diligent about creating safe crossing opportunities while also taking caution to "first do no harm".

The systemic Improved Street Crossings program seeks to identify ways to improve the safety of pedestrians crossing the street by identifying likely crossing locations in need of improvement subject to the following criteria:

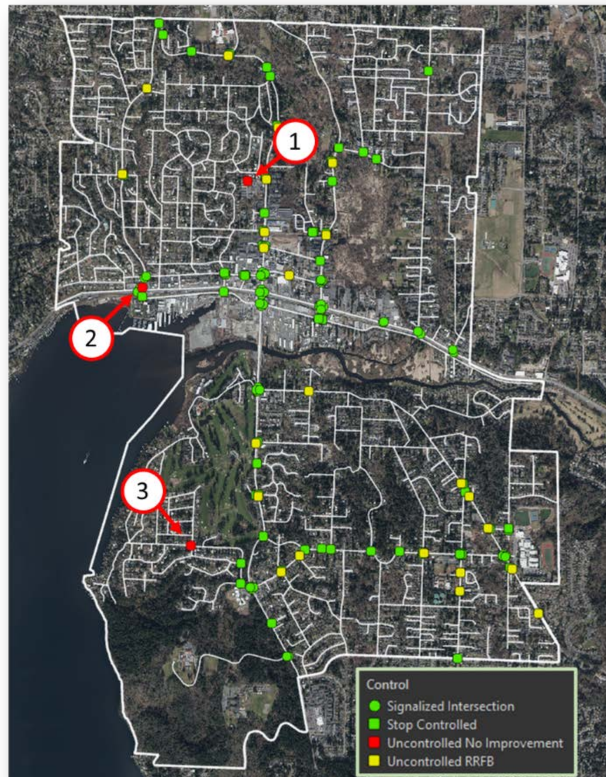
- Do not install a marked crossing without supplementary enhancements which are known to elicit driver compliance.
- Evaluate existing marked crossings without supplementary enhancements and determine whether they should be improved, or removed altogether.

- Identify likely crossing locations where pedestrians may not be able to effectively or accurately judge an adequate gap in traffic and provide crossing improvements or alternatives at those locations.
- Identify likely crossing locations where adequate gaps in traffic may not occur frequently enough to meet pedestrian crossing demand and provide crossing improvements or alternatives at these locations.

The locations which meet the above criteria for crossing improvement are included in the Safe Systems Project List and are prioritized according to the estimated project cost and estimated number of annual pedestrian crossings which the improvement would serve.

Unimproved Crossing Locations

	Intersection	Location Type
1	NE 189th Pl 18900 Block	Midblock, Park Access
2	NE SR 522 & 61st Av NE	WB Slip Lane
3	64th Av NE & NE Arrowhead Dr	Major leg crossing at Minor Street Stop Control



Related Projects

	Project Description	Status	Proj. No
1	RRFB	Planned	SSPL 1
2	SR 522 WSDOT Coordination	Planned	SSPL 15
3	RRFB, Speed Management	In-Progress	NA

Protected Bicycle and Pedestrian Facilities

On most of Kenmore's neighborhood streets, keeping travel speeds low is sufficient to create a traffic environment that can be safely shared by motor vehicles, cyclists, and pedestrians. On Kenmore's busier, higher speed streets, however, or on neighborhood streets where traffic risk is made worse by difficult geography, additional steps are warranted to make travel safe and comfortable for all road users.

Pedestrians and cyclists are more vulnerable to crash injuries than motor vehicle passengers, and when vulnerable road users are involved in a crash they are much more likely to experience severe or even fatal injury. The most effective way to prevent crashes involving vulnerable road users is to reduce their exposure to traffic, and there are several types of improvements that support this goal:

- Providing separated and protected facilities such as sidewalks, bike lanes, multi-use paths, and cycle tracks
- Shifting pedestrian and cyclist traffic to streets with lower speeds and lower traffic volumes by creating cut-through facilities or developing bicycle and pedestrian friendly infrastructure along neighborhood routes
- Design street crossings to reduce crossing distances, reduce vehicle speeds, and increase the visibility and prominence of pedestrian and cyclist crossings with methods such as curb bulb-outs with a tighter curb radius, raising crossing grade, or providing median islands

Often pedestrian and cyclist infrastructure will be included in larger projects that bring our roads up to modern standards, but when high-value improvements can't be grouped with other projects they are included in the Safe Systems Project List and are prioritized according to the estimated project cost, the estimated number of facility users annually, and the additional connectivity they provide to the existing network of bicycle or pedestrian infrastructure.

Safe Sight Lines

Kenmore streets are subject to curves, hills, hidden driveways, encroaching foliage, and dense or sporadic on-street parking on roads of all types – all features which have the potential to obstruct a driver's line of sight to oncoming vehicles when determining if a gap in traffic is adequate to enter the roadway, or to hazards in the roadway, crossing pedestrians or other cross-traffic which may require a sudden stop while traveling forward.

Consistent with regional and national practices, the City of Kenmore's minimum standard for safety is to provide "Stopping Sight Distance" for all intersections and driveways as well as for forward travel at all times. Poor sight distance means drivers entering traffic from a driveway or side street cannot see approaching vehicles well enough to judge a gap in traffic, or that forward traveling vehicles cannot see hazard in the road or crossing traffic soon enough to stop in time.

Resolving poor sight distance can mean removing sight distance obstructions (e.g. trimming back foliage, or restricting how close to an intersection parking is permitted), or slowing down vehicles (slower travel speeds mean vehicles travel less distance before coming to a stop). In most cases problematic sight lines can be improved by easy, low cost changes such as adjusting the location of travel lanes or parking areas, and the City will implement solutions quickly. In some cases, however, sightline improvements are costly and difficult to deliver and cannot be implemented quickly. When solutions cannot be implemented immediately, locations which are in need of sight line improvement are included in the Safe Systems Project List and are prioritized according to the estimated project cost and the Annual Average Daily Traffic (AADT) of vehicles affected by the sight line deficiency.

Travel Speed Reduction

Elevated travel speeds are endemic in Kenmore as well as the wider region. Higher travel speeds require longer distances to observe, react, and brake to a stop when a conflict must be avoided, and also increase the amount of kinetic energy dissipated destructively when crashes do occur, in this way higher travel speeds result in higher risk of crashes, and higher crash severity. While high travel speeds may contribute to crashes at locations which are identified for the Priority Project List, high travel speeds also contribute to crash risk systemically. Areas in Kenmore where operating speeds (85^{th} percentile travel speeds) exceed the speed limit by more than 5 mph are identified in the City's traffic calming program as warranting speed management, and these projects are included in the Systemic Safety Project List.

Local Road Speed Management Treatments

On local roads, which tend to have lower traffic volumes and where lower travel speeds are both necessary and appropriate, physical geometry is often helpful both for facilitating driver attention and for controlling the maximum travel speed which is comfortable for drivers; collectively, these types of treatments are generally referred to as "Traffic Calming". Vertical geometric features, such as speed humps, speed tables, and raised cross walks, and horizontal geometric features, such as chicanes, bump-outs, and pinch-points can be installed to accomplish speed management goals without introducing an undesirable degree of disruption to the traffic environment or neighborhood character. Specific treatments vary from one application to another and are the result of extensive outreach and partnership with the residents and road users affected by new traffic calming features. For the purposes of identifying and prioritizing projects in the Safe Systems Project List, typical lineal-project costs are used to estimate the general cost of traffic calming projects, and specific treatments are identified through community partnership once a project is likely to be feasible.

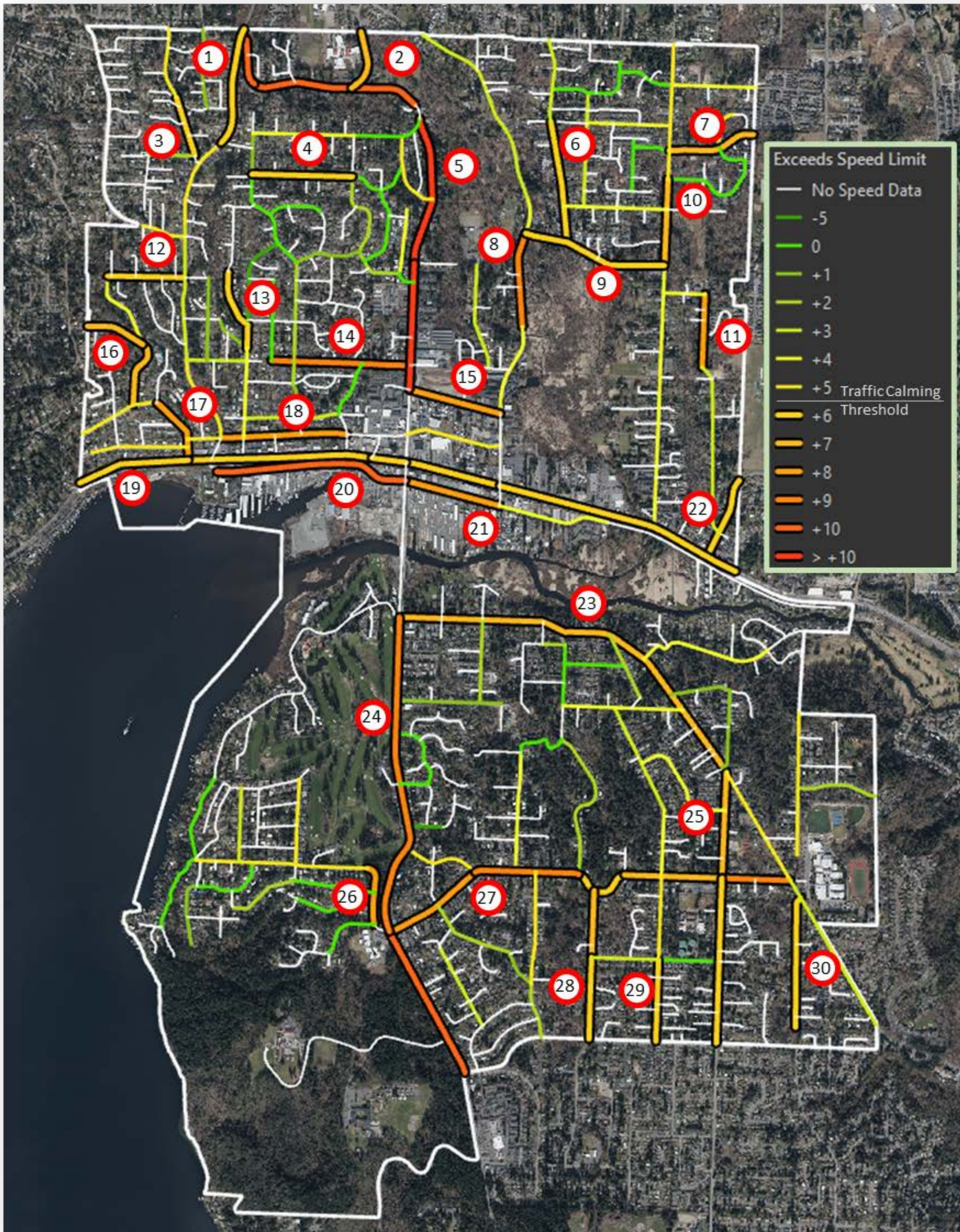
Collector and Arterial Road Speed Management Treatments

On roads which carry higher volumes and higher speeds, and where separate and / or protected facilities are often provided for vulnerable road users, geometry traffic calming may introduce an impractical degree of traffic disruption for normal road use a broader array of vehicle types. On Collector roads, traffic calming treatments in some cases may still be appropriate, but on arterial roads in it often necessary and desirable to provide a traveled way with a grade and alignment which is as consistent as possible. In these cases, speed management treatments are focused on providing environmental queues, driver feedback, and enforcement of traffic laws. A moderate degree of speed management can be accomplished through environmental queues and driver feedback, if a greater influence on driver speed is required it may be accomplished through speed enforcement.

Kenmore Automated Photo Enforcement (KAPE)

While in-person enforcement by law enforcement officers is effective at influencing driver speed, sustained in-person enforcement is labor-prohibitive on the scale required to effect sustained changes in travel speeds. The KAPE program allows the City to create a permanent enforcement presence without requiring the in-person presence of law enforcement officers, acting as a force-multiplier for the Kenmore Police in their efforts to encourage travels speeds appropriate for the speed limit. Additionally, photo enforcement is a speed management treatment which is revenue-positive, with the revenue generated by the KAPE program dedicated to funding other pavement management and traffic safety improvements throughout the City. Although photo enforcement is a very cost-effective measure for encouraging appropriate travel speeds, photo enforcement is reserved as a speed management tool of last resort. The KAPE program relies on the trust and buy-in of residents and road users, and when other tools are feasible and appropriate for managing travel speeds, those tools which are explored before photo enforcement is considered.

Locations where operating speed exceeds Speed Limit by 5 MPH or more



Locations Warranting Traffic Calming or Speed Management

	Segment	Excess Speed
1	61st Av NE From NE 197th St to N. City Limits	6 MPH
2	66th Av NE From NE 202nd St to N. City Limits	7 MPH
3	60th Av NE From 61st Pl NE to 202nd Ln	6 MPH
4	NE 198th St From 62nd Av NE to 65th Av NE	6 MPH
5	68th Av NE / NE 202nd St From NE 182nd St to 61st Pl NE	12 MPH
6	75th Av NE From NE 192nd St to NE 200th St	6 MPH
7	NE 198th St From 80th Av NE to E. EOR	7 MPH
8	73rd Av NE From NE 185th St to NE 192nd St	9 MPH
9	NE 192nd St From 73rd Av NE to 80th Av NE	6 MPH
10	80th Av NE From NE 192nd St to NE 196th Pl	7 MPH
11	82nd Av NE From NE 185th St to NE 190th St	8 MPH
12	NE 190th St From 56th Av NE to 61st Av NE	6 MPH
13	Kenlake Pl NE From NE 185th Pl to NE 194th Pl	6 MPH
14	NE 185th St From 62nd Av NE to 68th Av NE	9 MPH
15	NE 182nd St From 68th Av NE to 73rd Av NE	8 MPH

	Segment	Excess Speed
16	NE 187th St / 58th Av NE From E. City Limits to NE 182nd St	7 MPH
17	60th Av NE From 60th Av NE to SR 522	8 MPH
18	182nd St NE From 61st Av NE to 65th Av NE	8 MPH
19	SR 522 From W. City Limits to E. Cit Limits	6 MPH
20	NE 175th St From 61st Av NE to 68th Av NE	10 MPH
21	NE 175th St From 68th Av NE to 73rd Av NE	8 MPH
22	83rd Pl NE From SR 522 to E. City Limits	6 MPH
23	NE 170th St / Simonds Rd NE From Juanita Dr NE to 84th Av NE	6 MPH
24	Juanita Dr NE From NE 170th St to S. City Limits	9 MPH
25	84th Av NE From Simonds Rd NE to S. City Limits	7 MPH
26	NE Arrowhead Dr From Juanita Dr NE to 64th Av NE	8 MPH
27	NE 153rd Pl / NE 155th St From Juanita Dr NE to Simonds Rd NE	9 MPH
28	78th Av NE From NE 155th Pl to S. City Limits	7 MPH
29	81st Av NE From NE 150th Pl to S. City Limits	6 MPH
30	88th Av NE From Simonds Rd NE to S. EOR	6 MPH

Related Projects

	Project Description	Status	Proj. No.
1	Speed Management	In-Progress	NA
2	Speed Management	Planned	PPL 3
3	Speed Management	Planned	SSPL 2
4	Speed Management	Planned	SSPL 3
5	Speed management, curve visibility	Planned	PPL 3
6	Speed Management	Planned	SSPL 4
7	Speed Management	Planned	SSPL 5
8	Curve visibility and lighting improvements, photo enforcement Speed management	Planned In-Progress	PPL 9, K3 NA
9	Speed Management	Planned	SSPL 14
10	Roundabout, Speed Management	Planned	PPL 1
11	Speed Management	Planned	SSPL 6
12	Speed Management	Planned	SSPL 7
13	Speed Management	Planned	SSPL 9
14	Speed Management	Planned	PPL 3
15	Roundabout, speed limit reduction, speed management	Planned	PPL 4
16	Speed Management	Planned	SSPL 9
17	Speed Management	Planned	SSPL 9
18	Speed Management	Planned	PPL 5
19	Speed Management, WSDOT Coordination	Planned	SSPL 15
20	Speed Management	Planned	PPL 6
21	Speed Management	Planned	PPL 6
22	Speed Management	Planned	SSPL 10
23	Photo enforcement	Planned	K2
24	Photo enforcement Channelization improvements	Planned In-Progress	K1 NA
25	Speed Management	Planned	PPL 7
26	Speed Management	In-Progress	NA
27	Speed Management	Planned	PPL 7
28	Speed Management	Planned	SSPL 11
29	Speed Management	Planned	SSPL 12
30	Speed Management	Planned	SSPL 13

4.3 Safe Systems Project List

SSPL No.	Systemic Safety Project List	Estimated Project Cost	Crash Reduction K	Crash Reduction ABC	Crash Reduction PDO	Crash Prevention Annual Benefit	Project Life 20 yr Benefit	Estimated Benefit / Cost	Priority
1	189th St RRFB	$ 14,500.00	0.00	0.00	0.00	$ -	$ -	NA	
2	60th Av Traffic Calming	$ 9,343.75	0.00	0.00	0.06	$ 284	$ 5,683	0.61	9
3	West 198th St Traffic Calming	$ 18,687.50	0.00	0.00	0.09	$ 428	$ 8,550	0.46	12
4	75th Av Traffic Calming & Speed Limit Reduction	$ 23,359.38	0.00	0.01	0.48	$ 2,186	$ 43,722	1.87	2
5	East 198th St Traffic Calming	$ 18,687.50	0.00	0.00	0.12	$ 574	$ 11,482	0.61	8
6	82nd Av Traffic Calming	$ 14,015.63	0.00	0.00	0.12	$ 561	$ 11,225	0.80	7
7	190th St Traffic Calming	$ 14,015.63	0.00	0.00	0.08	$ 398	$ 7,951	0.57	10
8	Kenlake Traffic Calming	$ 14,015.63	0.00	0.00	0.08	$ 383	$ 7,655	0.55	11
9	Uplake Traffic Calming	$ 37,375.00	0.00	0.01	0.52	$ 2,531	$ 50,625	1.35	3
10	83rd Pl Speed Management	$ 14,015.63	0.00	0.02	0.90	$ 4,086	$ 81,719	5.83	1
11	78th Av Traffic Calming	$ 28,031.25	0.00	0.01	0.38	$ 1,875	$ 37,507	1.34	4
12	81st Av Traffic Calming	$ 14,015.63	0.00	0.00	0.13	$ 651	$ 13,014	0.93	5
13	88th Av Traffic Calming	$ 23,359.38	0.00	0.00	0.21	$ 1,034	$ 20,685	0.89	6
14	192nd St Speed Reduction & Multimodal Facilities	$ 4,588,000	0.01	0.04	2.30	$ 10,578	$ 211,559	0.05	13
15	SR 522 WSDOT Coordination	NA	0.47	20.35	33.40	$ 1,069,136	$ 21,382,720	NA	

KAPE No.	Photo Enforcement	AADT	Crash Reduction K	Crash Reduction ABC	Crash Reduction PDO	Crash Prevention Annual Benefit	Project Life 20 yr Benefit	Estimated Revenue
K1	Juanita Dr KAPE	9643	0.00	1.98	2.33	$ 330,340	$ 6,606,802	$ 1,583,862.75
K2	170th St KAPE	9759	0.00	1.04	2.07	$ 179,155	$ 3,583,100	$ 1,602,915.75
K3	73rd Av KAPE	5337	0.00	0.01	0.64	$ 13,757	$ 275,145	$ 657,451.69
K4	Simonds Rd KAPE	13162	0.00	1.04	2.07	$ 179,155	$ 3,583,100	$ 2,161,858.50

SECTION 5: REVIEW OF PAST PROJECTS

5.1 DESCRIPTION OF PROJECTS DELIVERED SINCE PREVIOUS REPORT

Future reports will include descriptions of previously delivered projects and status of project performance review. Projects preceding this update may be added in the future if data is available retroactively to support analysis of project performance.

5.2 BEFORE AND AFTER STUDIES OF COMPLETED PROJECTS

The City of Kenmore is limited in resources and staff time, and many traffic safety improvement projects require substantial resources to deliver. It is critical that the projects implemented by the City be maximally effective for the resources invested in making the desired improvement. The single most important goal of completing a traffic safety project is the reduction in crash rate. Evaluating before-and-after crash rates, however, can require many years of observation to determine the change in crash rate with confidence. Travel speed, however, is a critical goal of many traffic safety projects, and speed studies can be completed quickly and at low cost, allowing for rapid determination of a project's effect on travel speed, which in turn may provide insight on the speed-related component of a projects traffic safety value.

Before-and-After Crash Analysis

Projects which are warranted based on the crash history of a facility (such as those identified through network screening) are assessed with before-and-after crash analysis. On a project-scale basis, crash severity is highly variable, with sever crashes constituting a small portion of total crashes even in cases where factors contribute to elevated severity. For this reason, before-and-after crash assessment is made primarily on the bases of total-crashes, agnostic of severity. Before-and-After Crash analysis is conducted based on Highway Safety Manual methodologies with the following procedure:

Speed and Volume Data Collection
The Annual Count Program collects speed and volume data proactively throughout the City, regardless of planned projects. This pro-active data collection ensures that before-data is nearly always available, including before-data for control sites outside the project area, even when it must be collected before projects are planned.

Project is Warranted Based on 5-Year Crash History
The standard practice for network screening is to use a 5-year crash history. Crash history is available retroactively, and does not have to be collected proactively. Shorter periods may be used to warrant a project in some cases where changes to a facility or dramatic changes to crash experience warrant consideration of a shorter crash history period. The analysis which is used to warrant a project is retained either in the project files or as part of the Local Road Safety Plan documentation; this analysis will provide the basis for comparison after the project is complete.

Project is Evaluated After Completion Based on 1 Data Year
The crash history of the project is first evaluated after one data-year has been completed following substantial completion of the project (typically a minimum of two years after project completion based on data availability and data-year close-out). The purpose of the first review is to highlight

dramatic changes in crash experience, but may not be sufficient in the case where a smaller effect is expected. In the event that a dramatic change was expected but has not precipitated, or if a dramatic negative change is identified, additional changes to the facility may be warranted without allowing for a longer horizon for project evaluation.

Project is Evaluated After Completion Based on 3 and 5 Data Years
On the longer horizon, projects are evaluated as 3 and 5 data years become available. In areas where more changes are planned, 5-year horizons may not be practical as other factors are introduced which may make it infeasible to isolate the effect of the project. In addition to confirming (or failing to confirm) that the project has achieved the desired effect, the 3 and 5 year horizon studies offer insight into the treatment effectiveness in consideration of application of that treatment at other locations.

Before-And-After Speed Analysis

Analysis of travel speed can be completed with high-confidence on a relatively short timeline. Similar to crash analysis, speed analysis is done on the basis of before-and-after data with one or more treatments sites as well as comparison sites which will not receive the treatment. Before-and-after speed studies are conducted for all projects which are expected to have a substantial effect on travel speed, and in some cases are performed when there is a concern that changes to the facility may result in higher travel speeds. The procedure for conducting speed before-and-after speed studies is as follows:

Speed and Volume Data Collection
The Annual Count Program collects speed and volume data proactively throughout the City, regardless of planned projects. This pro-active data collection ensures that before-data is nearly always available, including before-data for control sites outside the project area, even when it must be collected before projects are planned.
When a project is planned, a speed study may also be scheduled to collect before-data at very specific locations in the project area, allowing travel speeds to be evaluated at a specific location in the corridor, or to develop a speed profile of the corridor if multiple studies are scheduled.

The Project is Evaluated Soon After Completion
If possible, after-data will be collected very soon after substantial completion of a project. While not critical, this will allow for insight into how the effects of the project change over time (e.g. if a treatment is effective immediately, but the effect diminishes over time).

The project is Evaluated 6 to 12 Months After Completion
Multiple follow-up studies may be desired in some cases, but all speed management projects will receive at least one follow-up study 6 to 12 months following substantial completion of the project in order to evaluate the effectiveness of the treatment.

Documentation of Before-After-Studies

The future updates to the Local Road Safety Plan will include on-going results of before-after-studies for past projects identified and delivered through the Local Road Safety Plan, or for which data is available retroactively.