7. Lakelse Avenue at Sparks Street: the heavier traffic demand expected in the Downtown will exacerbate the delays already incurred by the split signal timing necessitated by the offset T intersection. Heavier volumes on the skewed north-south movement will also invite safety concerns.

8. Lazelle Avenue at Sparks Street: the existing four-way stop is expected to continue to perform at an acceptable Level of Service, with average delays less than 15 seconds per vehicle during peak hours. However, any major changes to the Lakelse Avenue / Sparks Street intersection may have a downstream impact at this location.

9. Lakelse Avenue at Kalum Street: as a major junction between the Old Skeena Bridge, the Downtown, and the Upper Bench (via Skeenaview Drive), the intersection of Lakelse Avenue and Kalum Street will have a significant traffic demand. The reduced laning at the entrance to the 4600 Block of Lakelse Drive will also constrain capacity.

10. Skeenaview Drive at Munthe Avenue: the existing turning volume of traffic turning left from Munthe Avenue onto Skeenaview Drive (Sparks Street/Skeenaview) is low. Although the sight lines looking south are restricted by the road alignment, a mirror at the intersection has allowed the intersection to operate relatively safely. However, as traffic volumes increase to and from the Upper Bench, the capacity for these left turns will decrease with the available gaps in traffic. The trigger will be excessive peak hour delays and queues on Munthe Avenue, and potential safety concerns.

11. Highway 16 / Kalum Lake Road: The Highway 16 corridor is the subject of a separate study, so the highway intersections were largely omitted from this analysis. However, one notable issue is the expected heavy southbound left turning volume at the intersection of Highway 16 and Skeenaview Drive. This extra traffic demand would arise directly from the development of the Upper Bench, and would cause the intersection to warrant signalization. If that traffic signal was implemented as part of a rail overpass solution, a significant volume of traffic would divert to this location, and improve the Level of Service on other corridors.

12. Lazelle Avenue at Emerson Street: the intersection of Lazelle Avenue at Emerson Street is currently signalized, but the existing and expected future traffic volumes appear to be less than necessary to meet the warranting criteria for signalization. An unwarranted signal can create unnecessary traffic delays, which may invite non-compliance of the traffic control devices. However, there may be reasons unrelated to traffic demand to keep the traffic signal, such as safety, accessibility, or anticipated future development that would change existing traffic patterns. The intersection should be studied in detail at an operational level before the signal should be considered for removal.

5.5 NEW NETWORK LINKS

Based on the background literature, the traffic analysis, and the road classification (Figure 31), there is an apparent need for five new road links in the Terrace Road network:

Figure 42: Proposed Kalum Lake Rd Overpass

1. Kalum Lake Road should be connected to Braun Street across Highway 16 and the CN rail line (Figure 42). This is the most important new road link for the City in consideration of traffic capacity across the rail line, network reliability and redundancy, emergency response, neighbourhood connectivity, and the provision of truck routes.

2. Park Avenue should be extended between Eby Street and Munroe Street to provide an alternate route for traffic between Lanfear Drive and the Downtown. The importance of this extension will depend on the nature of the intersection upgrade at Lakelse Avenue and Eby Street, which will influence the available intersection capacity at Lazelle Avenue and Eby Street.

3. An extension of Park Avenue between Lanfear Drive and Kalum Lake Road is also proposed. This connection is desirable from a network connectivity perspective, especially insofar as it would help reduce the volume of local traffic on Highway 16. However, the traffic demand on this link is not likely to warrant this improvement within the study horizon.

4. The extension of Floyd Street between McConnell Avenue and Mountain Vista Drive was identified on the road functional classification. This road would have more importance for local neighbourhood traffic than it would for the greater network. Therefore, this link should be connected only as part of the development of the adjacent neighbourhood.

5. From the forecast volumes to and from the Upper Bench, there will be significant levels of congestion during the peak hours on the three existing routes, especially Lanfear Drive. The steep topography precludes the addition of new lanes on the existing roads. Therefore, a potential new route to the Upper Bench would have significant network benefits. Additional study is necessary to confirm if there are any opportunities for new alignments.

5.6 DOWNTOWN MULTI-MODAL TRANSPORTATION REVIEW

More than any other neighbourhood in Terrace, the Downtown should be safe and accessible for pedestrians. This is not only because of the large volume of pedestrians and transit users in the area, but also because the Downtown needs to have a people-oriented sense of place to realize its potential as the City Centre.

The Downtown street network is well-established, with a series of relatively short blocks that facilitate pedestrian traffic. All roads align well with each other except for the intersections of Lakelse Avenue/Sparks Street and Park Avenue/Sparks Street. With the exception of the former, the current traffic control in the Downtown intersections appears to be operating well, and should generally accommodate the forecast city growth.

All roads in the Downtown have hard-surfaced sidewalks which are typically wide and/or buffered from the street by landscaped boulevards. Furthermore, wheelchair ramps are standard on every street corner. Curb extensions (or "sidewalk bulbs") are available at numerous intersections, but not all. These are one of the most effective means of calming traffic, and improving the safety of the streets for pedestrians.

Almost all roads in the Downtown are two-lanes. Two exceptions to this are Lakelse Avenue (except between Kalum Street and Emerson Street) and Kalum Street (south of Park Avenue). Both of these roads are four lanes, and both have identified conflicts with weaving manoeuvres, on-street parking, and turning movements.

According to the current bicycle network (see Section 7.1), the formal cycle routes through the Downtown are planned to be Park Avenue and Kalum Street. These roads should be reconfigured to accommodate cyclists with dedicated bike lanes (see Section 5.2). The cycle mode can further be accommodated in the Downtown with the provision of convenient and secure bike racks, especially at key destinations.

The Downtown is currently well-served by the Terrace transit system, with all local routes connecting to the Downtown Core. As the community grows, additional bus routes, bus stops and potentially a central transit exchange should be implemented as required, maintaining the Downtown as the hub.

In light of the above, the traffic, transit, cycle and pedestrian movement within the Downtown could be improved for with the following measures:

1. "Lane diets" on the four-lane sections of Kalum Street and Lakelse Avenue.
2. Realignment of the intersections of Lakelse Avenue/Sparks Street and Park Avenue/ Sparks Street.
3. Formalized bike lanes along the Park Avenue and Kalum Street routes.
4. Improved traffic calming at intersections through the installation of curb extensions wherever possible.

5.7 TRUCK ROUTE ANALYSIS

A truck route is a designated route through or around a community which is designed and maintained to facilitate the movement of heavy industrial and commercial traffic. The purpose of a truck route is to separate the heavy trucks (and ideally the dangerous goods carriers) from the more developed and populated neighbourhoods in the city. The routes can be offered as a preferred alternative for truckers, or can have their use mandated and regulated through city bylaws.

By definition, truck and/or dangerous goods routes are only intended for through traffic (i.e. trucks with origins and destinations outside the city limits). Any truck trips starting or ending their journey within Terrace (e.g. local industries, service stations, shopping centres, arenas, etc) will necessarily have to divert from the designated network, preferably via the shortest and safest route.

The provincial highways are, by MoTI policy, open for use by all legal trucks and dangerous goods carriers (Figure 43). In this respect, Hwy 16, Hwy 37, and Kalum Lake Road (Hwy 113) are currently designated truck routes through Terrace. These routes inherently serve through traffic by virtue of continuing to regional destinations outside the city limits.

Figure 43: Highway 16 (Keith Avenue) at Sande Street

The only apparent candidate for a secondary truck route is Keith Avenue, which offers an alternative route around the city core. Keith Ave also has a straight alignment, and passes through the industrial area. The disadvantages of Keith Avenue as a truck route are the narrow road width, and the need to cross the railway tracks (at either Kenney Street or Frank Street) to connect to Highway 16. In the stakeholder consultation, the trucking representatives identified a safety concern with trucks crossing the tracks immediately before a traffic signal (i.e. the existing signal at Highway 16 / Kenney Street, or the new signal at Highway 16 / Frank Street). This concern is exacerbated for dangerous goods carriers.

Keith Avenue, Kenney Street, and Frank Street will continue to be routes that are heavily used by trucks, and afford community benefits by diverting trucks around the city core. However, these roads should not be officially designated as a truck route for the purpose of regulation and enforcement until a second rail overpass can be built (e.g. at Kalum Lake Road). At that time, Keith Avenue can be designated as an official truck and/or dangerous goods route (Figure 44).

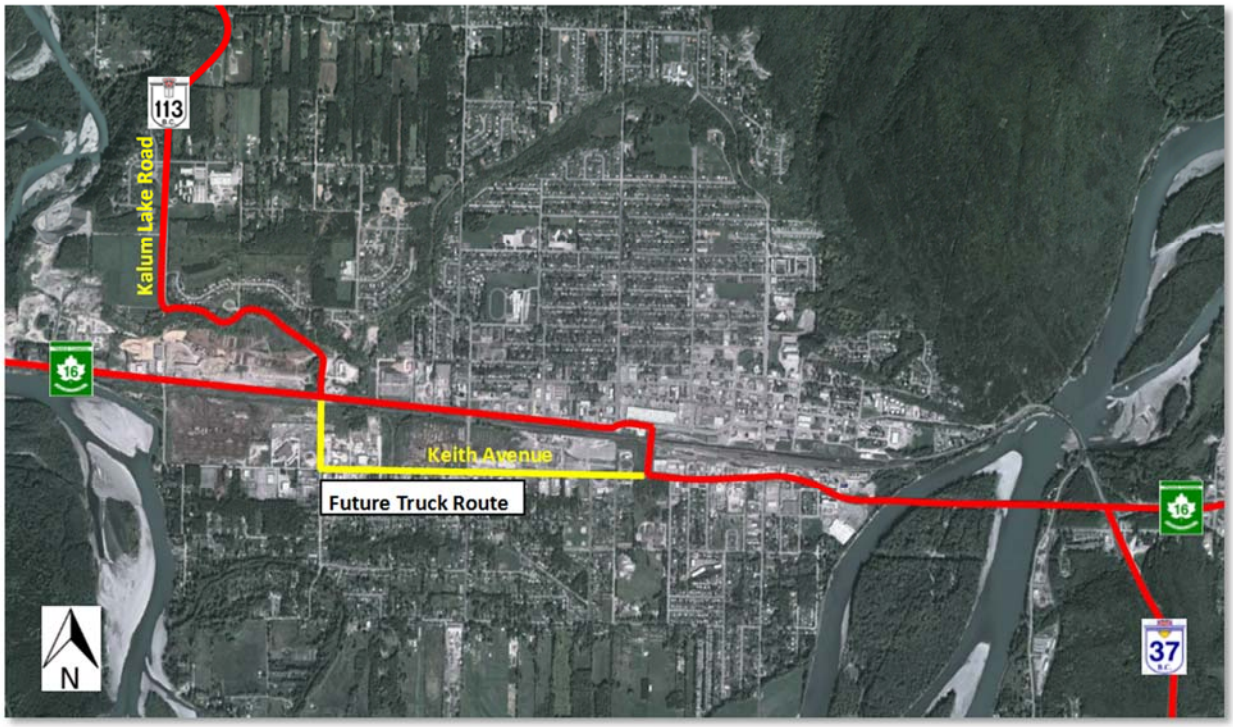


Figure 44: Truck Routes Through Terrace

6 ROAD SAFETY ANALYSIS

To analyze the safety of the Terrace transportation system, a comprehensive Road Safety Analysis was completed in accordance with criteria established by the Insurance Corporation of British Columbia (ICBC). The analysis was divided into an evaluation of overall trends, and a formal network screening to identify and study the top 20 collision-prone locations in the city.

6.1 GENERAL COLLISION ANALYSIS

There were a total of 13,755 collisions recorded in ICBC's database between January 1st, 1996 and November 17th, 2013 (the latest records available) within the greater Terrace area. Of these, there were 7,251 collisions (i.e. 53%) classified as motor vehicle incidents unrelated to parking manoeuvres, and 6,504 collisions (i.e. 47%) classified as occurring due to parking manoeuvres.

The annual number of non-parking related collisions on public roadways since 1996 has generally fluctuated between 300 and 500 per year (Figure 45). Using population data from Census Canada as an indicator of the traffic activity in Terrace, the annual collision frequency appeared to rise and fall with the population until the mid-2000s. After this period, a decrease in population did not appear to have an effect on the collision frequency, which increased to approximately 400 collisions per year.

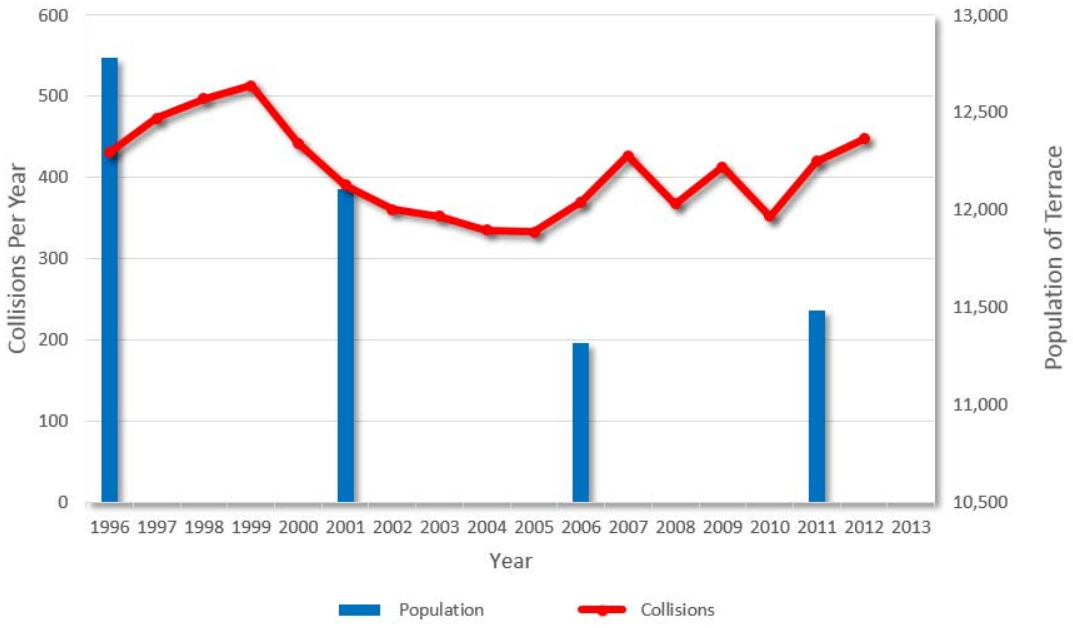


Figure 45: Annual Collision Frequency and City Population
(source: ICBC Collision Data and Census Canada)

To evaluate the recent collision trends, a detailed analysis of the last five years of collision data (i.e. November 18th, 2008 to November 17th, 2013) was completed. To focus the analysis on traffic incidents, the records concerning parking manoeuvres have been removed for separate consideration in Section 6.3. The results are outlined in the following sections.

6.1.1 Monthly Collision Trends

On a seasonal basis, the collision frequency during the winter months is typically 30% to 50% higher than the annual monthly average (Figure 46). This is largely a reflection of the effect of winter road conditions in a northern climate. The probability of precipitation is higher in winter, and the average daily temperature in Terrace is below freezing between November and February. This trend underscores the importance of winter road maintenance operations in traffic safety.

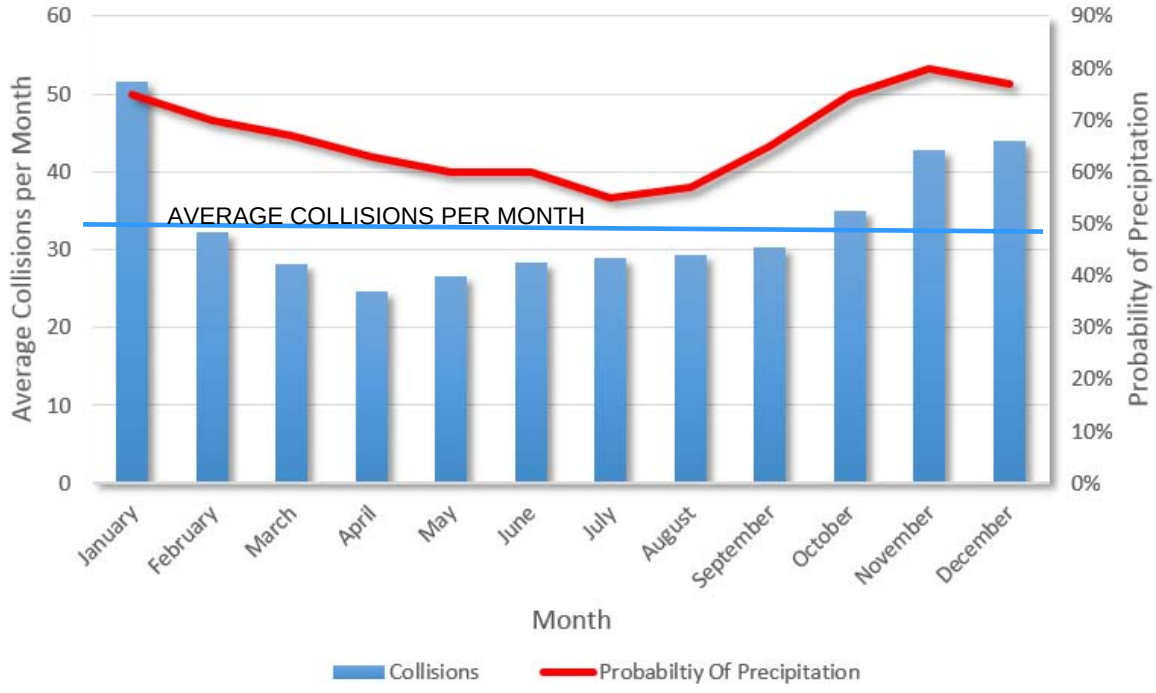


Figure 46: Monthly Collision Frequency and Probability of Precipitation
(source: weatherspark.com)

6.1.2 Daily Collision Trends

More collisions occur on Fridays, which is typically when the roads have higher traffic volumes (Figure 47). Collision frequencies are lowest on Sundays when volumes are less.

In the absence of a permanent traffic count station in Terrace, these trends could not be compared to the daily traffic volume patterns.

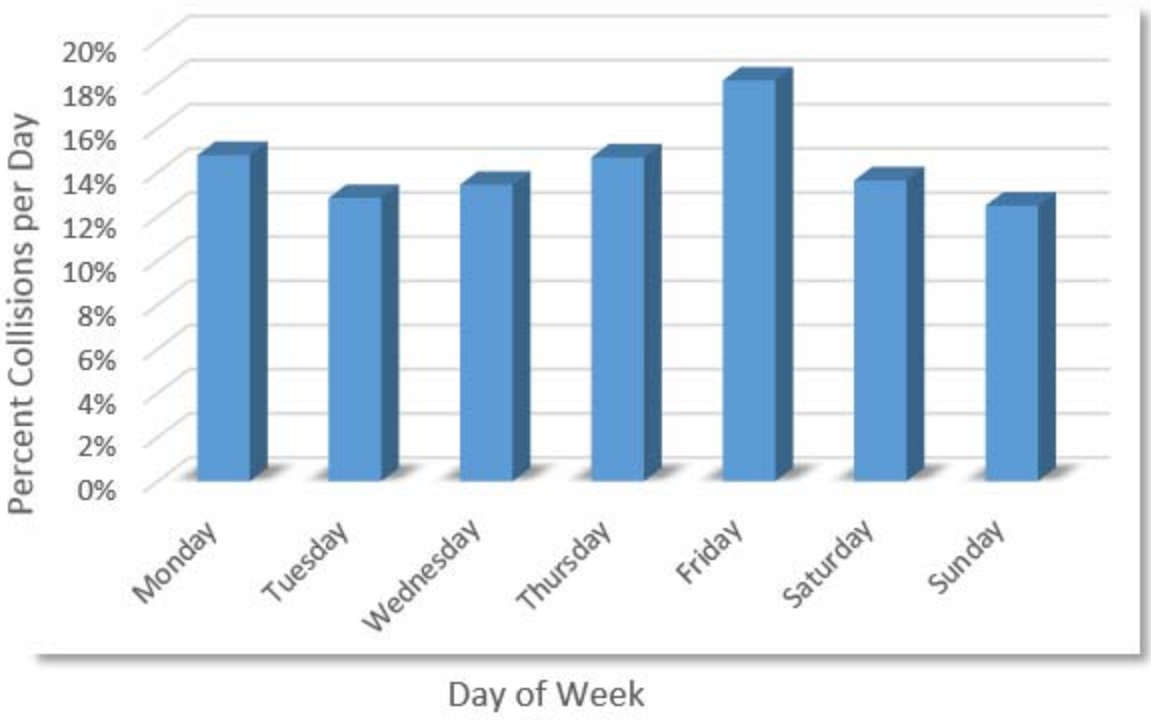


Figure 47: Percent of Collisions by Day of the Week

6.1.3 Hourly Collision Trends

When analyzed by hour of the day, the collision statistics indicate a spike in collision frequency in the morning and afternoon peak hours (Figure 48). In general, there is a strong correlation between the collision frequency and the local traffic volumes (as measured on Highway 16 at the Kenney Street intersection), indicating, as expected, that the frequency of collisions in Terrace is generally a function of the traffic exposure.

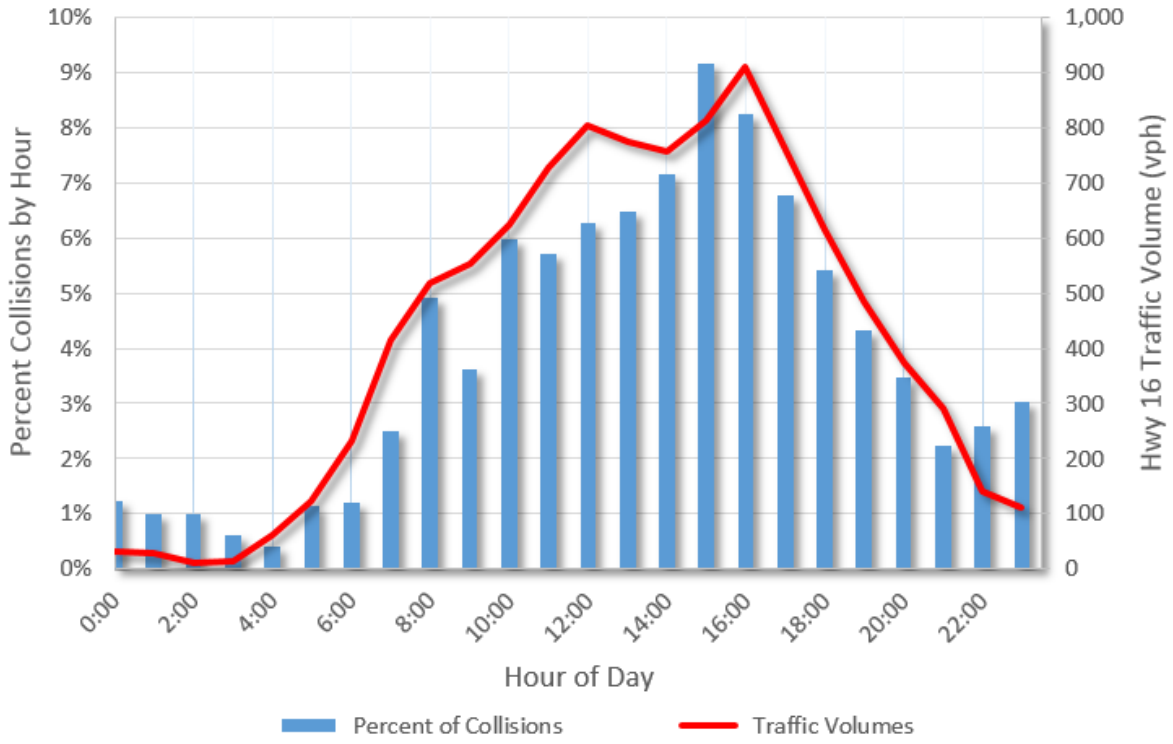


Figure 48: Percent of Collisions and Traffic Volume by Hour of the Day
(Source: MoTI Count Station 48-923EW on Highway 16 at Kenney Street, July 2014)

An exception to this is in the late evening hours, when the number of collisions increases relative to the traffic volume. This may be attributed to a number of reasons, including driver fatigue, darkness and/or poor lighting, and the potential for higher traffic speeds in the absence of heavy traffic volumes.

6.1.4 Collision Trends by Severity

Approximately 75% of all non-parking related collisions in Terrace during the analysis period were classified as Property Damage Only, in which only vehicle or other property damage was involved (Figure 49). The majority of the remainder involved an injury of some kind.

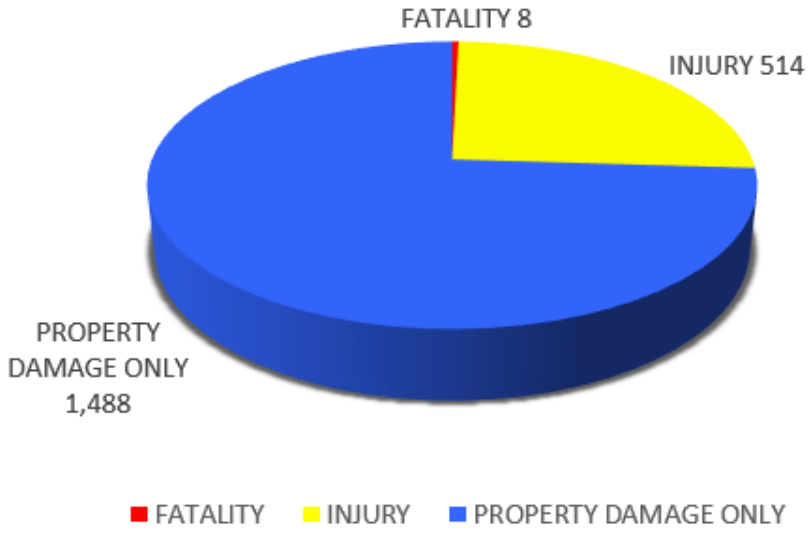


Figure 49: Collision Severity

There were eight fatal collisions (i.e. 0.4%) reported in the Terrace area, in which at least one person died as a result of the collision. From the available data, the exact locations were not always apparent. Those fatal collisions which were potentially within the city limits involved the following:

1. An off-road incident on Kalum Lake Road on a Saturday night in June 2013.
2. An off-road incident on Highway 16 on a Saturday afternoon in August 2012.
3. A head-on collision on Highway 16 on a Saturday afternoon in July 2011.
4. A head-on collision on Highway 16 on a Saturday afternoon in June 2010.
5. A left turn collision at Eby Street / Scott Avenue early in the evening on a Friday in May 2010.
6. A heavy truck incident on Highway 16 in slushy conditions involving an unsecured load on a Monday morning in January 2013.
7. A collision with a pedestrian at an unidentified location in the late evening on a Tuesday in June 2012.

The majority of fatalities occurred on the highways, where the traffic speeds are higher. Also, five of the eight fatal collisions occurred on summer weekends.

6.1.5 Collision Trends by Mode

Over 90% of the collisions were between automobiles, as would be expected from the relative proportions of vehicles on the road (Figure 50). The number of collisions involving cyclists, pedestrians, and motorcycles was relatively low. For motorcycles and cyclists, this is likely a function of exposure, as fewer people typically use these modes in northern climates.

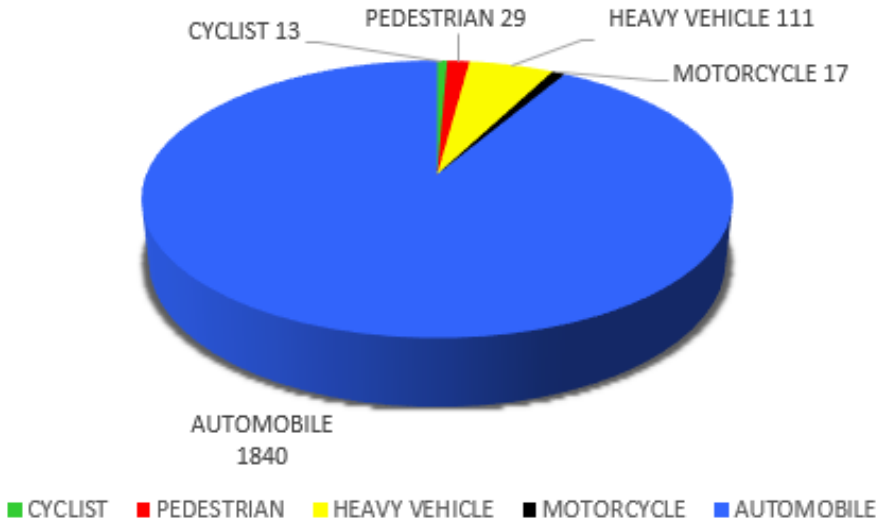


Figure 50: Collisions by Mode

Some of the apparent trends involving non-automobile users were as follows:

- Most of the 13 bicycle collisions in Terrace were Downtown (i.e. Lakelse (5); Lazelle (2); Kalum (3)), all occurring between the months of April and October. This may indicate a need for more safe cycling facilities Downtown.

- The 29 pedestrian collisions were concentrated on the main pedestrian corridors and crossing locations (i.e. Kalum Street (7); Lakelse Avenue (4); Eby Street (3); and Kenney Street (2)). There was also a pedestrian incident on Haugland Avenue at the hospital, where the public and stakeholders have expressed concerns about pedestrian safety. Approximately 25% occurred during hours of darkness.

- As expected, the majority of the collisions involving heavy trucks occurred on the major truck routes (i.e. Highway 16 (43); Highway 37 (7); Kalum Lake Road (3); and Keith Avenue (5)). There were also three heavy vehicle incidents reported on Lakelse Avenue in the Downtown, two of which involved turning at the Kalum Street intersection.

- There were no apparent locational trends in the motorcycle-related collisions. All occurred between the months of April and September, six of which involved drivers losing control.

6.2 NETWORK SCREENING

Based on the most recent five years of available ICBC collision data, 20 intersections were identified for further study, applying the following methodology:

1. A list of 30 intersections was generated by discarding all identifiable locations with less than four non-parking related collisions.

2. The traffic volume at each intersection was determined by traffic counts (where available), or estimated from counts at nearby locations (e.g. City hose counts). A K Factor of 10 was used to estimate Annual Average Daily Traffic (AADT) from the peak hour data.

3. A **Collision Rate** (i.e. number of collisions per million entering vehicles over the five year study period) was calculated for each intersection. This measure normalizes the data such that the collision history at a given location is considered in the context of its exposure to traffic volumes. The intersections were then ranked from the highest to the lowest Collision Rates.

4. A **Severity Index** was calculated for each intersection by assigning a weighting of 600 to each fatal collision, 20 to each injury collision, and 1 to each collision with property damage only. These weightings are intended to reflect the relative societal costs of each type of collision (Ref. 17). The intersections were then re-ranked from the highest to the lowest Severity Index to identify locations where the severity is of greater concern.

5. A **Critical Collision Rate** was calculated for each intersection. This calculation uses the Average Collision Rate for similar intersections to determine the threshold collision rate for the subject intersection (based on its traffic volume), above which the location may be considered problematic (with a 95 percent confidence). The most recent ICBC figures for Average Collision Rates in BC for signalized and stop-controlled intersections are 1.75 and 1.02 collisions per million-entering vehicles respectively. As these rates are generally far above the rates for the Terrace intersections, local Average Collision Rates were calculated from the list of top 30 intersections. The results were 0.99 and 0.40 collisions per million-entering vehicles for signalized intersections and stop-controlled intersections respectively.

   With the Critical Collision Rates, the **Critical Collision Rate Index** (CCRI) was calculated as the ratio of the actual Collision Rate at each intersection to the applicable Critical Rates. Values exceeding 1.0 indicated a potential concern. The list of 30 intersections was then re-ranked according to the CCRI scores.

6. With the three rankings, a combined ranking (with equal weightings) was calculated to prioritize the Top 30 intersections. Only the Top 20 were advanced for further study, as discussed in the following sections. These, and their respective indices, are summarized in Table 9.

Table 9: Identified Intersections for Study

Rank	Intersection Location	Traffic Control	AADT (vpd)	Collision Frequency	Collision Rate	FAT.	INJ.	PDO	Severity Index	Critical Rate	CCRI
1	Hwy 16 at Kenney Street	Signal	12,000	31	1.42	0	10	21	221	1.36	1.04
2	Keith Ave at Kenney St	Stop (2 way)	8,200	19	1.27	0	9	10	190	0.70	1.80
3	Hwy 16 (Keith Ave) at Kalum Street	Signal	17,000	34	1.10	0	13	21	281	1.30	0.84
4	Lazelle Avenue at Kalum Street	Stop (2 way)	9,600*	16	0.91	0	6	10	130	0.68	1.34
5	Park Avenue at Kalum Street	Signal	9,600	21	1.20	0	5	16	116	1.41	0.85
6	Scott Avenue at Eby Street	Stop (2 way)	3,500*	4	0.63	1	1	2	622	0.89	0.70
7	Hwy 16 at Munroe Street	Stop (2 way)	9,800*	14	0.78	0	3	11	71	0.68	1.16
8	Lakelse Avenue at Kalum Street	Signal	11,000	18	0.90	0	4	14	94	1.38	0.65
9	Hwy 16 at Sande St/Greig Ave	Signal	18,300	23	0.69	0	9	14	194	1.29	0.54
10	Haugland Avenue at S. Kalum Street	Stop (2 way)	4,000*	5	0.68	0	4	1	81	0.86	0.80
11	Hwy 16 (Keith Ave) at Hall Street	Stop (2 way)	15,800	13	0.45	0	6	7	127	0.61	0.74
12	Hwy 16 at Eby Street	Signal	13,600	15	0.60	0	6	9	129	1.34	0.45
13	Walsh Avenue at Eby Street	Stop (2 way)	4,500*	4	0.49	0	4	0	80	0.83	0.59
14	Lakelse Avenue at Apsley Street	Stop (2 way)	7,500*	5	0.37	0	3	2	62	0.72	0.51
15	Lakelse Avenue at Sparks Street	Signal	9,400	10	0.58	0	3	7	67	1.41	0.41
16	Park Avenue at Kenney Street	Stop (2 way)	6,300*	4	0.35	0	4	0	80	0.75	0.46
17	Hwy 16 (Keith Ave) at Tetrault Street	Stop (2 way)	18,000*	11	0.33	0	3	8	68	0.60	0.56
18	Lazelle Avenue at Sparks Street	Stop (4 way)	7,500	5	0.37	0	1	4	24	0.72	0.51
19	Lakelse Avenue at Emerson Street	Signal	7,900	5	0.35	0	4	2	82	1.45	0.24
20	Straume Avenue at Kalum Street	Stop (2 way)	6,300*	4	0.35	0	2	2	42	0.75	0.46

** Annual Average Daily Traffic estimated from counts at adjacent intersections.*

Approximately one-third of the collision records included latitude and longitude (i.e. GPS) locational referencing. This data is reflected in Figure 51, showing larger yellow circles for locations with higher collision frequency. This figure correlates well with the Top 20 list of study intersections, which are circled in red.

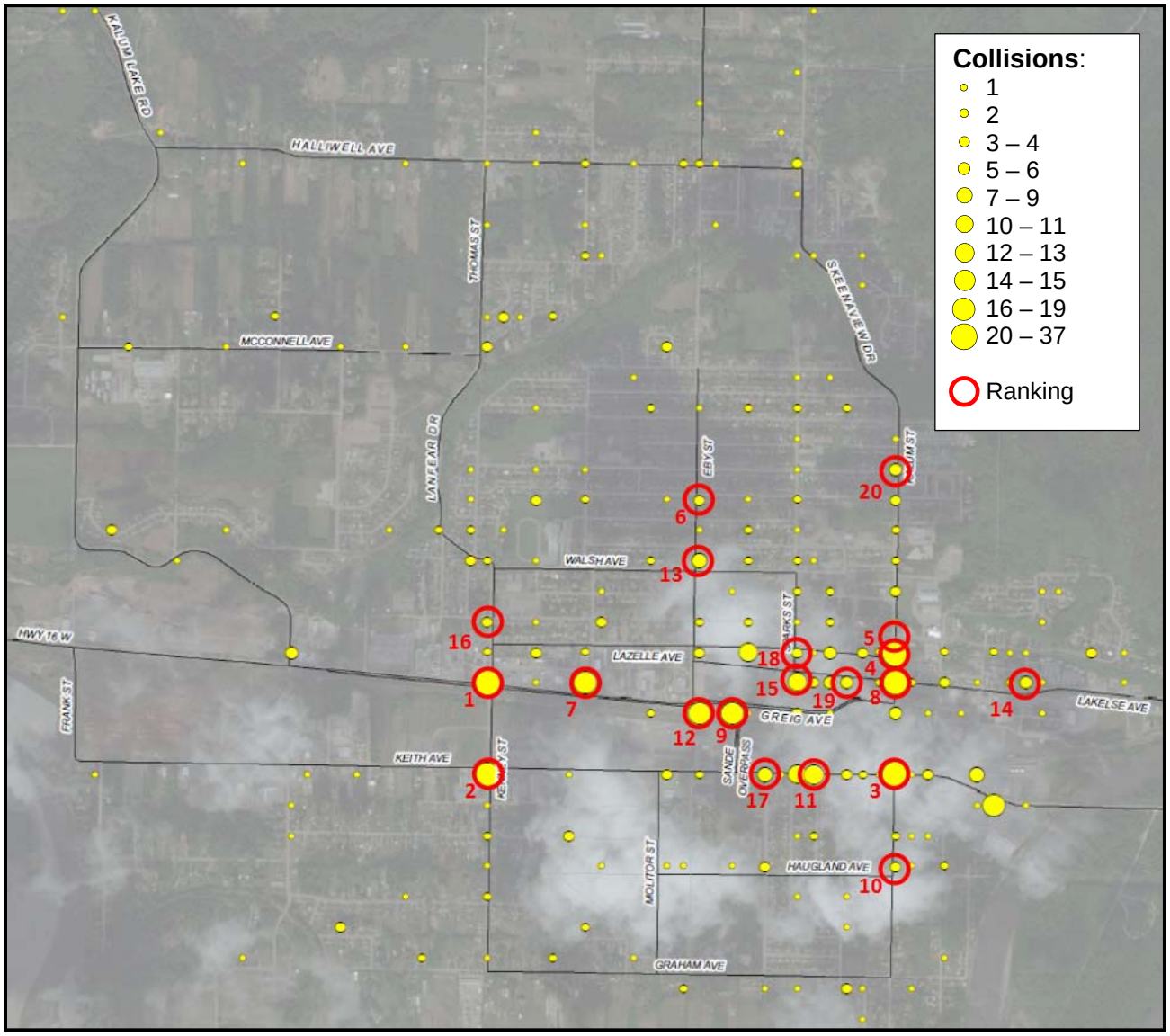


Figure 51: Relative Collision Frequencies at Intersections in Terrace

Following the analysis, the ten intersections discarded from the original list of 30 locations are shown in Table 10.

Table 10: Discarded Intersections

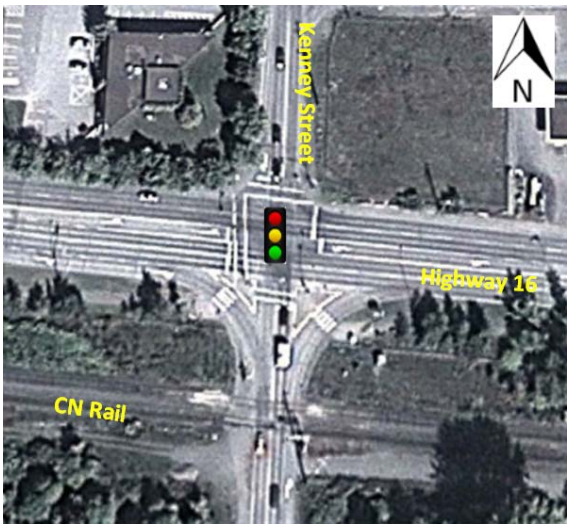
Intersection Location	Traffic Control	AADT (vpd)	Collision Frequency	Collision Rate	FAT.	INJ.	PDO	Severity Index	Critical Rate	CCRI
Hwy 16 (Keith Ave) at Sande Street	Stop (2 way)	18,900	14	0.41	0	4	10	90	0.59	0.68
Haugland Avenue at Tetrault Street	Stop (2 way)	4,500*	4	0.49	0	2	2	42	0.83	0.59
Hwy 16 at Kalum Lake Road	Stop (2 way)	5,500	4	0.40	0	1	3	23	0.78	0.51
Hwy 16 (Keith Ave) at Sparks Street	Stop (2 way)	17,000*	9	0.29	0	2	7	47	0.61	0.48
Greig Avenue at Kalum Street	Stop (2 way)	6,600*	4	0.33	0	3	1	61	0.74	0.45
Lazelle Avenue at Emerson Street	Signal	5,000	4	0.44	0	1	3	23	1.58	0.28
Davis Avenue at Kalum Street	Stop (2 way)	6,500	4	0.34	0	1	3	23	0.75	0.45
Scott Avenue at Kalum Street	Stop (2 way)	6,600	4	0.33	0	2	2	42	0.74	0.45
Lazelle Avenue at Eby Street	Stop (4 way)	8,400	4	0.26	0	1	3	23	0.70	0.37
Greig Avenue at Sparks Street	Stop (2 way)	9,300	4	0.24	0	0	4	4	0.68	0.34

** Annual Average Daily Traffic estimated from counts at adjacent intersections.*

The intersection of Highway 16 (Keith Avenue) at Sande Street has sufficient scores to be included in the Top 20 list. However, since this intersection had substantial laning and geometric upgrades and a new traffic signal in 2015, this intersection was discarded from further analysis.

According to the stakeholders, a trend in eastbound left turn collisions has emerged since the intersection improvements, largely due to drivers' failure to adapt to the new traffic control, and their apparent confusion about the right-of-way. At the time of this report, MoTI was monitoring the situation and revisiting the signage to further clarify the traffic control.

6.2.1 Highway 16 at Kenney Street



Description:
The signalized intersection of Highway 16 and Kenney Street (Figure 52) is the first of two at-grade railway crossings west of the Sande Street overpass. The south leg connects to the Keith Avenue industrial area; the north leg connects to Lanfear Drive, which is the busiest of the three routes to the Upper Bench area. Consequently, the intersection has a significant traffic demand, with an estimated average daily entering volume of 12,000 vpd.

The highway has four lanes, with opposing left turn lanes. Kenney Street has dedicated right turn lanes, and shared left/through lanes, The posted speed on all approaches is 50 km/h, although the speed changes to 60 km/h just west of the intersection.

Figure 52: Highway 16 at Kenney Street

Collision Analysis:
Within the recent five year study period, there were 31 reported incidents (i.e. 6 per year on average), although there were 12 collisions reported in 2012. The obvious trends in the collision data were as follows (Table 11 and Figure 53):

1. There were 11 collisions which occurred between 3pm and 6pm, with no collisions reported in the late evening hours, suggesting illumination is not a concern.
2. The majority of collisions (17) occurred between Thursday and Friday, with relatively few occurring on weekends.
3. The collisions occurred in all seasons, although a significant proportion (12/31) occurred between September and October.
4. There were 8 rear-ends collisions on the northbound approach on Kenney Street. Drivers may be distracted by the extra traffic control as they clear the tracks.
5. There were 7 left turn collisions involving the westbound left and the eastbound through movement, with the changing traffic signal and traffic speeds cited as contributing factors. The eastbound drivers were often in the outside lane.

Table 11: Collision Types at Hwy 16 / Kenney Street

Crash Types	PDO	Injury	Total
Rear End	8	4	12
Left Turn	6	4	10
Rear End – Right Turn	1		1
Side Impact	1	2	3
Side Swipe Same Direction	2		2
Single Vehicle	2		2
Head On	1		1
Total	**21**	**10**	**31**

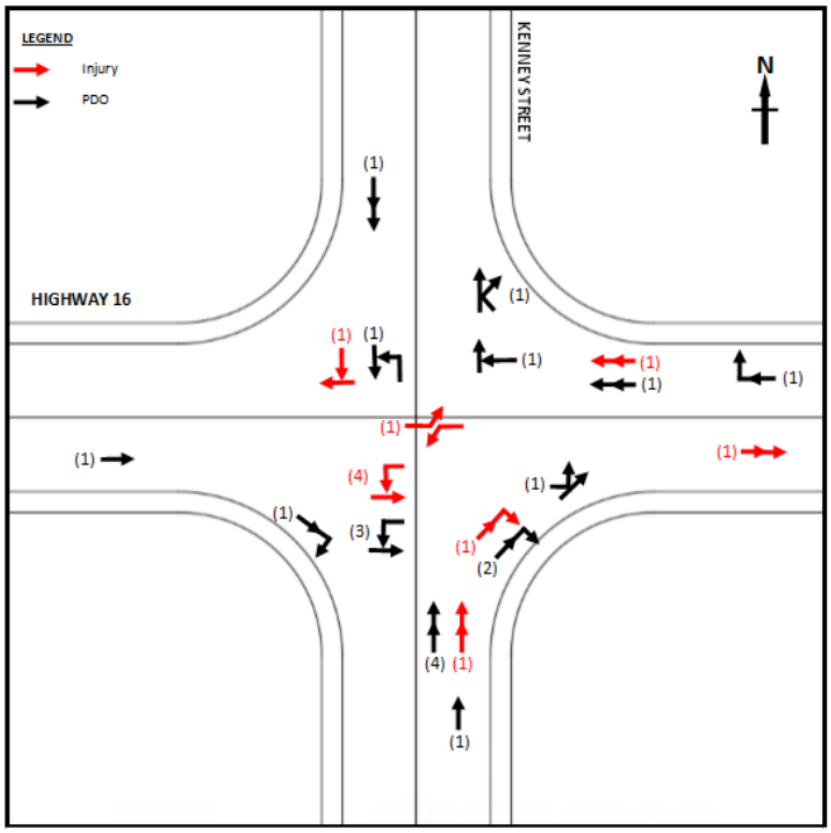


Figure 53: Collision Diagram at Highway 16 and Kenney Street

Potential Solutions:
The two collision trends with strong potential for correctability are the westbound left turns and the northbound rear ends, with the former tending to be the more severe. Potential improvements are as follows:

1. Install a red light camera for Highway 16 eastbound traffic to reduce the incidence of red light running, especially conflicting with westbound left turns.

2. Revisit the traffic control (i.e. traffic signal and rail signal) on the northbound approach to ensure clear and visible guidance.

3. Ensure the traffic signals meet current MoTI specifications for visibility.

4. Construct a dedicated left turn lane on the Kenney Street approaches to allow through traffic to proceed unimpeded across the highway.

5. Construct a new rail overpass at the Kalum Lake Road intersection to reduce the traffic demand at this at-grade crossing.

Any modifications at this intersection will require the participation of MoTI.

6.2.2 Keith Avenue at Kenney Street

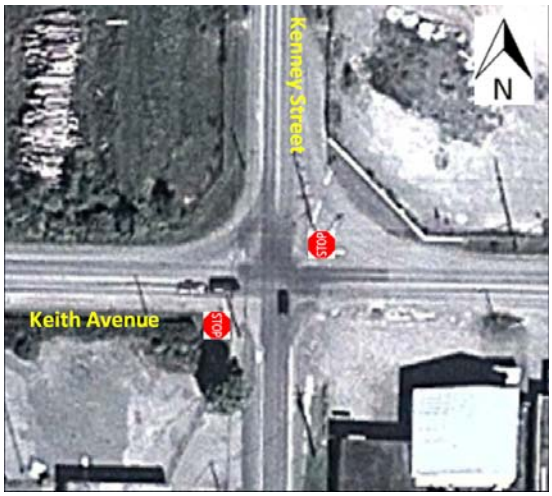


Figure 54: Keith Avenue at Kenney Street

Description:
The intersection of Keith Avenue at Kenney Street (Figure 54) has stop control on the eastbound and westbound approaches on Keith Avenue. The intersection is part of a major truck route through Terrace's industrial area, and connects directly to Highway 16 to the east and to the north. The estimated entering traffic volume is 8,200 vpd.

Both roads are two-lanes, with posted speeds of 50 km/h. A raised island on the northeast corner channelizes right turn traffic, and also provides protection for hydro pole with bi-directional power lines. The stakeholders identified the pole as an impediment to the sight distance at the intersection.

Collision Analysis:
Within the recent five year study period, there were 19 reported incidents (i.e. 4 per year on average). The obvious trends in the collision data were as follows (Table 12 and Figure 55):

1. The majority of collisions (13) occurred during the daytime during typical work hours, between 10:30AM and 6:00PM, indicating no likely concern with illumination.
2. Almost half the collisions involved injuries, indicating a high degree of severity.
3. There were 11 incidents involving drivers not yielding right-of-way on Keith Avenue, resulting in 90 degree collisions.
4. Two incidents were caused by cyclists on Keith Avenue not stopping.
5. There was one pedestrian collision in the west crosswalk, by an eastbound driver.

Table 12: Collision Types at Keith Avenue / Kenney Street

Crash Types	PDO	Injury	Total
Rear End	4	1	5
Left Turn	1		1
Rear End – Right Turn			
Side Impact	2	9	11
Single Vehicle	1	1	2
Head On			
Total	**8**	**11**	**19**

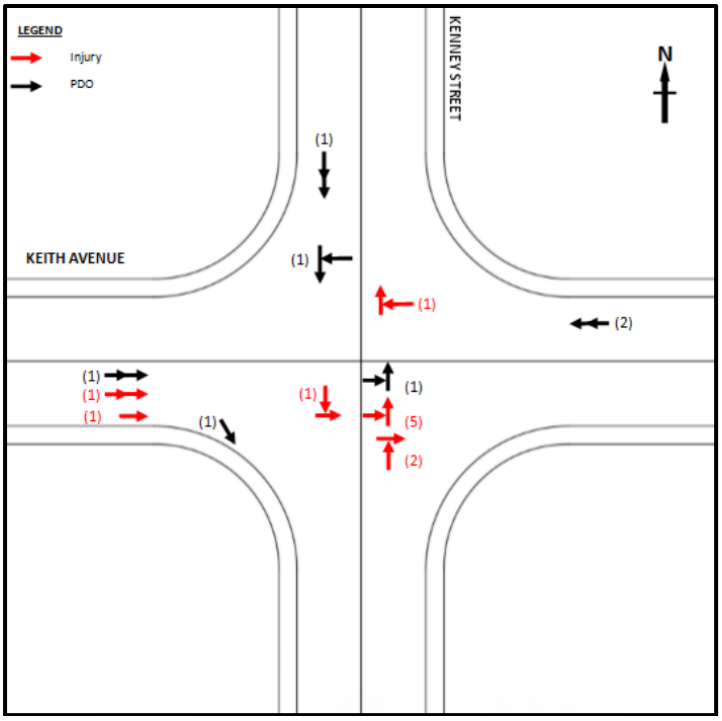


Figure 55: Collision Diagram at Keith Avenue and Kenney Street

Potential Solutions:
Both drivers and cyclists on Keith Avenue are not yielding right-of-way to traffic on Kenney Street. Furthermore, the visual cues suggest a continuing road on each approach, and Kenney Street is the only stop-controlled intersection on Keith Avenue. And finally, it is not always clear to drivers on Keith Avenue that Kenney Street traffic is free-flow. For these reasons, the highest potential for correctability appears to be with the traffic control. From Section 5.4, left turn lanes would also be beneficial from an operational perspective, but these would have a lesser effect on the identified collision trends than traffic control.

Applying the TAC warrants, a four-way stop appears warranted by the traffic volumes. The current Level of Service for the intersection is “B”, with the Keith Avenue approaches currently experiencing a Level of Service between “C” and “D” during the peak hours. By converting the intersection to a four-way stop, the Level of Service on all approaches would be between “A” and “B” during the peak hours.

By stopping all four approaches, the collisions should decrease due to the reduction in delays on Keith Avenue, and from the inherent reduction in traffic speeds through the intersection. To address the visual cues that suggest a continuous road, the stop signs should be complemented by red reflective post covers, and ideally a red flashing beacon on each approach (either under the stop signs, or suspended over the intersection).

After the four-way stop is installed, the volumes and queue lengths should be monitored to ensure southbound traffic does not queue back to the railway tracks. If and when this occurs, signalization (or a roundabout) should be considered for installation, with queue detection on the southbound approach.

6.2.3 Highway 16 (Keith Avenue) at Kalum Street

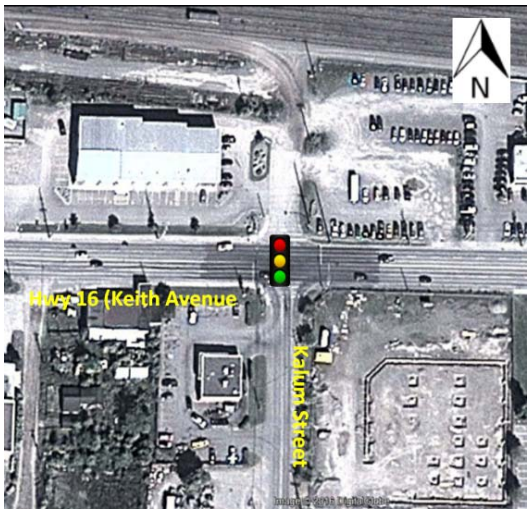


Figure 56: Hwy 16 (Keith Ave) at Kalum Street

Description:
The signalized intersection of Highway 16 (Keith Avenue) at Kalum Street (Figure 56) connects highway traffic to the residential area to the south. One of the two local Tim Horton's restaurants is situated on the southwest corner, which contributes to a significant volume of turning traffic at the intersection.

The highway has four lanes, with no turning lanes. The Kalum Street approaches have a shared left/through lane and a dedicated right turn lane. The estimated average daily entering traffic at the intersection is 17,000 vpd. The posted speed on both roads is 50 km/h.

Collision Analysis:
Within the recent five year study period, there were 34 reported incidents (i.e. 7 per year on average). The obvious trends in the collision data were as follows (Table 13 and Figure 57):

1. There were 9 collisions that occurred on Fridays, with only a few on each of the other days.
2. The collisions were generally evenly distributed through the seasons.
3. The majority of collisions (27) occurred during the daytime, between 8:00AM and 8:00PM, indicating no likely concern with illumination. A large proportion of these (11) occurred between 3:00 PM and 6:00PM.
4. There were 12 rear end collisions, many of which involved an impact with a vehicle in the inside lane, stopped to make a left turn. The majority of the rear end collisions were in the eastbound and westbound directions.
5. There were 8 incidents attributed to westbound left turn movements colliding with opposing eastbound movements.
6. Two incidents involved pedestrians, one of which was crossing the highway.

Table 13: Collision Types at Hwy 16 / Kalum Street

Crash Types	PDO	Injury	Total
Rear End	6	6	12
Left Turn	6	4	10
Rear End – Right Turn			
Side Impact	1	1	2
Sideswipe – Same Direction	3		3
Single Vehicle	5	2	7
Head On			
Total	**21**	**13**	**34**

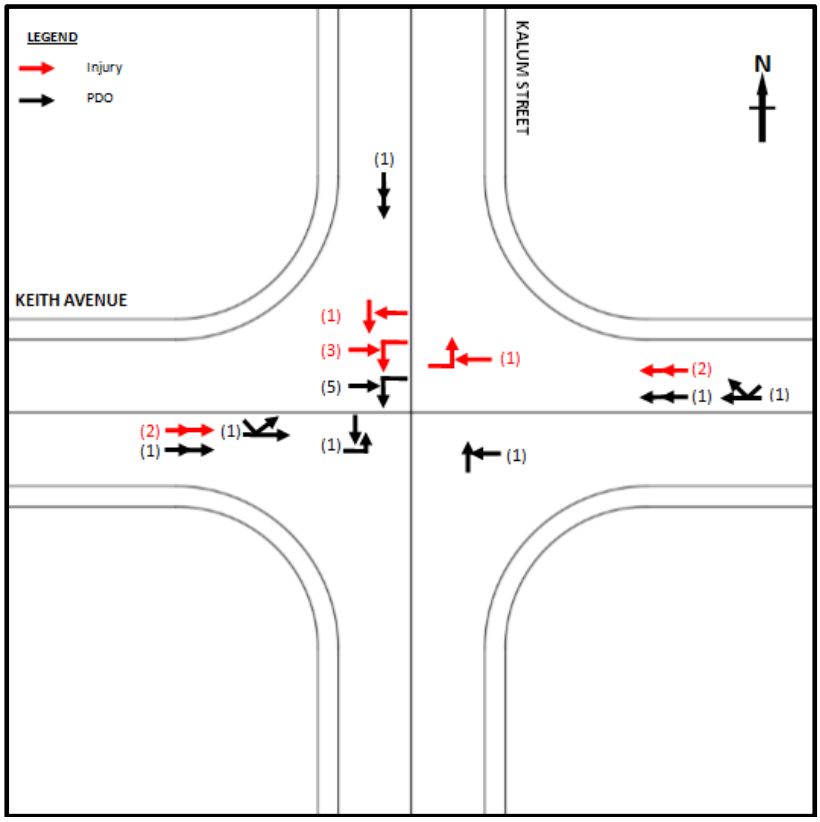


Figure 57: Collision Diagram at Highway 16 (Keith Ave) and Kalum Street

Potential Solutions:
The trend with a strong potential for correctability are associated with the left turn movements, especially in the westbound direction. A westbound advance left turn phase was added to the traffic signal in 2016, which helps address the turning demand. To further facilitate these turns and to reduce the potential for rear end collisions, dedicated left turn lanes should be considered. These would be costly in consideration of the adjacent infrastructure, the narrow right-of-way, and the large power poles on the north side of the highway. Therefore, this improvement should be planned, but will not likely be justifiable until the left turning volume increases significantly.

The trend in rear end collisions may have already been partially addressed by recent modifications in the adjacent restaurant drive-through, which have reduced queueing problems on the highway. Any remaining rear end issues can be addressed by ensuring that the traffic signals meet current MoTI specifications for visibility.

Any modifications at this intersection will require the participation of MoTI.

6.2.4 Lazelle Avenue at Kalum Street

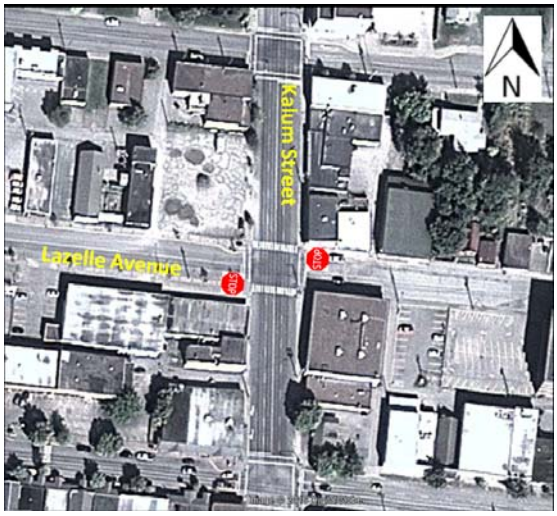


Figure 58: Lazelle Avenue at Kalum Street

Description:
The intersection of Lazelle Avenue and Kalum Street in Downtown Terrace has a stop condition on the Lazelle Street approaches, and free flow traffic on Kalum Street between the signalized intersections at Lakelse Avenue and Park Avenue (Figure 58).

Kalum Street is four lanes at the Lazelle intersection, but changes to two-lanes with a Two-Way Left Turn Lane north of Park Avenue. Lazelle Avenue is a two lane road. Both roads are posted at 50 km/h. The estimated average daily entering traffic volume is 9,600 vpd.

Collision Analysis:
Within the recent five year study period, there were 16 reported incidents (i.e. 3 per year on average). The obvious trends in the collision data were as follows (Table 14 and Figure 59):

1. There were 7 collisions that occurred in winter months (i.e. November to February), indicating a potential issue with winter road conditions.
2. Almost all collisions occurred between the late morning and early evening hours (i.e. 11AM to 6PM), when activity Downtown is greatest. Ten of these were between 2PM and 4:30PM.
3. There were 5 incidents that involved 90 degree collisions; these were evenly distributed by direction. With the proximity of the adjacent buildings and the four lanes of traffic, this likely indicates an issue with sight distance.
4. There were 5 rear-end collisions, most of which occurred on Lazelle Avenue at the stop condition.

Table 14: Collision Types at Lazelle Ave / Kalum St

Crash Types	PDO	Injury	Total
Rear End	3	2	5
Left Turn		1	1
Rear End – Right Turn			
Side Impact	2	3	5
Sideswipe – Same Direction	3		3
Single Vehicle	1		1
Unknown			1
Total	**10**	**6**	**16**

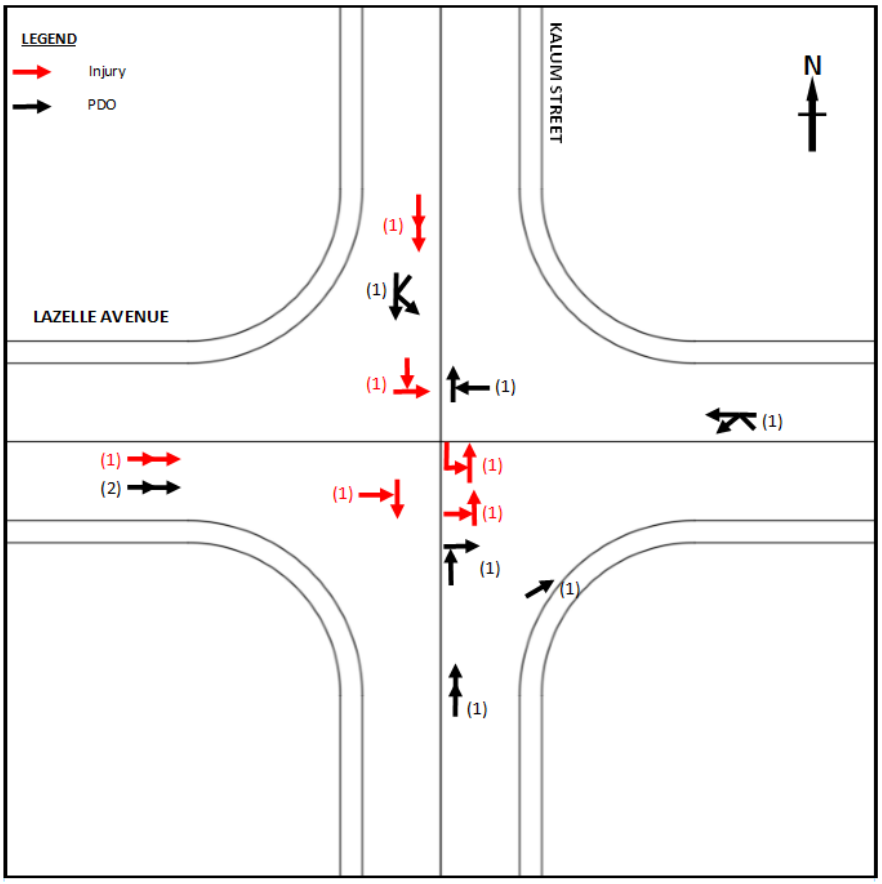


Figure 59: Collision Diagram at Lazelle Avenue at Kalum Street

Potential Solutions:
The two trends with the most potential for correctability are the rear ends and the 90 degree collisions:

1. The 90 degree collisions can be addressed by continuing the lane diet south of Park Avenue, through the Lazelle Avenue intersection. With only two lanes of through traffic on Kalum Street, drivers on Lazelle Avenue can better gauge safe gaps in traffic flow. Furthermore, there are less conflict points when crossing the intersection.

2. The rear end collisions can also be addressed by extending the lane diet on Kalum Street. On Lazelle Avenue, drivers can move further into the intersection to see oncoming traffic more clearly, which may reduce the need for reversing manoeuvres that cause rear ends. On Kalum Street itself, a dedicated left turn lane will also reduce the potential for rear end collisions by separating the turning movements from the through movements.

3. Rear end collisions can also be reduced on Lazelle Avenue by installing a sidewalk extension on the northeast corner of the intersection. This will allow the westbound stop sign to be placed in a more visible location for approaching traffic.

6.2.5 Park Avenue at Kalum Street

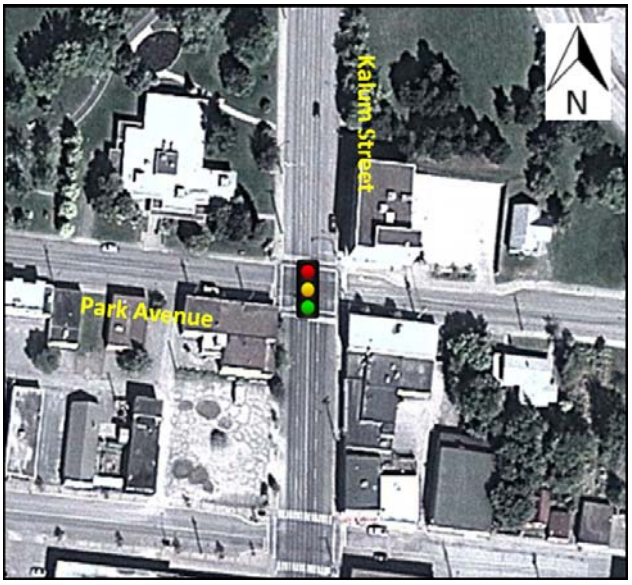


Figure 60: Park Avenue at Kalum Street

Description:
The intersection of Park Avenue and Kalum Street in Downtown Terrace (Figure 60) is controlled by a traffic signal. Kalum Street had a four-lane cross section during the study period, but has since been changed to two lanes with a Two-Way Left Turn Lane north of Park Avenue.

Park Avenue is two lanes at the Kalum Street intersection, with an 11 metre long right turn lane on the westbound approach. Adjacent buildings reduce the available sight distances around the intersection corners. Both roads are posted at 50 km/h. The estimated average daily entering traffic volume is 9,600 vpd.

Collision Analysis:
Within the recent five year study period, there were 21 reported incidents (i.e. 4 per year on average). The obvious trends in the collision data were as follows (Table 15 and Figure 61):

1. There were 9 collisions that occurred in winter months (i.e. November to February), indicating a potential issue with winter road conditions.
2. The majority of collisions occurred between the late morning and early evening (i.e. 11AM to 6PM), when activity Downtown is greatest. Seven of these occurred between 3:00PM and 6:00PM. Illumination is not considered a factor.
3. Only five collisions involved injuries, indicating lower speed collisions.
4. Two incidents cited winter conditions as a factor.
5. Three incidents were reported as rear ends, including reversing manoeuvres.
6. Seven incidents were reported as 90 degree collisions due to red light running.
7. Three incidents involved left turn manoeuvres on Kalum Street.
8. Two collisions involved pedestrians, one of which was identified as jaywalking.

Table 15: Collision Types at Park Ave / Kalum St

Crash Types	PDO	Injury	Total
Rear End	3		3
Left Turn	3	1	4
Rear End – Right Turn			
Side Impact	5	2	7
Sideswipe – Same Direction	1		1
Sideswipe – Opposite Direction	2		2
Single Vehicle	2	2	4
Head On			
Total	**16**	**5**	**21**

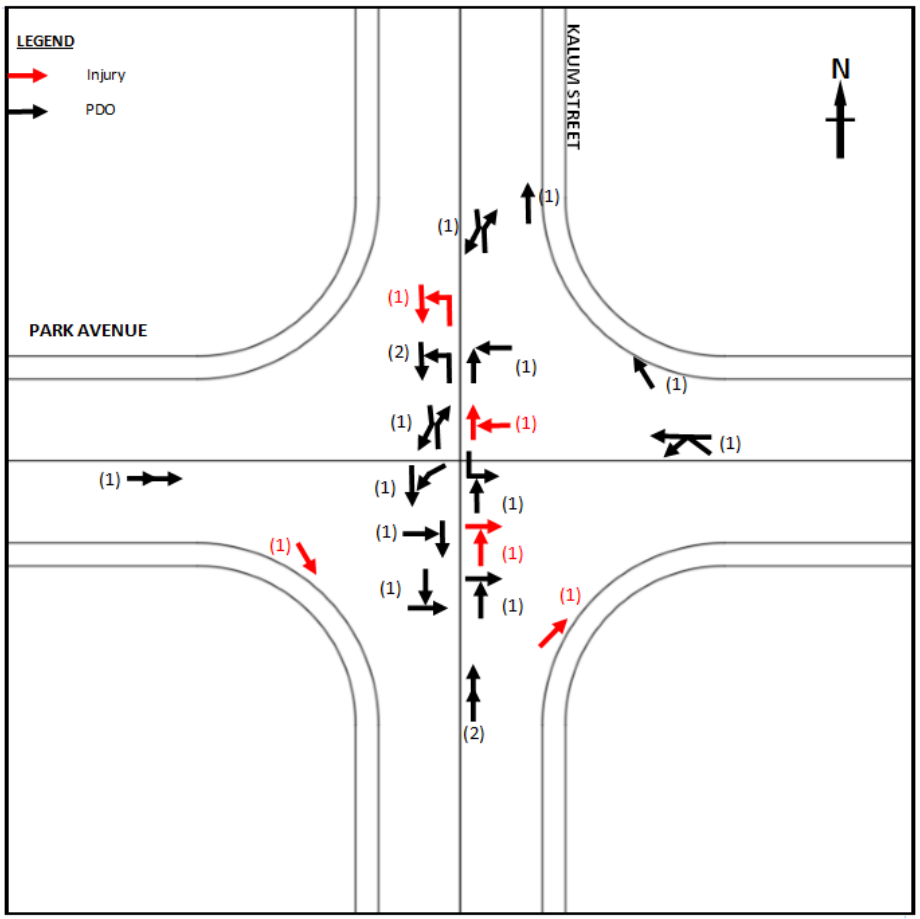


Figure 61: Collision Diagram at Park Avenue at Kalum Street

Potential Solutions:
The collision trend associated with the left turn manoeuvres on Kalum Street could be addressed by creating formal northbound and southbound left turn lanes, which could be achieved by extending the existing three lane section on Kalum Street south through the Downtown. This would improve the sight distance for left turn movements, and eliminate the conflict from the second opposing lane of traffic.

The trend in 90 degree collisions due to red light running has a strong potential for correctability. This can be addressed by:

1. Revisiting the intergreen (i.e. yellow-red) phase of the signal timing. In particular, 2 seconds of “all-red” time after each phase can significantly improve the safety of the vehicle clearance.
2. Upgrading the signal heads to higher intensity LED bulbs.
3. Upgrading the primary head backboards to reflective yellow sheeting.

Although the trend in pedestrian collisions is relatively small, the incidence of jay walking and general pedestrian crossing safety can be improved with the installation of countdown pedestrian signal heads.

6.2.6 Scott Avenue at Eby Street

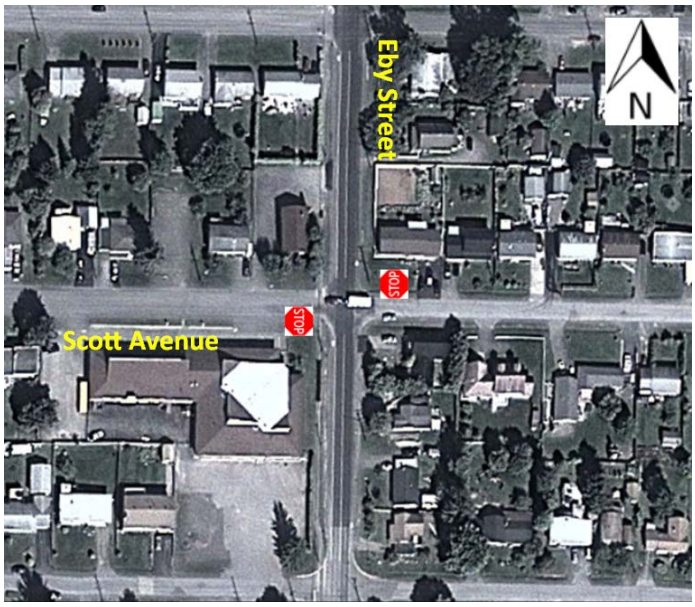


Figure 62: Scott Avenue at Eby Street

Description:
Situated in the residential neighbourhood at the bottom of the Bench, the intersection of Scott Avenue and Eby Street is effectively the connection of two city collectors (Figure 62). Both roads are two lanes, and there are no turning lanes at the intersection.

The eastbound and westbound approaches on Scott Avenue have stop conditions. Eby Street is free-flowing through the intersection. The daily traffic volume entering the intersection is estimated at 3,500 vpd. The posted speed on all approaches is 50 km/h. This is the only city intersection that had a fatal collision during the study period.

Collision Analysis:
Within the recent five year study period, there were 4 reported incidents (i.e. less than one per year). It is the low volume of traffic and the high severity of the collisions that has caused this intersection to be in the Top 20 list. The obvious trends in the collision data were as follows (Table 16 and Figure 63):

1. All collisions occurred in the afternoon or early evening, during daylight hours. This does not indicate any concerns with illumination.
2. One collision was a rear end with a vehicle that had stopped to make a left turn.
3. Two of the incidents were 90 degree collisions caused by drivers on Scott Avenue not yielding right-of-way. One involved running through the stop sign, and one involved stopping, then proceeding without a safe gap in traffic.
4. The fatal collision involved a northbound vehicle turning left in front of a southbound vehicle.

Table 16: Collision Types at Scott Ave / Eby St

Crash Types	PDO	Injury	Fatality	Total
Rear End	1			1
Left Turn			1	1
Rear End – Right Turn				
Side Impact	1	1		2
Sideswipe – Same Direction				
Sideswipe – Opposite Direction				
Single Vehicle				
Head On				
Total	**2**	**1**	**1**	**4**

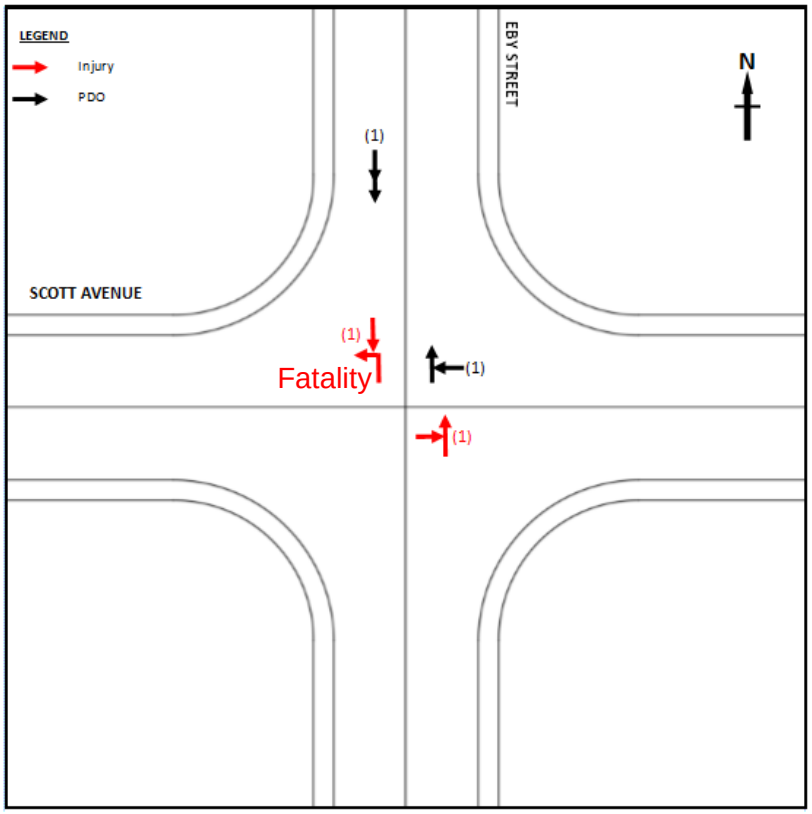


Figure 63: Collision Diagram at Scott Avenue at Eby Street

Potential Solutions:

The trend with the strongest potential for correctability is with drivers on Scott Avenue failing to yield right-of-way. This may be addressed by the following:

1. The visibility of the stop signs on Scott Avenue should be improved by adding red reflective tape to the stop sign posts.
2. The westbound stop sign should be relocated closer to the roadway.
3. A stop line should be painted on the westbound approach, similar to the eastbound approach.
4. Ensure snow piles are kept sufficiently back from the intersection to preserve the necessary sight lines.

The fatal collision did not appear to follow any defined trends at the intersection. However, to help protect against a similar incident in the future, the left turn conflicts at this intersection (and similar intersections) should be monitored to determine if effective counter-measures can be identified.

6.2.7 *Highway 16 at Munroe Street*

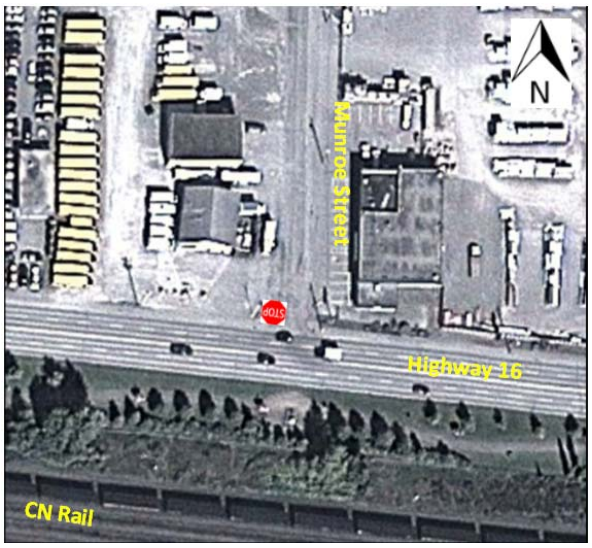


Figure 64: Hwy 16 at Munroe Street

Description:
The T-intersection of Highway 16 and Munroe Street connects a main city collector to the provincial highway (Figure 64). The highway has four lanes of free flow traffic through the intersection; Munro Street is two-lanes, with a stop condition at the highway. There are no turning lanes on any of the approaches.

Both roads are posted at 50 km/h. The estimated average daily entering traffic volume is 9,800 vpd. The intersection is located 400 metres west of the signalized intersection at Eby Street, and 400 metres east of the signalized intersection at Kenney Street. Both signals provide gaps in traffic that facilitate turning movements.

Collision Analysis:
Within the recent five year study period, there were 14 reported incidents (i.e. 3 per year on average). The obvious trends in the collision data were as follows (Table 17 and Figure 65):

1. All collisions occurred between the hours of 8:00 AM and 5:30 PM, which were almost all during daylight hours. This does not indicate concerns with illumination.
2. Eight of the collisions occurred between Friday and Saturday.
3. Only three collisions involved injuries, indicating lower severity incidents.
4. Half of the incidents involved southbound drivers on Munroe Street attempting to turn left, and colliding with a westbound vehicle on Highway 16.

Table 17: Collision Types at Hwy 16 / Munroe Street

Crash Types	PDO	Injury	Total
Rear End	4		4
Left Turn	6	3	9
Rear End – Right Turn			
Side Impact	1		1
Sideswipe – Same Direction			
Sideswipe – Opposite Direction			
Single Vehicle			
Head On			
Total	**11**	**3**	**14**

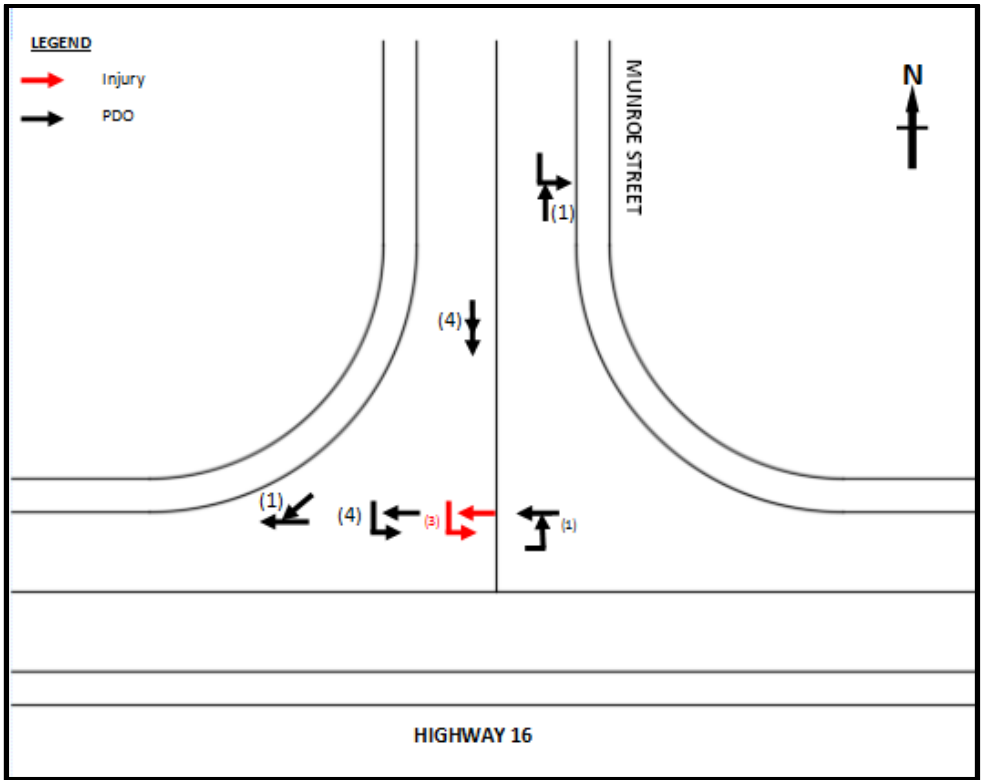


Figure 65: Collision Diagram at Highway 16 at Munroe Street

Potential Solutions:
The trend with the most potential for correctability is associated with the southbound left turn movements. These appear to be problematic due to drivers misjudging the gaps, especially over four lanes of highway traffic. The easiest solution would be to ensure the sight lines at the intersection are maintained, especially looking east from Munroe Street. The northeast corner of the intersection should thus be kept clear of parked vehicles, signage, foliage, and piles of snow in the winter months.

Although there does not appear to be a problem with drivers observing the stop sign on Munroe Street, the stop condition at the highway does warrant a stop line. The stop sign itself could also be emphasized with reflective tape on the sign post.

The collision trend could also be addressed by restricting the intersection movements to right-in/right-out only (e.g. with the installation of a raised island). Lazelle Avenue to the north would allow traffic on Munroe Street to easily divert to the traffic signals at Eby Street and Kenney Street. However, unless this improvement is implemented in conjunction with access management along Highway 16, southbound drivers on Munroe Street would be inclined to divert through the adjacent properties to connect to Highway 16.

Any modifications at this intersection will require the participation of MoTI.

6.2.8 Lakelse Avenue at Kalum Street

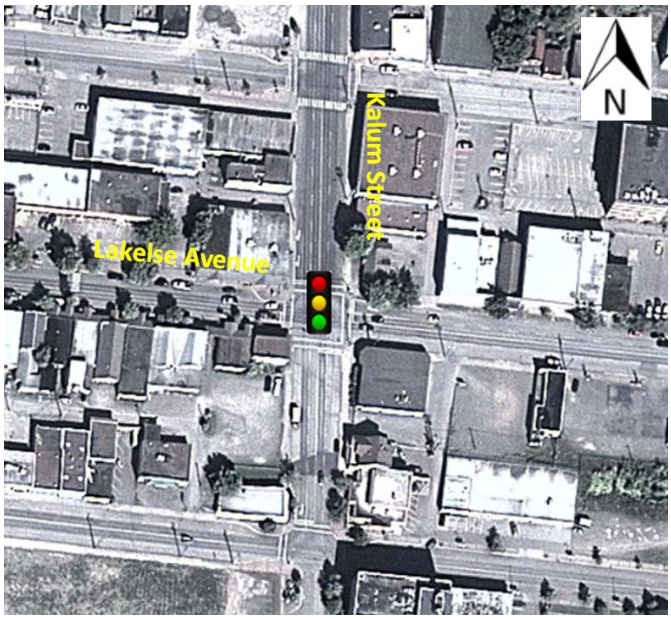


Figure 66: Lakelse Avenue at Kalum Street

Description:
The signalized intersection of Lakelse Avenue and Kalum Street is situated in the middle of Downtown Terrace (Figure 66). Kalum Street is four lanes, and is classified as an arterial road due to its direct connection to the Upper Bench. The west leg of Lakelse Avenue is two-lanes through the street-scaped Downtown neighbourhood. The east leg of Lakelse Avenue is four lanes, and connects to the Skeena River Bridge. An advance protected left turn phase facilitates eastbound left turning traffic from Lakelse Avenue to Kalum Street.

Both roads are posted at 50 km/h. The estimated average daily entering traffic volume is 11,000 vpd.

Collision Analysis:
Within the recent five year study period, there were 18 reported incidents (i.e. almost 4 per year on average). The obvious trends in the collision data were as follows (Table 18 and Figure 67):

1. There were 9 collisions that occurred in winter months (i.e. November to February), indicating a potential issue with winter road conditions.
2. There were 16 collisions that occurred between the hours of 10:00 AM and 6:00 PM, when activity Downtown is greatest. Illumination is not likely to be a concern.
3. Only four of the collisions involved injuries, reflecting the lower speeds of the collisions.
4. Ten of the incidents were rear-end collisions.
5. Five of the incidents were classified as sideswipes.

Table 18: Collision Types at Lakelse Ave / Kalum St

Crash Types	PDO	Injury	Total
Rear End	5	3	8
Left Turn			
Rear End – Right Turn	2		2
Side Impact	1	1	2
Sideswipe – Same Direction	5		5
Sideswipe – Opposite Direction			
Single Vehicle	1		1
Head On			
Total	**14**	**4**	**18**

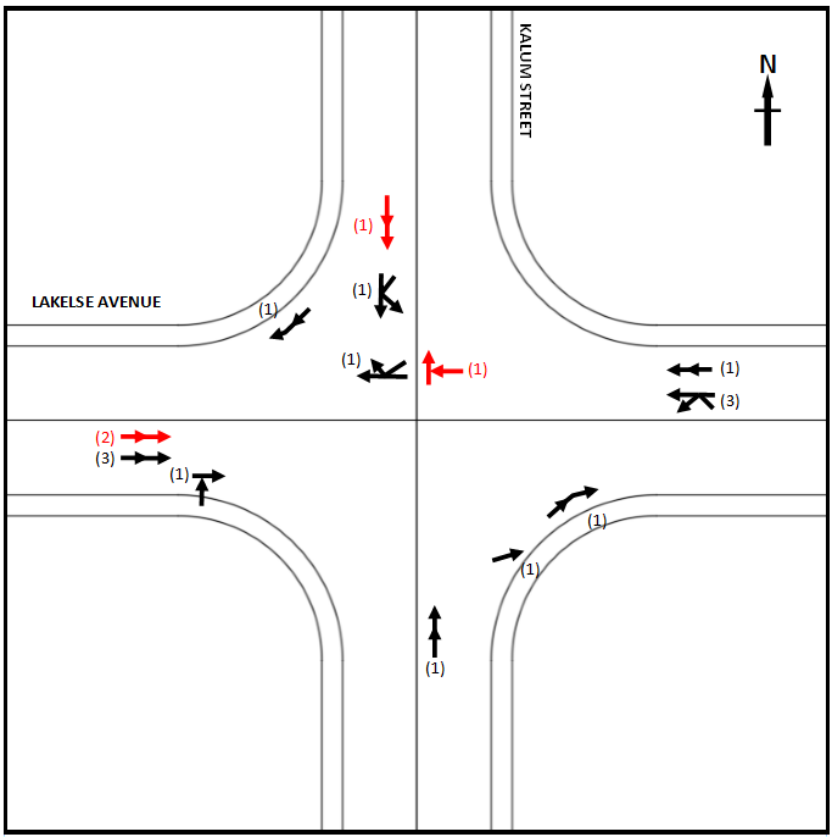


Figure 67: Collision Diagram at Lakelse Avenue at Kalum Street

Potential Solutions:
The trend with the most potential for correctability is associated with the rear ends, which were present on all four approaches. Some drivers mentioned they were unable to see the signals clearly. To improve the visibility of the traffic signals, the heads should be changed to higher intensity LED bulbs, and the backboards on the primary heads upgraded to a reflective material.

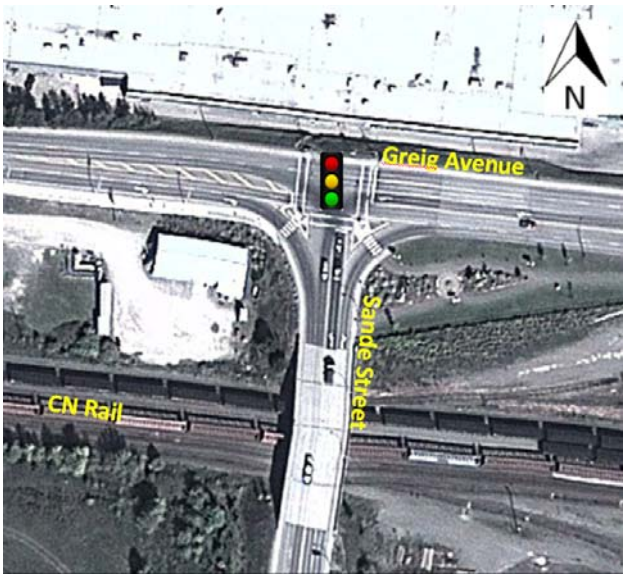
The rear end collisions on Kalum Street could also be addressed by extending the lane diet at Park Avenue through the Lakelse Avenue intersection. By having opposing left turn lanes on the north and southbound approaches, the left turning traffic could be separated from the conflict with through traffic.

The trend in sideswipes could be addressed with a lane diet on Kalum Street by improving the clarity and guidance of the laning. This should reduce the potential for drivers to change lanes through the intersection.

A lane diet would also be beneficial on the east leg of Lakelse Avenue. However, the laning at Kalum Street would have to be adjusted to match the two lane section on the west side of the intersection. Otherwise, another trend in sideswipes could arise.

Snow and ice removal should be maintained through the winter months, especially to reduce the potential for rear end collisions at this and other signalized intersections.

6.2.9 Highway 16 at Sande Street / Greig Avenue



Description:
The signalized intersection of Sande Street and Greig Avenue connects Highway 16 to the city's arterial network (Figure 68). The south leg of the intersection (Sande Street) is the only grade-separated crossing of the CN rail line within Terrace. The west leg of the intersection continues west to Prince Rupert. The east leg of the intersection is a city arterial road connecting into the Downtown.

All roads are four-lanes, although there is only one dedicated lane in each direction for highway through traffic (i.e. eastbound right turns and northbound left turns). The estimated daily entering traffic volume is 18,300 vpd. All approaches are posted at 50 km/h.

Figure 68: Hwy 16 at Sande St / Greig Ave

Collision Analysis:
Within the recent five year study period, there were 23 reported incidents (i.e. 5 per year on average). The obvious trends in the collision data were as follows (Table 19 and Figure 69):

1. There were 12 collisions that occurred in winter months (i.e. November to February), indicating a potential issue with winter road conditions.
2. There were 17 collisions that occurred during work hours (i.e. 10AM to 6PM). Seven of these were between 4:00PM and 6:00PM, the PM Peak. Illumination is not likely a concern.
3. There were 10 incidents that involved rear end collisions. These were most prevalent on the northbound (Sande Street) approach.
4. There were 12 incidents involving left turning movements. These were most prevalent between the westbound left and the eastbound through traffic.

Table 19: Collision Types at Hwy 16 / Sande St / Greig Ave

Crash Types	PDO	Injury	Total
Rear End	7	3	10
Left Turn	6	6	12
Rear End – Right Turn			
Side Impact			
Sideswipe – Same Direction	1		1
Sideswipe – Opposite Direction			
Single Vehicle			
Head On			
Total	**14**	**9**	**23**

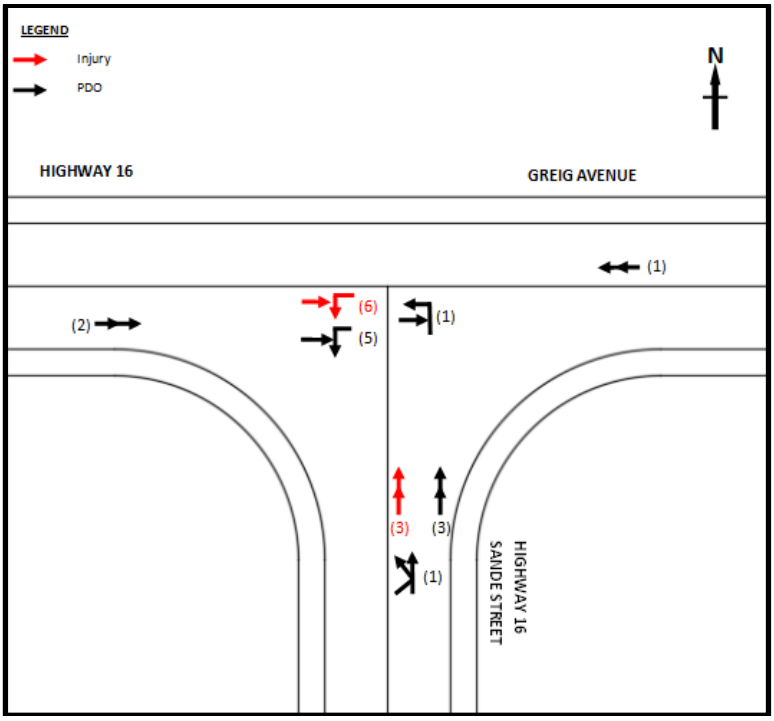


Figure 69: Collision Diagram at Hwy 16 / Sande St / Greig Ave

Potential Solutions:
The two collision trends with the strongest potential for correctability are the northbound rear end collisions, and the westbound left turn collisions.

The northbound rear ends were attributed to such factors as:

1. Icy road conditions, especially on the downgrade to the signal. This can be addressed with extra sanding and salting by MoTI during winter maintenance activities.
2. Stopping for pedestrians crossing the intersection, which can be addressed with the installation of crosswalk signs between the southeast corner of the intersection and the corner island.
3. Traffic congestion during peak hours, which can be addressed with a second northbound left turn lane. This would be a costly improvement due to the proximity of the bridge, but may be warranted by the anticipated traffic volumes by 2025.
4. The visibility of the traffic signals, which can be addressed by ensuring the signal heads meet current MoTI specifications for visibility.

The trend in collisions between westbound left turns and eastbound through traffic could be addressed by converting the westbound advance left turn ("protected-permitted") phase to protected-only left turns. However, this would add a significant delay to the intersection. Another solution may be to construct a median island on the eastbound approach to help westbound drivers recognize opposing through traffic approaching over the crest of the intersection.

Any modifications at this intersection will require the participation of MoTI.

6.2.10 Haugland Avenue at Kalum Street

Figure 70: Haugland Avenue at S. Kalum Street

Description:
The intersection of Haugland Avenue and Kalum Street is located on the south side of Terrace. Both roads are two lane collectors with no designated turning lanes. South Kalum Street has right-of-way. The eastbound and westbound approaches on Haugland Avenue have stop conditions (Figure 70).

Both roads are posted at 50 km/h. The estimated daily entering traffic volume is 4,000 vpd.

Collision Analysis:
Within the recent five year study period, there were 5 reported incidents (i.e. 1 per year on average). The low estimated traffic volume and the relatively high collision severity (4/5 injury collisions) caused this intersection to be identified on the Top 20 list.

The obvious trends in the collision data were as follows (Table 20 and Figure 71):

1. All collisions occurred during the daytime, between 8:30 AM and 5:00PM. Illumination is not likely to be a concern.
2. Two collisions were attributed to winter conditions.
3. Four of the collisions were attributed to drivers on Haugland Avenue not yielding to traffic on Kalum Street.

Table 20: Collision Types at Haugland Ave / S Kalum St

Crash Types	PDO	Injury	Total
Rear End	1		1
Left Turn		1	1
Rear End – Right Turn			
Side Impact		2	2
Sideswipe – Same Direction			
Sideswipe – Opposite Direction			
Single Vehicle			
Head On		1	1
Total	**1**	**4**	**5**

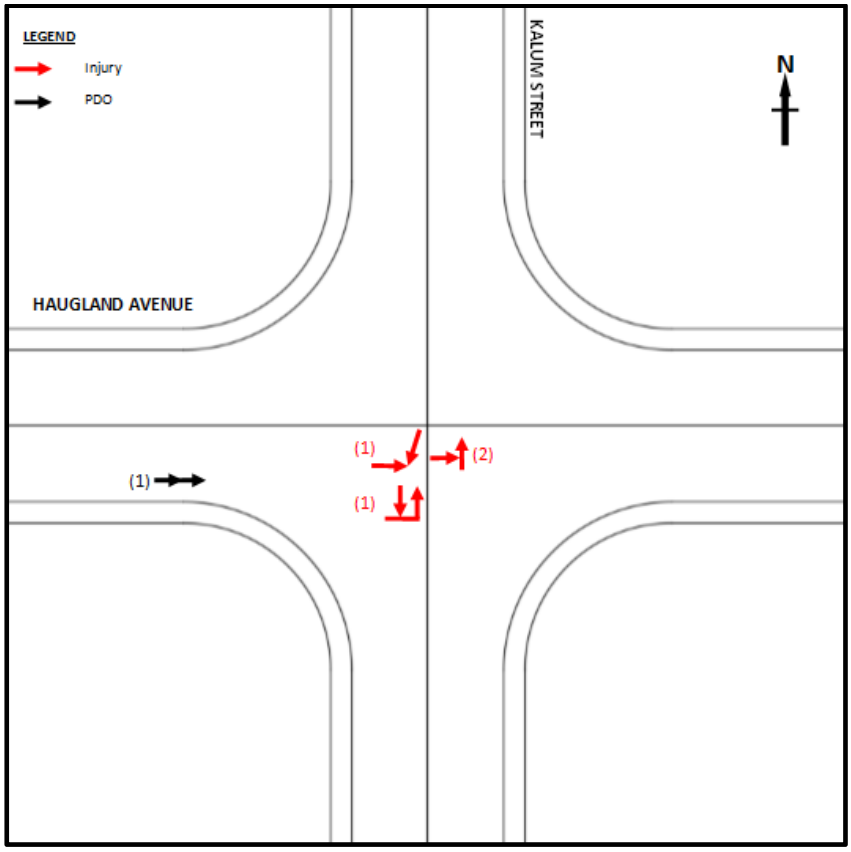


Figure 71: Collision Diagram at Haugland Avenue at S. Kalum Street

Potential Solutions:

The trend with the strongest potential for correctability is with drivers on Haugland Avenue failing to yield right-of-way. This may be addressed by the following:

1. The stop signs on Haugland Avenue should be located well within the drivers' lines of sight on both approaches. The stop signs should be made of micro-prismatic reflective sheeting, and complemented with reflective tape on the sign posts.
2. Stop lines should be painted on Haugland Avenue.
3. The sight lines in the intersection corners should be kept clear of foliage, snow piles, and other obstructions.

To address the trend in winter-related collisions, snow and ice removal activities should be maintained.

6.2.11 Hwy 16 (Keith Ave) at Hall Street

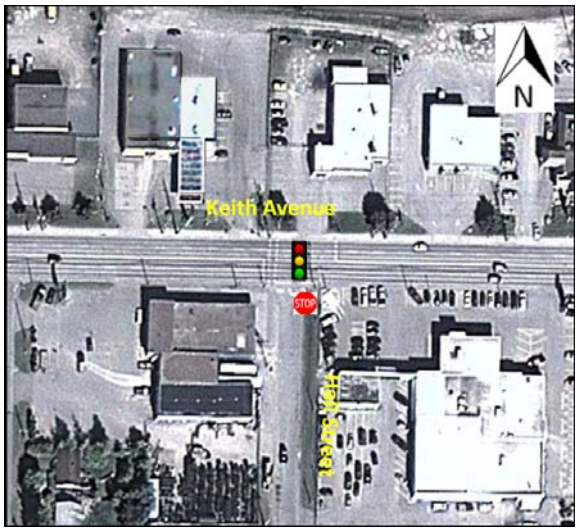


Figure 72: Hwy 16 (Keith Ave) at Hall Street

Description:
The intersection of Highway 16 (Keith Avenue) and Hall Street has a pedestrian signal, but not a traffic signal. Highway 16 is a four lane provincial highway, with no turning lanes through the intersection. Hall Street is a two-lane local road that connects to the south side of Terrace (Figure 72).

Both roads are posted at 50 km/h. The estimated average daily entering traffic volume is 15,800 vpd, of which very little comes from Hall Street.

Collision Analysis:
Within the recent five year study period, there were 13 reported incidents (i.e. 3 per year on average). The obvious trends in the collision data were as follows (Table 21 and Figure 73):

1. Almost half the collisions involved injuries.
2. Almost all collisions occurred during work hours (i.e. 9:30AM to 5:00PM). Seven of these occurred between 2:00PM and 5:00PM.
3. Seven of the incidents involved rear ends, most of which were on Keith Avenue. These were attributed to such contributing factors as driver distraction, unexpected left turn movements, icy road conditions, and stopping for the pedestrian signal.
4. There were four sideswipe collisions, most of which involved drivers changing lanes at or near the intersection.

Table 21: Collision Types at Hwy 16 (Keith Ave) at Hall Street

Crash Types	PDO	Injury	Total
Rear End	4	3	7
Left Turn	1		1
Rear End – Right Turn			
Side Impact		1	1
Sideswipe – Same Direction	2	1	3
Sideswipe – Opposite Direction			
Single Vehicle			
Head On		1	1
Total	**7**	**6**	**13**

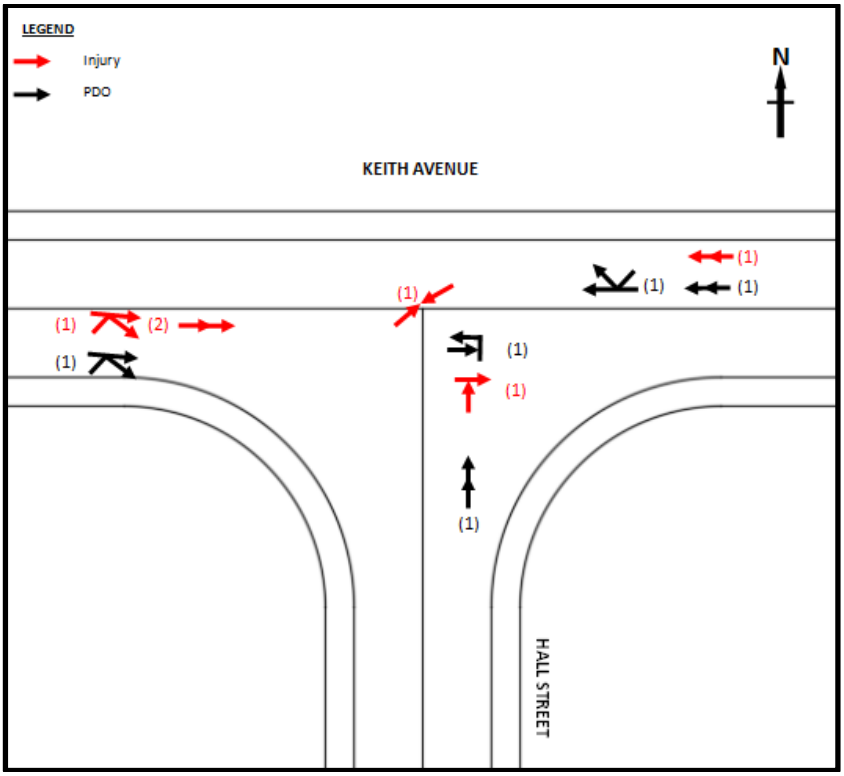


Figure 73: Collision Diagram at Hwy 16 (Keith Ave) at Hall Street

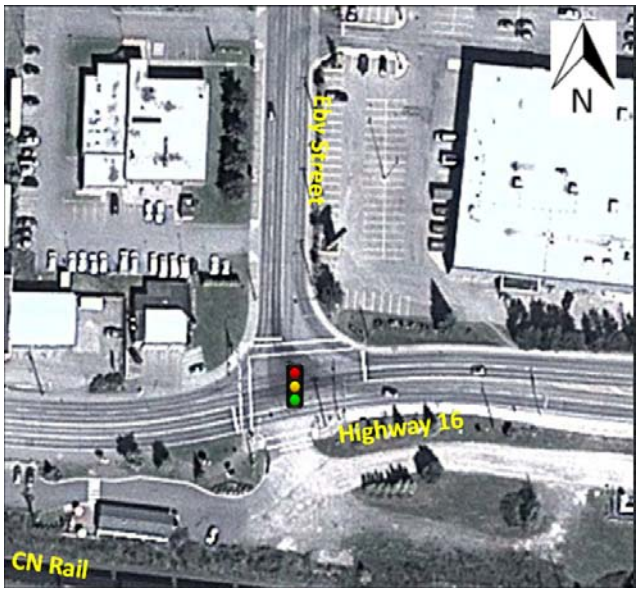
Potential Solutions:

The trend with the strongest potential for correctability is associated with the rear end collisions on Highway 16 (Keith Avenue). This trend can be addressed by ensuring the signal heads meet current MoTI specifications for visibility, and by maintaining winter maintenance operations as required. Turning lanes would also help reduce the potential for rear end collisions, although the existing right-of-way width is insufficient for the necessary highway widening.

The trend in sideswipe collisions on Highway 16 (Keith Avenue) could be addressed by painting a solid white line between the two through lanes on each intersection approach in order to reduce lane changing manoeuvres at the intersection.

Any modifications at this intersection will require the participation of MoTI.

6.2.12 Hwy 16 at Eby Street



Description:
The signalized intersection of Highway 16 and Eby Street is one of the primary connections between the provincial highway system and Downtown Terrace (Figure 74). The intersection is also located immediately west of the Sande Street overpass at Greig Avenue. The south leg of the intersection is an access, and has a low volume of traffic.

Both Highway 16 and Eby Street are four-lanes at the intersection, with no additional turning lanes. However, the right lane on Eby Street is for right turning traffic, and the left lane is for left turning traffic. The estimated average daily entering traffic volume is 13,600 vpd. Both roads are posted at 50 km/h.

Figure 74: Hwy 16 at Eby Street

Collision Analysis:
Within the recent five year study period, there were 15 reported incidents (i.e. 3 per year on average). The obvious trends in the collision data were as follows (Table 22 and Figure 75):

1. Six of the collisions involved injuries, potentially reflecting higher speeds.
2. Five collisions occurred during the winter months (i.e. November to January), which may indicate a potential concern with road conditions.
3. Almost all collisions occurred during work hours (i.e. 10AM to 6PM). Eight of these were between 4:00PM and 5:30PM, indicating a trend during the PM Peak Hour.
4. There were eight rear end collisions, occurring on all approaches.
5. Four of the collisions were sideswipes, most of which involved lane changing.
6. There were three incidents involving eastbound left turning vehicles colliding with westbound through vehicles.

Table 22: Collision Types at Hwy 16 at Eby Street

Crash Types	PDO	Injury	Total
Rear End	4	4	8
Left Turn	1	2	3
Rear End – Right Turn			
Side Impact			
Sideswipe – Same Direction	4		4
Sideswipe – Opposite Direction			
Single Vehicle			
Head On			
Total	**9**	**6**	**15**

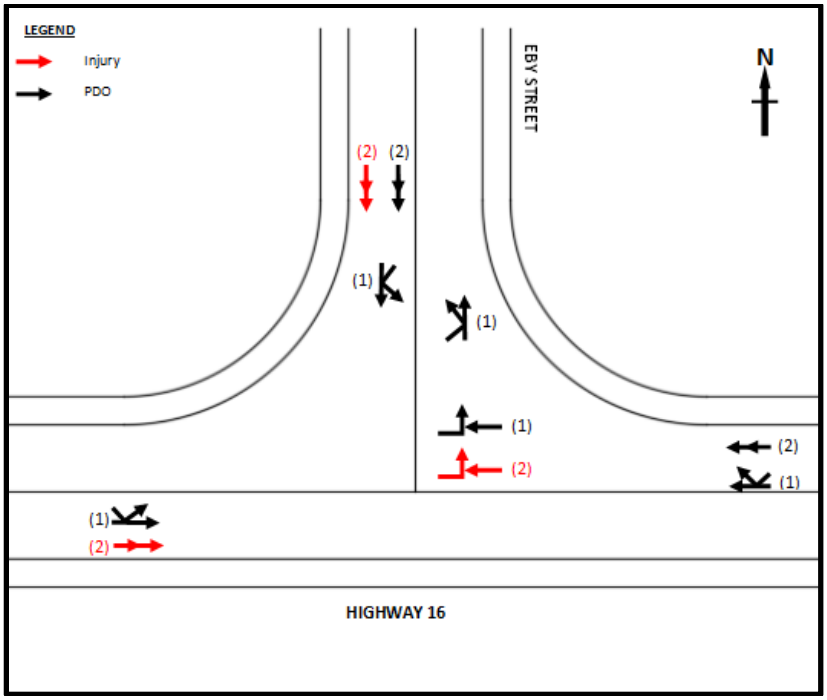


Figure 75: Collision Diagram at Hwy 16 at Eby Street

Potential Solutions:

The trend with the strongest potential for correctability is associated with the rear end collisions. This trend can be addressed by ensuring the signal heads meet current MoTI specifications for visibility, and by maintaining winter maintenance operations as required.

The installation of an eastbound left turn lane would be a relatively costly improvement, but would also reduce the potential for rear ends on the eastbound approach by separating the left turn movements. This left turn lane could also improve the left turning sight distance, which may also address the trend with left turn collisions. A left turn lane will likely be warranted in the future with the expected growth in traffic volumes.

The trend in sideswipes on Highway 16 could be addressed by painting solid white lines on the intersection approaches to restrict lane changes at the intersection.

A representative from the adjacent ambulance service identified a safety concern with the speed of southbound right turning traffic from Eby Street. These right turns conflict with vehicles entering Highway 16 from the ambulance service parking lot, especially in an emergency situation. This issue can be addressed by adding an emergency all-red pre-emption phase to the traffic signal. Since right turns are legal at red lights, the southbound right turns would require an additional red flashing beacon mounted to a sign that reads "No Right Turn when Red Light Flashing".

During non-emergency situations, the safety of the ambulance parking lot access can be improved by removing the parking from the east end of the parking lot in order to clear the sight lines.

Any modifications at this intersection will require the participation of MoTI.

6.2.13 Walsh Avenue at Eby Street

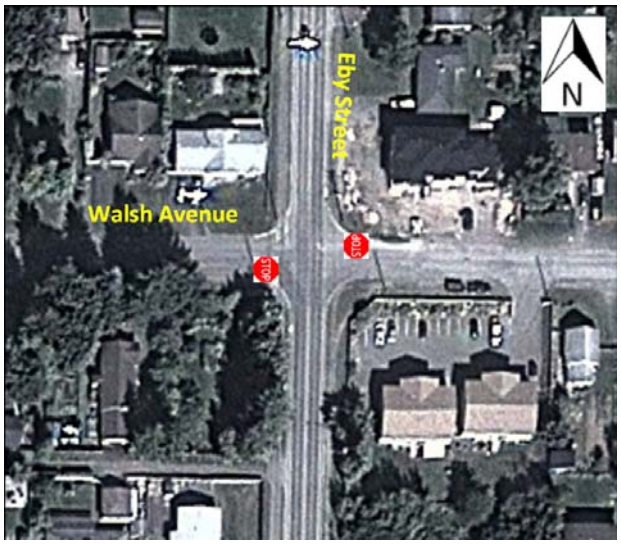


Figure 76: Walsh Ave at Eby Street

Description:
The intersection of Eby Street and Walsh Avenue is centrally located in Terrace. Eby Street is a collector which connects to Highway 16 and the Downtown. Walsh Street is classified as a local road, but is also the main access route to Skeena Middle School to the west. There are stop conditions on the Walsh Avenue approaches, with free flow traffic movement on Eby Street (Figure 76).

Both roads are two lanes through the intersection, with no turning lanes. The estimated average daily entering traffic volume is 4,500 vpd. The posted speed on both roads is 50 km/h.

Collision Analysis:
Within the recent five year study period, there were 4 reported incidents (i.e. 1 per year on average). The collisions were evenly distributed throughout the days of the week, and the four seasons. The obvious trends in the collision data were as follows (Table 24 and Figure 77):

1. Three of the four incidents occurred in 2009, which may suggest any intersection improvements or changes in traffic patterns may have addressed an issue.
2. Two incidents were in the early evening, during hours of darkness.
3. All four collisions involved injuries, potentially indicating higher speeds.
4. Three of the incidents were caused by westbound drivers on Walsh Avenue failing to observe the stop sign, and colliding with through traffic on Eby Street.
5. One incident involved a pedestrian being struck as she crossed the street.

Table 23: Collision Types at Walsh Ave at Eby Street

Crash Types	PDO	Injury	Total
Rear End			
Left Turn			
Rear End – Right Turn			
Side Impact		3	3
Sideswipe – Same Direction			
Sideswipe – Opposite Direction			
Single Vehicle		1	1
Head On			
Total	**0**	**4**	**4**

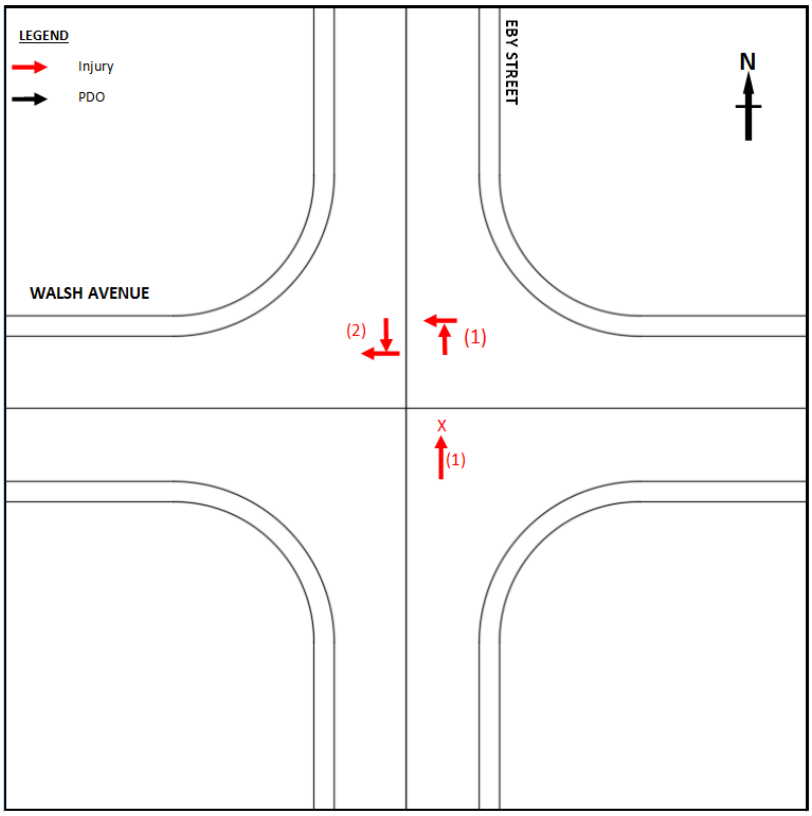


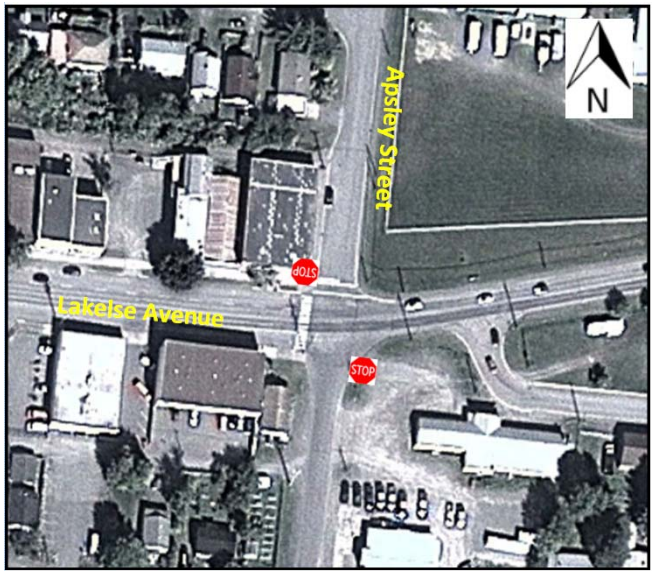
Figure 77: Collision Diagram at Walsh Ave at Eby Street

Potential Solutions:
The trend with the strongest potential for correctability is the non-compliance with the stop sign on the westbound approach. The narrow road and the visual cues on this approach suggest a continuing roadway. The stop sign appears well placed, but should be made of micro-prismatic reflective material to improve visibility. Also, a stop line should be painted on the westbound approach to match that on the opposing approach.

The pedestrian incident could be addressed with the installation of a signed and marked crosswalk if the technical warrants for a crosswalk are satisfied. If this is also a designated route to school, School Crosswalk signs could be used.

Although not related to any observed collision trends, the abundant foliage in the southwest corner of the intersection may be obstructing sight lines looking from Walsh Avenue to the south. These trees should be pruned as necessary to ensure safe sight lines are maintained at the intersection.

6.2.14 Lakelse Avenue at Apsley Street



Description:
The intersection of Lakelse Avenue and Apsley Street has been identified as the east gateway to Downtown Terrace, since Lakelse Avenue connects the Downtown to the Old Skeena Bridge. Apsley Street connects Greig Avenue to a multi-family development further north (Figure 78). Both roads are classified as collectors.

The west leg of Lakelse Avenue is four lanes; the other three legs are two lanes. The estimated average daily entering traffic volume is 7,500 vpd. Both roads have posted speeds of 50 km/h.

Figure 78: Lakelse Ave at Apsley Street

Collision Analysis:
Within the recent five year study period, there were 5 reported incidents (i.e. 1 per year on average). The obvious trends in the collision data were as follows (Table 25 and Figure 79):

1. Two of the records reference the same multi-vehicle collision in January 2013. This was caused by multiple rear ends, which may have been in adverse winter conditions.
2. Four of the collisions occurred in the daytime, between 10:00 AM and 5:00PM.
3. Four of the reported incidents were classified as rear ends, apparently caused by driver inattention.
4. One incident involved a left turn collision on Lakelse Avenue.

Table 24: Collision Types at Lakelse Ave at Apsley Street

Crash Types	PDO	Injury	Total
Rear End	1	3	4
Left Turn	1		1
Rear End – Right Turn			
Side Impact			
Sideswipe – Same Direction			
Sideswipe – Opposite Direction			
Single Vehicle			
Head On			
Total	**2**	**3**	**5**

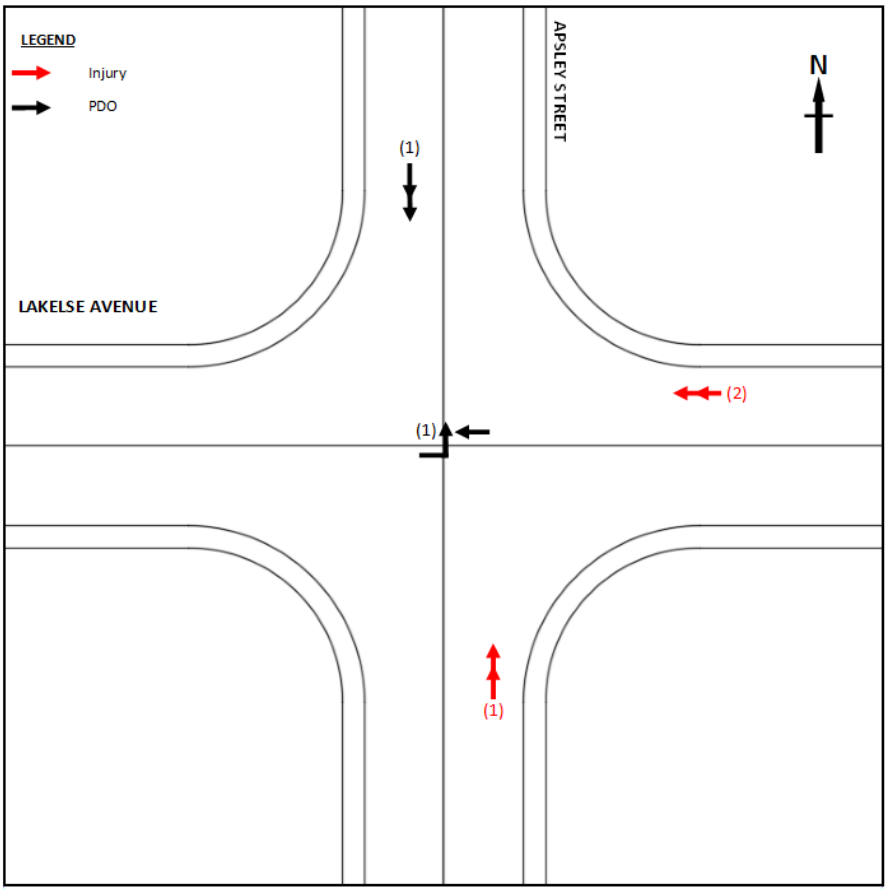


Figure 79: Collision Diagram at Lakelse Ave at Apsley Street

Potential Solutions:
Although only represented by one collision, the incident with the highest potential for correctability appears to be the left turn collision. The conversion of the west leg of Lakelse Avenue to a two lane section with a Two Way Left Turn Lane may facilitate left turns by separating them from the traffic stream. As this intersection currently transitions between the two and four lane sections on Lakelse Avenue, the design of the transition will be critical.

The rear end incidents on Apsley Street may be reduced with stop lines, which currently do not exist on the northbound approach.

The rear end issue on Lakelse Avenue may be addressed through road maintenance. The road could be more icy than other roads at times due to the proximity to the river.

6.2.15 Lakelse Avenue at Sparks Street

Figure 80: Lakelse Ave at Sparks Street

Description:
The signalized intersection of Lakelse Avenue and Sparks Street is located in the middle of Downtown Terrace (Figure 80). Both roads are classified as collectors. Lakelse is four lanes through the intersection, and Sparks Street is two lanes, with right turn lanes on each approach.

There is an offset of approximately 20 metres between the Sparks Street approaches. This requires the signal to operate as a split phase, serving northbound and southbound traffic separately. The estimated average daily entering traffic volume is 9,400 vpd. Both roads are posted at 50 km/h.

Collision Analysis:
Within the recent five year study period, there were 10 reported incidents (i.e. 2 per year on average). The incidents were evenly distributed throughout the seasons. The obvious trends in the collision data were as follows (Table 26 and Figure 81):

1. Only three collisions involved injuries, indicating typically lower speeds involved.
2. There were 7 collisions that occurred between the hours of 9:00AM and 3:00PM, when the activity Downtown is generally highest.
3. Three incidents involved rear end collisions, two of which were on the southbound approach on Sparks Street.
4. Three incidents involved right turn movements
5. Lane changing on Lakelse Avenue was cited as a contributing factor in at least three collisions.
6. One incident involved an eastbound cyclist on Lakelse Avenue being hit by a vehicle turning southbound left from Sparks Street.
7. One incident involved a pedestrian being hit in the crosswalk on Sparks Street.

Table 25: Collision Types at Lakelse Ave at Sparks Street

Crash Types	PDO	Injury	Total
Rear End	3	1	4
Left Turn		1	1
Rear End – Right Turn			
Side Impact	1		1
Sideswipe – Same Direction	2		2
Sideswipe – Opposite Direction			
Single Vehicle	1	1	2
Head On			
Total	**7**	**3**	**10**

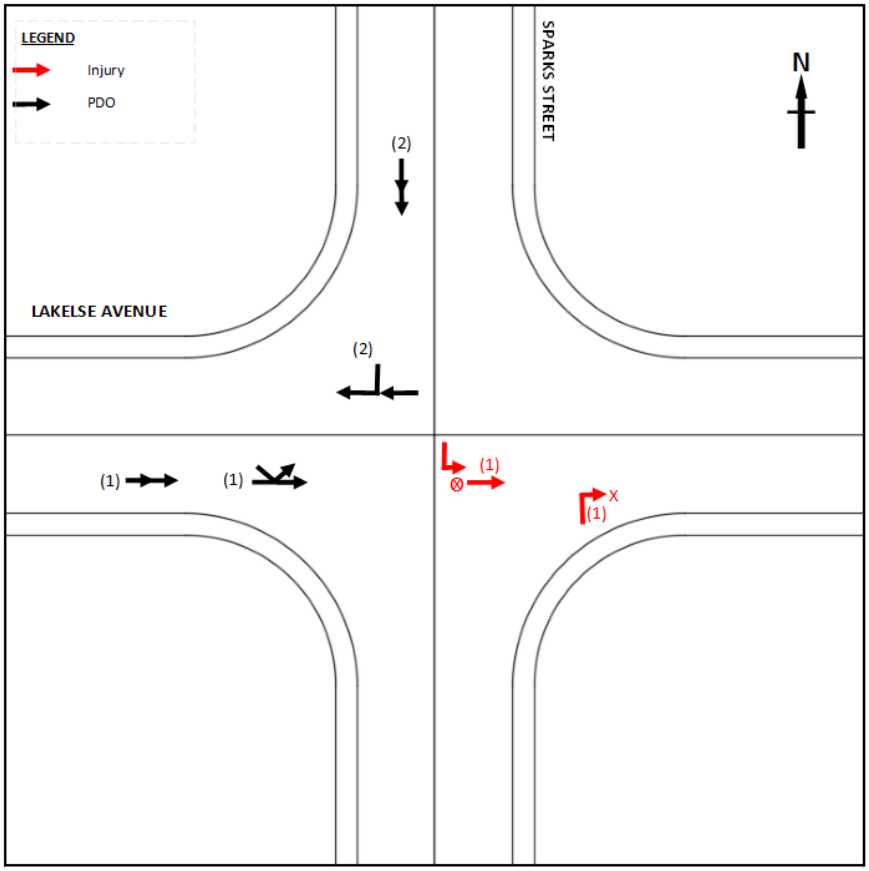


Figure 81: Collision Diagram at Lakelse Ave at Sparks Street

Potential Solutions:
The trend in collisions associated with lane changing has the greatest potential for correctability. This could be addressed by implementing a lane diet on Lakelse Avenue, which would replace one through lane in each direction with a Two Way Left Turn Lane. This lane diet would also provide more space for cyclists, which should reduce the potential for other cycling incidents.

Another option would be to realign Sparks Street to eliminate the offset T intersections. This would prevent drivers from having to complete an "S" Turn manoeuvre as they travel northbound or southbound through the intersection. The realignment would also have the benefit of reducing the demands on the drivers' attention by providing a more conventional intersection configuration. As traffic volumes grow in the Downtown, both the current offset "T" configuration and the associated signal phasing to accommodate it will likely become more problematic.

The trend in rear end collisions could be addressed by upgrading the signal heads with higher intensity LED bulbs, and reflective yellow backboards.

6.2.16 Park Avenue at Kenney Street

Figure 82: Park Ave at Kenney Street

Description:
The intersection of Park Avenue and Kenney Street is located west of the Downtown (Figure 82). Both roads are classified as collector roads, although Kenney Street is the busier road. Kenney Street has bicycle lanes, curb/gutter, and a sidewalk. Traffic on Kenney Street is free-flowing through the intersection. Park Avenue is narrow east of Kenney Street, and has open shoulders. Traffic on Park Avenue has a stop condition at Kenney Street. There are no turning lanes at the intersection.

The estimated average daily traffic volume entering the intersection is 6,300 vpd. Both roads are posted at 50 km/h.

Collision Analysis:
Within the recent five year study period, there were 4 reported incidents (i.e. 1 per year on average). The obvious trends in the collision data were as follows (Table 27 and Figure 83):

1. All of the incidents involved injuries, which suggested higher speeds involved.
2. Three of the four incidents occurred in 2010, which may suggest any intersection improvements or changes in traffic patterns may have addressed the issue.
3. Three of the incidents involved drivers on Park Avenue missing the stop sign.
4. One incident involved a pedestrian on Park Avenue, but details were not provided.

Table 26: Collision Types at Park Ave at Kenney Street

Crash Types	PDO	Injury	Total
Rear End			
Left Turn			
Rear End – Right Turn			
Side Impact		3	3
Sideswipe – Same Direction			
Sideswipe – Opposite Direction			
Single Vehicle			
Unknown		1	1
Total		**4**	**4**

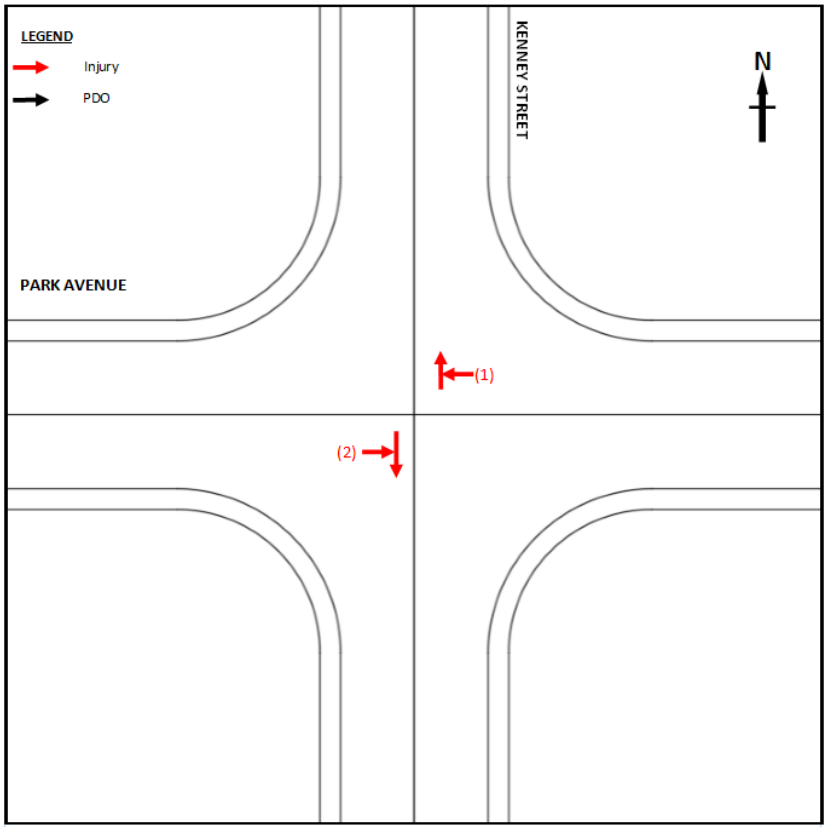
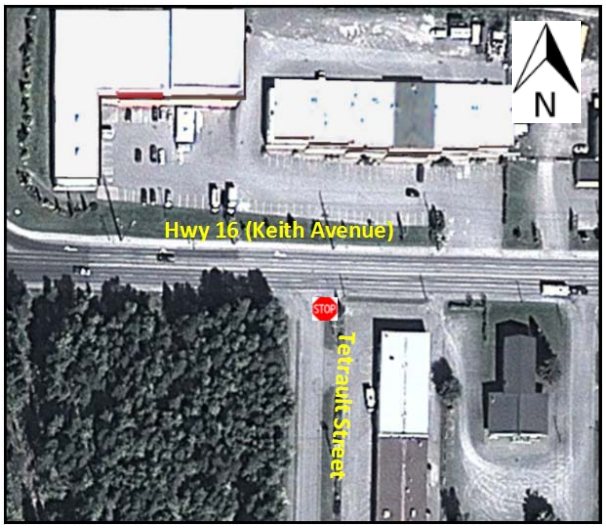


Figure 83: Collision Diagram at Park Ave at Kenney Street

Potential Solutions:
The trend with the strongest potential for correctability is the non-compliance with the stop signs on Park Avenue. The narrow road on the east approach, and the visual cues on both approaches, suggest a continuing roadway, which may be exacerbated in hours of darkness. The visibility of the stop condition could be improved with micro-prismatic reflective sign material, and stop lines on both sides of the intersection.

The sight lines should also be kept clear at the intersection.

6.2.17 Hwy 16 (Keith Ave) at Tetrault Street



Description:
The "T" intersection of Highway 16 (Keith Avenue) and Tetrault Street is located just east of the signalized Sande Street intersection (Figure 84). Northbound traffic approaching the highway on Tetrault Street has a stop condition, with a left turn restriction. Tetrault Street is a primary signed access route to the Terrace Hospital to the south.

Highway 16 is four lanes through the intersection, and Tetrault Street is a two lane local road. There are no turning lanes at the intersection except for a new eastbound right turn lane installed in 2016. The estimated average daily entering traffic volume is 18,000 vpd (almost all of which is on Highway 16). Both roads are posted at 50 km/h.

Figure 84: Hwy 16 (Keith Ave) at Tetrault Street

Collision Analysis:
Within the recent five year study period, there were 11 reported incidents (i.e. 2 per year on average). The collisions were evenly distributed over the past 5 years, which includes the years since the left turn restriction has been in place. There were likewise no apparent trends associated with the seasons or the days of the week. The obvious trends in the collision data were as follows (Table 28 and Figure 85):

1. Only three of the collisions involved injuries, potentially indicating lower speeds.
2. Ten of the collisions occurred during work hours, between 8:00AM and 5:00PM, when the traffic volumes are heaviest.
3. Three of the incidents were westbound rear end collisions with vehicles stopped to turn left into Tetrault Street.
4. Two of the incidents involved illegal left turns from Tetrault Street colliding with eastbound through traffic on the highway.
5. Two of the incidents involved northbound rear ends at the stop sign on Tetrault Street.
6. Two of the incidents involved pedestrians, but these were not part of a trend.

Table 27: Collision Types at Hwy 16 (Keith Ave) at Tetrault Street

Crash Types	PDO	Injury	Total
Rear End	2		2
Left Turn	2		2
Rear End – Left Turn	1	2	3
Sideswipe – Same Direction	2		2
Single Vehicle	1	1	2
Head On			
Total	**8**	**3**	**11**

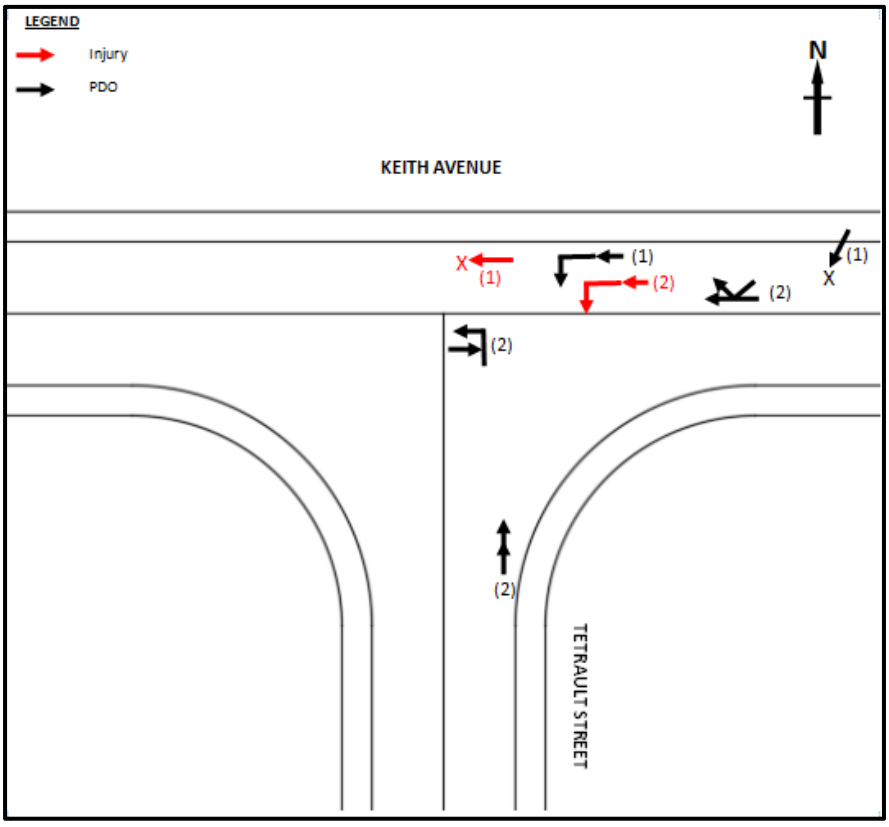


Figure 85: Collision Diagram at Hwy 16 (Keith Ave) at Tetrault Street

Potential Solutions:

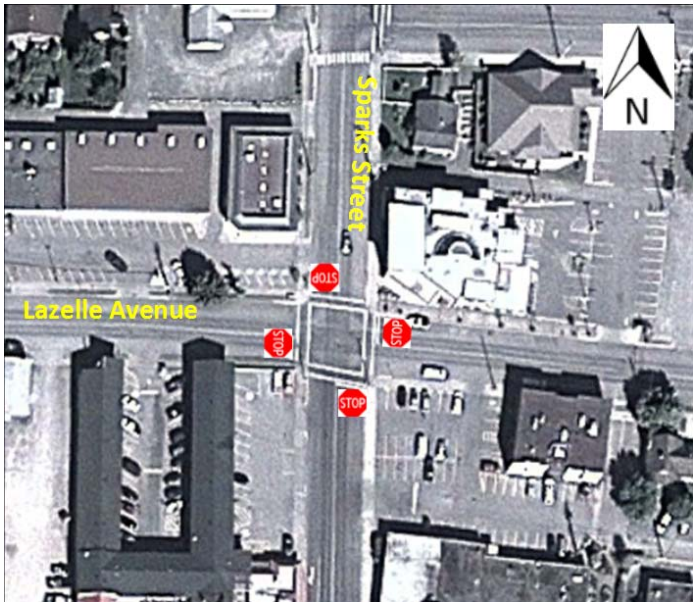
The trends with the strongest potential for correctability are illegal left turns from Tetrault Street, and the rear ends collisions on the highway and Tetrault Street. All three can be addressed by relocating the hospital access to create a fourth (south) leg at the signalized intersection at Sande Street. This relocation would address the collision trends as follows:

1. Trips leaving the hospital would have direct signalized access to the highway. Drivers would not have to make circuitous diversions, and would thus be less inclined to make illegal left turns.
2. The demand for westbound left turns at Tetrault Street would be less if removed as the official hospital route. This in turn would reduce the incidence of rear ends.

If the hospital access cannot be relocated to Sande Street, a westbound left turn lane would be another alternative to improve the safety on the route to the hospital. However, additional right-of-way would be necessary to accommodate this widening.

Additional enforcement should also be considered at the intersection to prevent illegal northbound left turn movements.

6.2.18 Lazelle Avenue at Sparks Street



Description:
The intersection of Lazelle Avenue and Sparks Street in Downtown Terrace is located immediately north of the offset "T" intersection at Lakelse Avenue (Section 6.2.15). The intersection is controlled as a four-way stop (Figure 86).

All four legs of the intersection are two lanes. Although there are no dedicated turning lanes, there is sufficient road width to accommodate separated right turn movements.

The estimated average daily entering traffic volume is 7,500 vpd. Both roads are posted at 50 km/h.

Figure 86: Lazelle Avenue at Sparks Street

Collision Analysis:
Within the recent five year study period, there were 5 reported incidents (i.e. 1 per year on average). The obvious trends in the collision data were as follows (Table 29 and Figure 87):

1. Only one collision involved an injury, which suggests slower speeds.
2. Three of the collisions occurred in winter months, indicating a potential issue with winter conditions.
3. All five collisions occurred in the afternoon hours, between 1:30PM and 4:30PM, when traffic volumes are heaviest.
4. One collision was caused by two concurrent right turns being made from the same approach.
5. Due to the low volume of collisions, there was no clear trend in collision types.

Table 28: Collision Types at Lazelle Avenue at Sparks Street

Crash Types	PDO	Injury	Total
Rear End	1		1
Left Turn			
Rear End – Right Turn	1		1
Side Impact			
Sideswipe – Same Direction	1		1
Sideswipe – Opposite Direction			
Single Vehicle	1		1
Unknown		1	1
Total	**4**	**1**	**5**

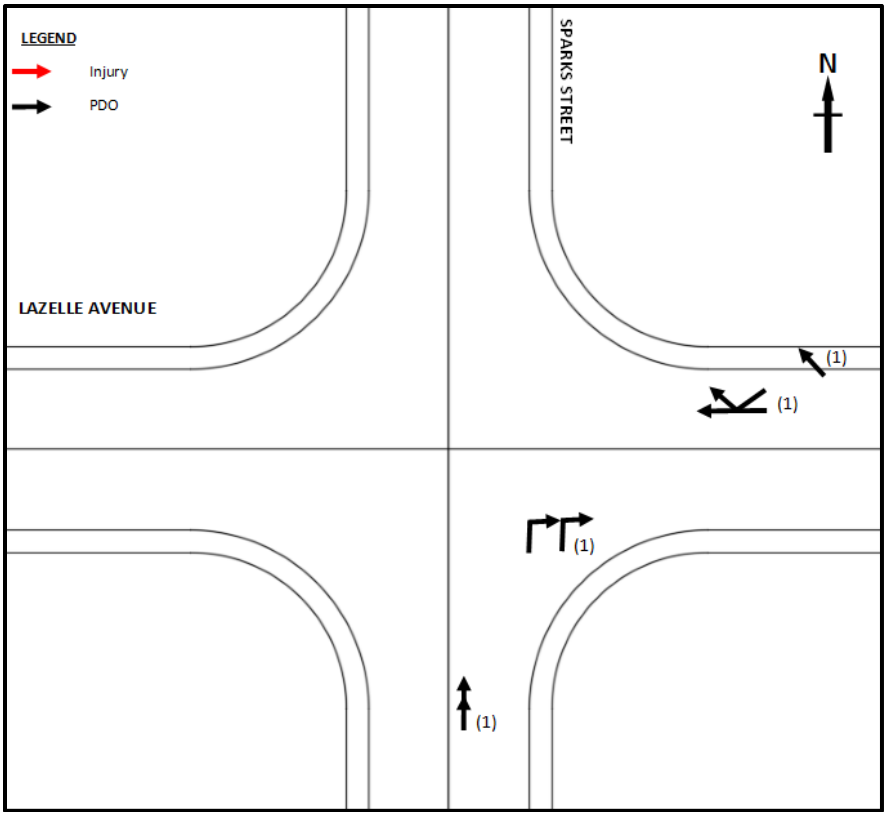


Figure 87: Collision Diagram at Lazelle Avenue at Sparks Street

Potential Solutions:
The collision with the strongest potential for correctability was related to the double right turn movement. On approaches with relatively heavy right turn movements (e.g. the northbound right), a short turning lane could be painted within the available width to clarify the guidance for drivers.

With the trend of collisions occurring in winter, this intersection should be well-maintained with the rest of the Downtown.

6.2.19 Lakelse Avenue at Emerson Street

Figure 88: Lakelse Avenue at Emerson Street

Description:
The intersection of Lakelse Avenue and Emerson Street in Downtown Terrace is controlled by a two phase traffic signal (Figure 88). The west leg of Lakelse Avenue is four lanes, with the right lane on the eastbound approach restricted to right turns. The east leg of Lakelse Avenue is two lanes only. Both approaches on Emerson Street have one through-left lane, and a right turn lane.

Left turns on Lakelse Avenue are restricted from 9AM to 6PM to keep traffic flowing. The estimated average daily entering traffic volume is 7,900 vpd. Both roads are posted at 50 km/h.

Collision Analysis:
Within the recent five year study period, there were 6 reported incidents (i.e. 1 per year on average). The obvious trends in the collision data were as follows (Table 30 and Figure 89):

1. Four of the collisions involved injuries, especially with vulnerable road users.
2. All collisions occurred in the afternoon, between 12:30PM and 5:30PM, when Downtown activity is greatest.
3. One incident involved a 90 degree collision between a southbound vehicle on Emerson Street and an eastbound vehicle on Lakelse Avenue.
4. Two incidents involved pedestrians crossing at the crosswalk.
5. One incident involved a cyclist.

Table 29: Collision Types at Lakelse Avenue at Emerson Street

Crash Types	PDO	Injury	Total
Rear End	1		1
Left Turn			
Side Impact		1	1
Sideswipe – Same Direction	1		1
Sideswipe – Opposite Direction			
Pedestrian		2	2
Cyclist		1	1
Head On			
Total	**2**	**4**	**6**

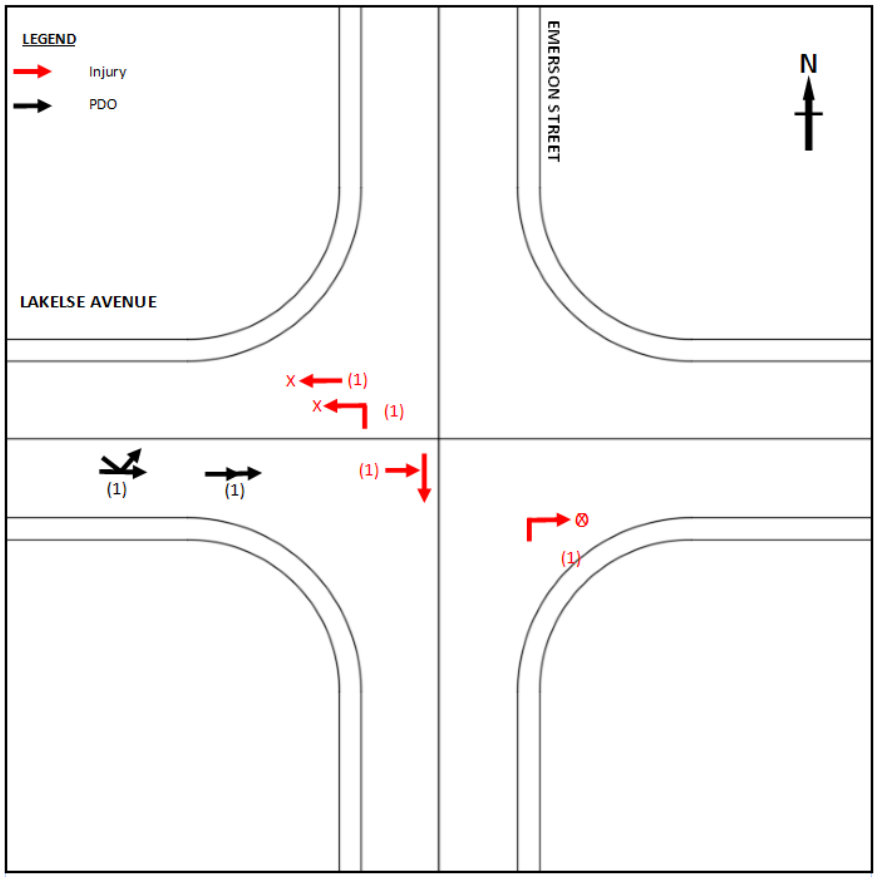


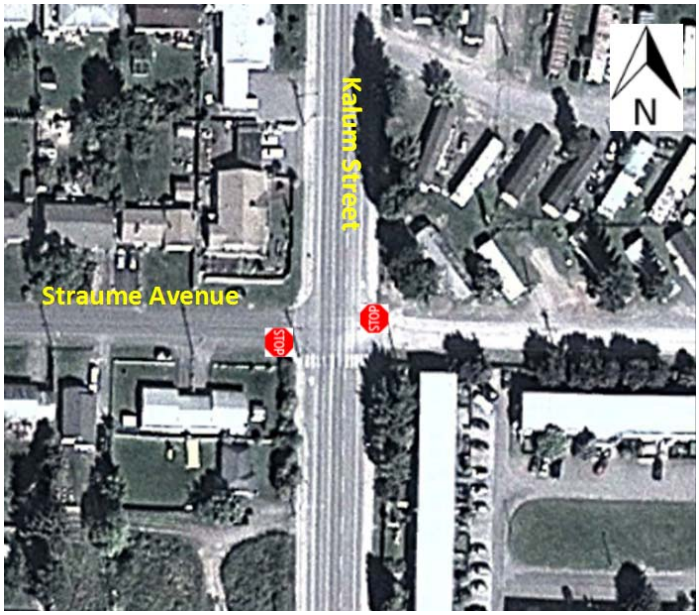
Figure 89: Collision Diagram at Lakelse Avenue at Emerson Street

Potential Solutions:
The trend with the most potential for correctability is with drivers not correctly observing the traffic signals. This was a concern in the 90 degree collision, and may have contributed to the two pedestrian collisions. The signal heads should be upgraded with higher intensity LED bulbs, and reflective yellow backboards.

Although there was no evidence to suggest the pedestrians involved in the collisions were jaywalking, the safety of the pedestrian crossings could still be improved with the use of countdown signals. These alert pedestrians to how much time they have remaining to cross.

The proposed lane diet on Lakelse Avenue would also improve the safety of this intersection by (a) providing a traffic calming effect, (b) reducing the demand for lane changes, and (c) affording more space for cyclists.

6.2.20 Straume Avenue at Kalum Street



Description:
The intersection of Straume Avenue and Kalum Street has stop conditions on the eastbound and westbound (Straume Ave) approaches (Figure 90). Straume Avenue is a narrow two lane local road. Kalum Street is a collector that connects the Downtown to the east side of the Upper Bench, and has recently had a lane diet from four lanes to two lanes with a Two Way Left Turn Lane. There are no other turning lanes at the intersection.

The estimated average daily entering traffic volume is 6,300 vpd. Both roads are posted at 50 km/h. A marked crosswalk exists on Kalum Street, on the south side of the intersection.

Figure 90: Straume Avenue at Kalum Street

Collision Analysis:
Within the recent five year study period, there were 4 reported incidents (i.e. 1 per year on average). The obvious trends in the collision data were as follows (Table 31 and Figure 91):

1. Two of the collisions occurred in winter, potentially indicating an issue with winter conditions.
2. All of the collisions occurred in the daytime hours, between 9:00AM and 5:30PM.
3. Three of the collisions involved rear ends. One was due to stopping for a pedestrian at the crosswalk, and the other two were reversing manoeuvres on Straume Avenue.

Table 30: Collision Types at Straume Avenue at Kalum Street

Crash Types	PDO	Injury	Total
Rear End	1	2	3
Left Turn			
Rear End – Right Turn			
Side Impact			
Sideswipe – Same Direction	1		1
Sideswipe – Opposite Direction			
Single Vehicle			
Head On			
Total	**2**	**2**	**4**

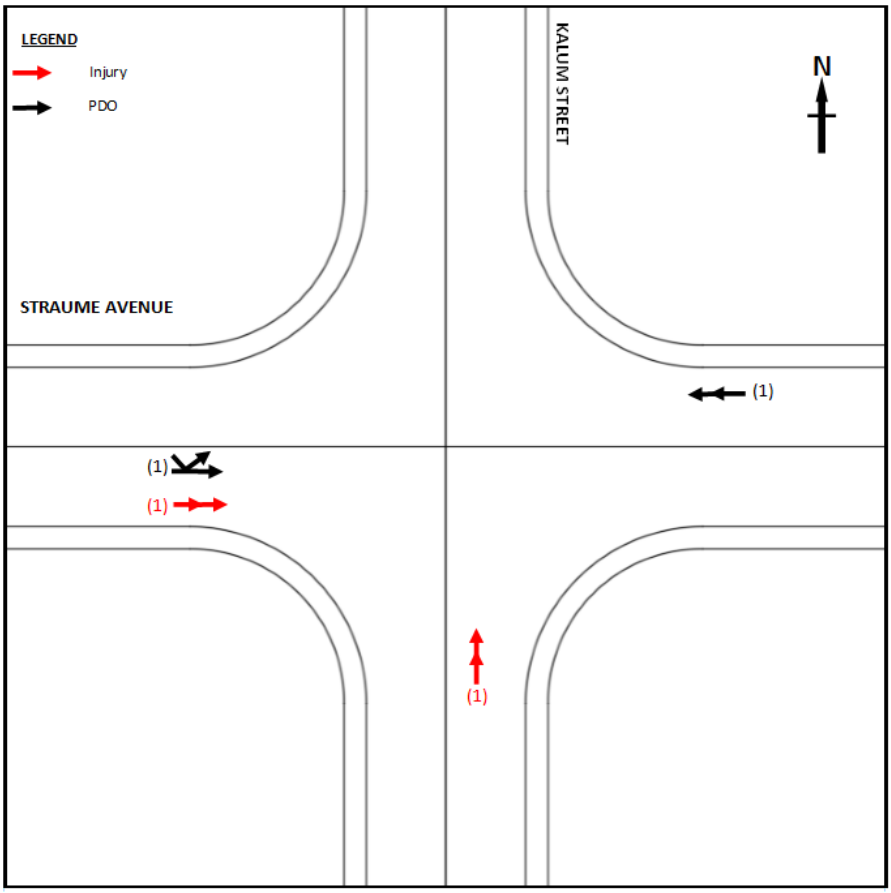


Figure 91: Collision Diagram at Straume Avenue at Kalum Street

Potential Solutions:
The only potential correctable issue is with the rear end collision on Kalum Street. The crosswalk should be upgraded with standard signing to ensure drivers see and stop at the crosswalk as necessary.

The two rear ends associated with reversing manoeuvres on Straume Avenue are likely already resolved by the new lane diet on Kalum Street. Both collisions occurred before 2012, when Kalum Street was four lanes. With the new laning design, the presence of the extra shoulder width on Kalum Street should reduce the incidence of reversing manoeuvres.

6.3 PARKING-RELATED COLLISIONS

Within the five year analysis, there were 2,159 collisions in the ICBC records which were classified as being related to parking manoeuvres. These were mostly in private parking lots. The collisions were typically of low severity, with only 3% identified as involving injuries.

Approximately half of the collision records had GPS coordinates, which have been spatially represented in Figure 92. Larger circles indicate locations with more frequent parking-related collisions.

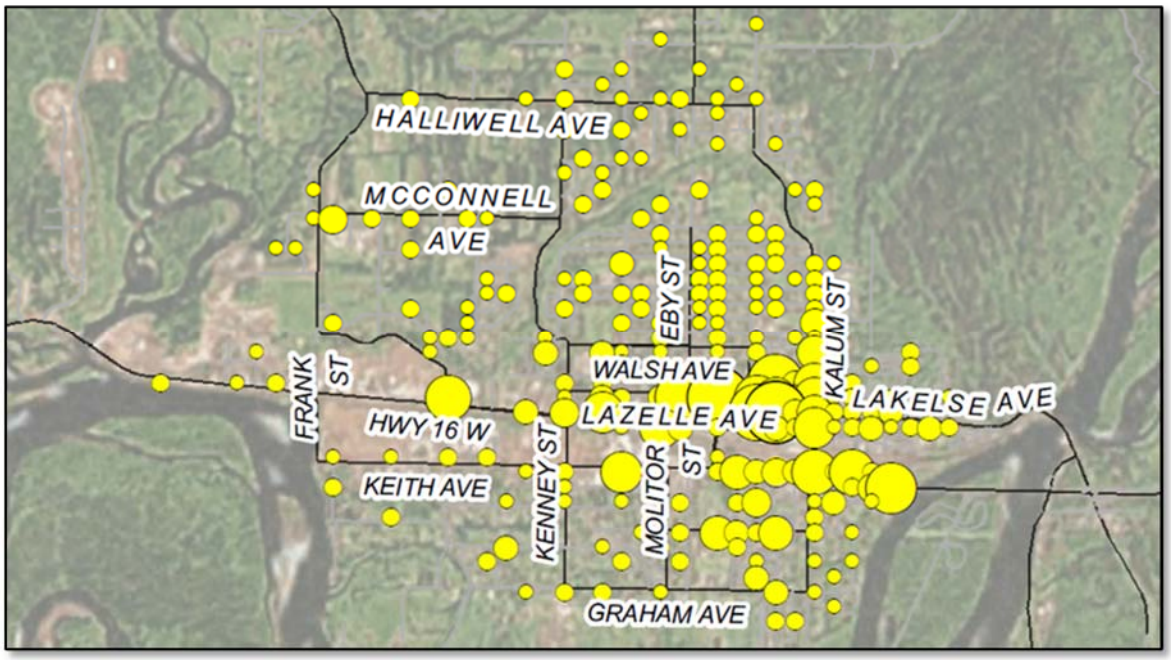


Figure 92: Locations of Parking-Related Collisions

The circles represent both on-street and off-street (i.e. parking lot) collisions. The areas with the highest frequency of parking collisions are listed in Table 32 below.

Table 31: Locations with High Frequency of Parking-Related Collisions

Rank	Street Name	Block	From	To	Reported Collisions	Comments
1	Lakelse Avenue	4600	Kalum Street	Sparks Street	108	80% identified in private parking lots.
2	Lakelse Avenue	4700	Sparks Street	Eby Street	99	85% identified in private parking lots.
3	Park Avenue	4600	Kalum Street	Sparks Street	35	65% identified in private parking lots.
4	Highway 16 (Keith Ave)	4600	Kalum Street	Sparks Street	34	95% identified in private parking lots, with 15% occurring at the site access.
5	Highway 16 (Keith Ave)	4400	Kerr Street	Cramer Street	31	100% identified in private parking lots.
6	Lazelle Avenue	4600	Kalum Street	Sparks Street	29	50% identified in private parking lots, with 20% listed as due to access sight distance.
7	Lazelle Avenue	4700	Sparks Street	Eby Street	22	55% identified in private parking lots.
8	Kalum Street	3300	Hwy 16	Loen Avenue	18	55% identified as related to on-street parking.
9	Lakelse Avenue	4800	Sparks Street	Eby Street	17	80% identified in private parking lots, with 20% related to on-street parking.
10	Highway 16	4800	Eby Street	Kenney Street	16	100% identified in private parking lots.
11	Highway 16	5100	Brooks Street	Kalum Lake Road	16	100% identified in private parking lots.
12	Greig Avenue	4500	Clinton Street	Kalum Street	16	95% identified in private parking lots, with one identified at the access.
13	Haugland Avenue	4700	Sparks Street	Eby Street	15	65% identified in private parking lots, with two identified at the access.
14	Keith Avenue	4900	Sande Street	Kenney Street	13	85% identified in private parking lots, with one identified at the access.
15	Highway 16	4900	Munroe Street	Kenney Street	10	100% identified in private parking lots.
16	Highway 16	5000	Kenney Street	Kalum Lake Road	10	100% identified in private parking lots, with 25% identified at the access.
17	Lazelle Avenue	4800	Eby Street	Munroe Street	10	85% identified in private parking lots, with 25% identified at the access.
18	Legion Avenue	4400	Cul-De-Sac	Apsley Street	10	90% identified in private parking lots.
19	McConnell Avenue	5300	Floyd Street	Kalum Lake Road	10	90% identified in private parking lots.

As noted in the table, the majority of parking related collisions occurred in private parking lots. Although this is outside the scope of the Traffic Management Plan, the strong trend underscores the importance of the design and maintenance of parking lots, and the accesses thereto. The sight distance at accesses in particular should be managed through on-street parking restrictions.

There were also a few collision trends associated with on-street parking in the Downtown. This supports the proposed lane diets on Lakelse Avenue and Kalum Street, which tend to provide additional buffer between parked vehicles and street traffic. A Downtown Parking Study would also help determine a safe strategy for on-street parking.

7 ACTIVE TRANSPORTATION ISSUES

7.1 PEDESTRIAN AND CYCLE NETWORKS

According to the City's Active Transportation Plan (Ref. 10), there are a total of 33 km of sidewalks, and 11 km of walkways and trails in Terrace in 2009. Only 40% of roads were identified as having sidewalks. The priorities for new sidewalks should be on arterial and collector roads (by virtue of their typically higher traffic volumes and bus routes), and around schools, as shown in Figure 93.

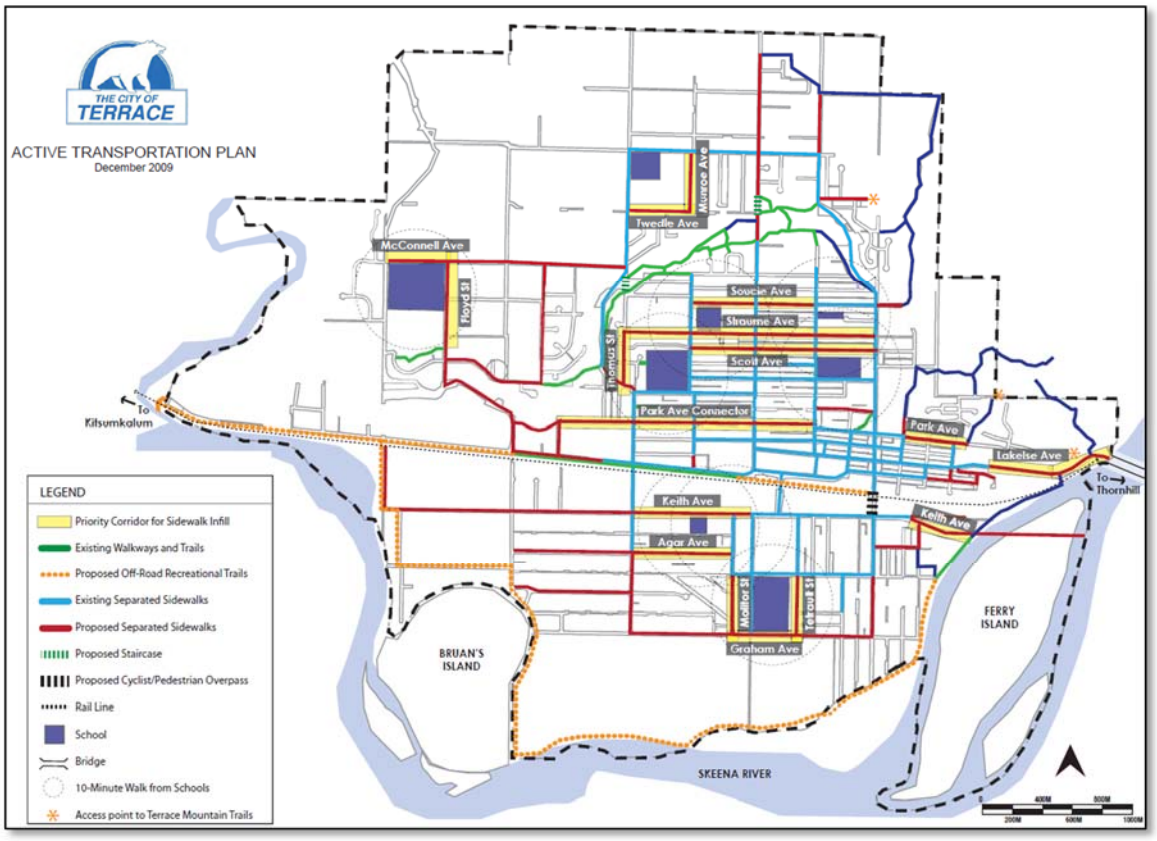


Figure 93: Pedestrian Network Priorities
(source: Terrace Active Transportation Plan)

The Active Transportation Plan also identified a total of 8 km of on-road cycling facilities in Terrace, including both marked routes (e.g. Eby Street, Sparks Street, and Kalum Street) and unmarked routes (e.g. Halliwell Avenue, Skeenaview Drive, and Lanfear Drive). The study also identified 5 km of off-road facilities, including the Howe Creek Trail and Grand Trunk (Millennium) Pathway. To facilitate cycling trips, a comprehensive and integrated bicycle network should be developed, as outlined in Figure 94.

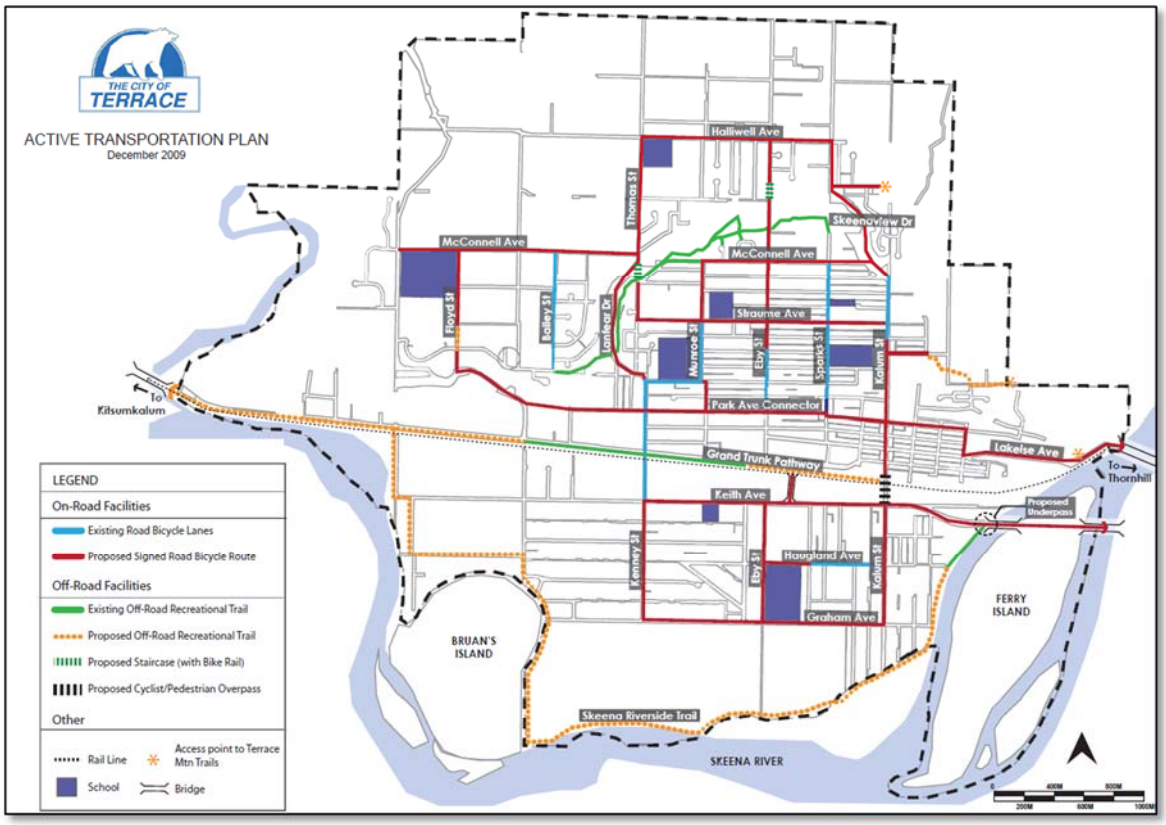


Figure 94: Bicycle Network Priorities
(source: Terrace Active Transportation Plan)

The four key issues identified by the Active Transportation Plan which affect the Transportation Master Plan are as follows:

1. The grade-separated trail connection across the CN line, which is critical for connecting neighbourhoods, facilitating active transportation, and improving the safety of residents who might otherwise be tempted to cross the train tracks at grade.
2. The trail and stairway connections to the Upper Bench, which would provide a safer and more aesthetic choice than is currently offered on Lanfear Drive and Skeenaview Drive.
3. The trail connection between the Old Skeena Bridge and the New Skeena Bridge, which may be used for both a recreational loop, and also a commuter connection to Thornhill.
4. The Howe Creek Trail crossing at the bottom of Lanfear Drive, which will become an increasing concern as traffic volumes and trail user volumes grow.

7.2 TRANSIT SYSTEM

As illustrated in Table 2, the transit mode has only 1% of the Terrace commuter mode share, based on 2006 census data. This is far less than the 10% average for BC. The excess capacity on the roadways, the abundant parking, and the winter climate, all contribute to the convenience and preference of the personal automobile in Terrace.

As the population grows over the next ten years, the available road capacity and parking supply are expected to diminish somewhat. Furthermore, a larger number of residents may choose not to drive. All this should help shift local trips to the transit system.

The existing transit service (Figure 95) was raised frequently as a concern in the public consultation. To address these concerns and prepare the city for the expected growth, a formal Transit Plan should be developed for Terrace. The Plan should include a review of the existing and potential ridership, the routes and schedules, the on-street bus stop infrastructure, a potential transit exchange at the Skeena Mall, and a transit policy to facilitate future transit planning and operational decisions.

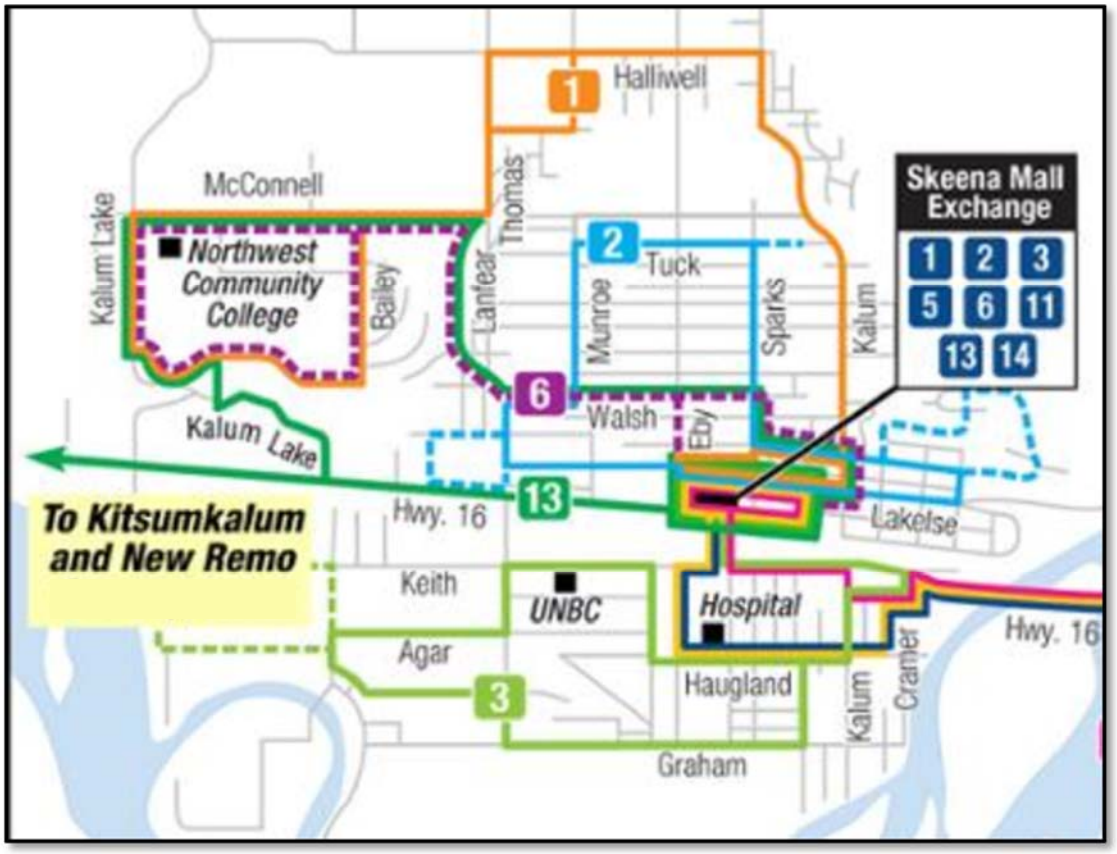


Figure 95: Terrace Transit System
(source: BC Transit)

8 SUMMARY OF ISSUES AND CONCERNS

Based on the input from the public and stakeholders, the review of background literature, and the technical analysis, the following list of issues and concerns was compiled.

8.1 MAJOR NETWORK ISSUES

There were six major network issues confirmed in the Transportation Master Planning process, as outlined in Table 33 below. Each involves a comprehensive level of analysis and design, and multi-million dollar budgets.

Table 32: Major Transportation Network Issues

No.	Location	Description of Issue(s)	Literature	Consultation	Traffic Analysis	Safety Analysis
1.	Proposed grade-separated rail crossing, west of Sande Street	The Highway 16 (Sande Street) overpass is the only available connection between the north and south areas of Terrace for vehicles, pedestrians and cyclists when trains are passing through the city. This divides the City, and affects emergency response.	✓	✓	✓	✓
2.	Proposed grade-separated rail crossing for pedestrians	There is a significant demand for pedestrian crossings at the CN railway tracks in the vicinity of Kalum Street, which is a safety concern due to the 14 tracks at that location.	✓	✓		
3.	Lanfear Drive	The existing connections to the Bench (i.e. via Lanfear Drive and Skeenaview Drive) are steep and windy, with concerns about pedestrian/cyclist safety, and speeding motorists, especially in consideration of future growth expected in the Bench area. Lanfear Drive is considered to be the higher priority.	✓	✓	✓	✓
4.	Skeenaview Drive					
5.	Keith Avenue	Keith Avenue is a significant truck route with a collision-prone intersection at Kenney Street. The road is a candidate to be the designated truck route, but requires upgrading and a grade-separated connection back to the highway (see No. 1 above).	✓	✓	✓	✓
6.	Park Avenue	The extension of Park Avenue should be considered as a future network solution, especially between Eby Street and Munroe Street. Ultimately, Park Avenue should be extended to Kalum Lake Road.	✓		✓	✓

8.2 ISSUES WITH SPECIFIC LOCATIONS

Table 34 outlines the 25 issues that were identified with specific locations in Terrace, and the source(s).

Table 33: Summary of Specific Issues

No.	Location	Description of Issue(s)	Literature	Consultation	Traffic Analysis	Safety Analysis
1.	Keith Avenue at Kenney Street	Identified as a concern in the Safety Analysis (2/20) due to a strong trend in collisions due to non-compliance with the stop signs. The two-way stop causes delays and safety concerns, especially with heavy truck traffic and potential obstructions to the sight distance. A four way stop is warranted now.		✓	✓	✓
2.	Lakelse Avenue	The existing four lane cross section of Lakelse Avenue results in concerns about available lane width (esp. for larger vehicles), on-street parking conflicts, traffic speeds, and the safety of crossing pedestrians.	✓	✓	✓	✓
3.	Lakelse Avenue at Sparks Street	Identified as a concern in the Safety Analysis (15/20) due to a trend in collisions associated with weaving manoeuvres. The offset T intersection causes delays, and concerns for the safety of motorists and pedestrians. This intersection must be considered in conjunction with the intersection of Lazelle Avenue and Sparks Street.		✓	✓	✓
4.	Lakelse Avenue at Eby Street	The existing traffic control is confusing to some drivers, causes delays and safety concerns, and will cause the intersection performance to fail by 2025. This intersection must be considered in conjunction with the intersection of Eby Street / Lazelle Avenue, where there is an existing merging conflict in the northbound direction.		✓	✓	
5.	Thomas Street at McConnell Avenue	The offset T intersection creates concerns with intersection geometry, restricted sight lines, traffic safety and congestion/delays in the peak hours.		✓	✓	
6.	Lanfear Drive at Thomas/Pheasant	Traffic and pedestrian safety at the bottom of Lanfear Hill is a concern due to traffic speeds, road geometry, limited sight distance, and the demand for crossing pedestrians.	✓	✓	✓	
7.	Park Avenue at Kalum Street	Identified as a concern in the Safety Analysis (5/20) due to a trend in drivers not observing the traffic signal. Also identified by public/stakeholders as a concern, especially with the transition to the Two-Way Left Turn Lane.		✓	✓	✓
8.	Lakelse Avenue at Kalum Street	Identified as a concern in the Safety Analysis (8/20) due to a trend in rear ends. The four lane section impedes left turning sight lines.		✓	✓	✓
9.	Lazelle Avenue at Kalum Street	Identified as a concern in the Safety Analysis (4/20) due to trends in rear ends and 90 degree collisions. There are concerns for the safety of pedestrians crossing Kalum Street, esp. around Lazelle Avenue.		✓		✓
10.	Scott Avenue at Eby Street	Identified as a concern in the Safety Analysis (6/20) due to a recent fatality, and a trend in drivers not complying with the stop signs.				✓
11.	Skeenaview Drive (Sparks Street) at Munthe Avenue	There is concern for the safety of the Munthe Avenue intersection at the top of Skeenaview Drive, due to the limited sight distance.		✓	✓	
12.	Kalum Street	The existing lane diet at Park Avenue could be extended south.			✓	
13.	Walsh Avenue at Eby Street	Identified as a concern in the Safety Analysis (13/20) due to drivers not complying with the stop signs. A crosswalk may be necessary.		✓		✓

No.	Location	Description of Issue(s)	Literature	Consultation	Traffic Analysis	Safety Analysis
14.	Haugland Avenue at Kalum Street	Identified as a concern in the Safety Analysis (10/20) due to drivers not complying with the stop signs.				✓
15.	Park Avenue at Kenney Street	Identified as a concern in the Safety Analysis (16/20) due to drivers not complying with the stop signs.				✓
16.	Lakelse Avenue at Emerson Street	Identified as a concern in the Safety Analysis (19/20) due to drivers not observing the traffic signals.				✓
17.	Lakelse Avenue at Apsley Street	Identified as a concern in the Safety Analysis (14/20) due to issues and rear ends at the eastern gateway to the Downtown.				✓
18.	Straume Avenue at Kalum Street	Identified as a concern in the Safety Analysis (20/20) due to rear end collisions.				✓
19.	Haugland Avenue at Cassie Hall School	Pedestrian safety is a concern on Haugland Avenue near the Cassie Hall School.		✓		
20.	Halliwell Avenue at Sparks Street	Safety concerns identified by public/stakeholders, especially concerning the three-way stop control at the four-leg intersection. This is not a typical configuration, as it is more intuitive to drivers to see similar traffic control conditions on opposing approaches.		✓	✓	
21.	Lazelle Avenue at Sparks Street	Identified as a concern in the Safety Analysis (18/20) due to issues with right turning movements.				✓
22.	Lazelle Avenue at Kenney Street	Increasing traffic on Lanfear Drive will drive the warrant for turning lane improvements at this intersection.			✓	
23.	Park Avenue at Sparks Street	The offset T intersection creates concerns with geometry, pedestrian safety and traffic control.		✓	✓	
24..	Trail Connection To Thornhill	An improved pedestrian/cycle path to Thornhill is desired, which would require accommodating a trail connection on either the Skeena River (Highway 16) bridges and/or Old Skeena Bridge.	✓	✓		
25.	Lazelle Avenue at Emerson Street	Technical analysis suggests the traffic signal may not be warranted by existing and expected future traffic volumes.			✓	

8.3 PROVINCIAL HIGHWAY ISSUES

Table 35 outlines the issues identified with the provincial highways through Terrace, and the source(s). The provincial highway system is under the jurisdiction of MoTI, although the City is a key stakeholder and cost sharing partner on highway issues.

Table 34: Summary of Issues with Provincial Highways

No.	Location	Description of Issue(s)	Literature	Consultation	Traffic Analysis	Safety Analysis
1.	Hwy 16 (Keith Ave) at Sande Street	The upgrade to the traffic signal initially created some driver confusion, especially associated with the eastbound left turning movement. This has since been rectified with signage.	✓	✓	✓	✓
2.	Hwy 16 at Kenney Street	Identified as a concern in the Safety Analysis (1/20) due to trends in collisions associated with westbound left turns and northbound rear ends.		✓		✓
3.	Hwy 16 (Keith Ave) at Tetrault Street	Identified as a concern in the Safety Analysis (17/20). Left turn restrictions from Tetrault Street onto Highway 16 are not desired by some drivers, and illegal turns have caused collisions. There is also a trend in rear end collisions with westbound left turning traffic. Hospital access to and from Highway 16 is considered circuitous and problematic.		✓		✓
4.	Hwy 16 (Keith Ave) at Kalum Street	Identified as a concern in the Safety Analysis (3/20) due to a trend in collisions associated with westbound left turns. A westbound advance left turn phase was installed in 2016.				✓
5.	Hwy 16 at Eby Street	Identified as a concern in the Safety Analysis (12/20) due to a trend in rear end collisions. Also, the close proximity of the ambulance service access to the highway causes conflicts between southbound right turn drivers and ambulances attempting to enter the highway. The traffic signal does not have siren detection.		✓		✓
6.	Hwy 16 (Sande Street)	The existing Highway 16 (Sande Street) overpass has limited space for pedestrians and cyclists.	✓	✓		✓
7.	Hwy 16 at Munroe Street	Identified as a concern in the Safety Analysis (7/20) due to a trend in collisions associated with the southbound left turns.				✓
8.	Hwy 16 (Sande Street) at Greig Avenue	Identified as a concern in the Safety Analysis (9/20) due to a trend in collisions associated with the westbound left turns and northbound rear ends.	✓	✓		✓
9.	Hwy 16 (Keith Ave) at Hall Street	Identified as a concern in the Safety Analysis (11/20) due to a trend in rear end collisions.				✓
10.	Hwy 16 (Keith Ave) at Kerr Road	Challenging truck movements due to the operations at the bulk fuel plant. Formalizing a north connection to the signal opposite Walmart may allow trucks to turn at the existing traffic signal.		✓		
11	Hwy 16 at the Grand Trunk Pathway	More access to the Grand Trunk Trail across Highway 16 is desired by users, esp. around Kenney Street.		✓		
12.	Kalum Lake Road	A sidewalk on the highway is desired to improve pedestrian safety.		✓		

8.4 GENERAL ISSUES

Table 36 outlines the general issues identified with the Terrace transportation system, and the source(s). These are systemic concerns about the system as a whole.

Table 35: Summary of General Issues

No.	Description of Issue(s)	Literature	Consultation	Traffic Analysis	Safety Analysis
1.	There is a strong desire by the public to make Terrace more safe and accessible for active transportation, such as walking and cycling, especially Downtown. This includes more sidewalks, bike lanes, and trails, including formal bike lanes on Park Avenue and Kalum Street. Bike lanes should be more offset from roadways where possible.	✓	✓	✓	✓
2.	The existing traffic control (i.e. signs, signals, etc) is confusing to some users, and occasionally is difficult to see due to obstructions.		✓		
3.	Terrace should be designed for accessibility, including flatter sidewalk crossfalls, fewer obstacles, wheelchair ramps at crosswalks and audible signals at traffic signals.		✓		
4.	There is a desire by the public to revisit the transit system to improve service and convenience. More handyDart service is desired, as well as a route to the airport.		✓		
5.	A designated truck route is necessary to facilitate truck movements within and through Terrace.	✓	✓	✓	✓
6.	More parking is desired Downtown, especially accessible parking (with signing).	✓	✓		
7.	Traffic speeds are a concern in Terrace; traffic calming measures are desired.		✓	✓	✓
8.	Lane markings are not durable, and cause concerns with safety and traffic guidance.		✓		
9.	More winter maintenance (esp. on transit routes) and spring street sweeping activities are desired.		✓		✓
10.	The existing pavement condition was felt to be in need of improvement by the some members of the public.		✓		
11.	Wayfinding signage is needed to promote guidance, sustainability and accessibility.	✓	✓		
12.	The road functional classification can be updated to incorporate the recommendations from the Transportation Master Plan.			✓	
13.	Approximately half of all reported collisions in Terrace are associated with parking manoeuvres.				✓
14.	More street lighting is desired to improve safety and security at night.		✓		
15.	Many motorists, pedestrians and cyclists do not appear to understand the rules of the road.		✓		✓

9 OPTIONS FOR IMPROVEMENT

9.1 GRADE-SEPARATED RAIL CROSSINGS

9.1.1 New Overpass

The 2009 Terrace Corridor Study (Ref. 3) identified three crossing alternatives for a second grade-separated rail overpass at Highway 16: Kalum Lake Road, Kenney Street, and Brooks Street. The study concluded that all three were viable, with Kenney Street scoring best from a technical perspective. However, the public feedback indicated that a Kalum Lake Road was preferred by the users.

At the time the study was written, CN Rail was considering the closure of the Kenney Street at-grade crossing. Therefore, a Kenney Street overpass would simply replace and upgrade an existing rail crossing. As the Kenney Street crossing is no longer being considered for closure, an alternate location for the overpass should be considered in order to increase the available traffic capacity across the tracks, and improve the connectivity between the north and south halves of the city.

The Kalum Lake Road intersection (Figure 96) is an ideal location for a rail overpass from a number of perspectives:

1. The location is 800 metres from the signalized intersections at Kenney Street (to the east) and Frank Street (to the west), which achieves an appropriate spacing for traffic signals along an arterial highway corridor.
2. A crossing at Kalum Lake Road would provide a convenient alternative for westbound traffic turning south when Kenney Street is closed for train crossings.
3. As the overpass will necessarily become the future truck route, there is an advantage to connecting it directly to Kalum Lake Road, a provincial highway.
4. The topography for a rail crossing is advantageous at Kalum Lake Road.

Figure 96: Kalum Lake Intersection as Viewed from Braun Street

To achieve the elevation necessary for the rail crossing, the highway would have to be raised approximately 7 metres (Figure 97). This is a similar concept as what currently exists at the Sande Street overpass, which is considered to be working well.

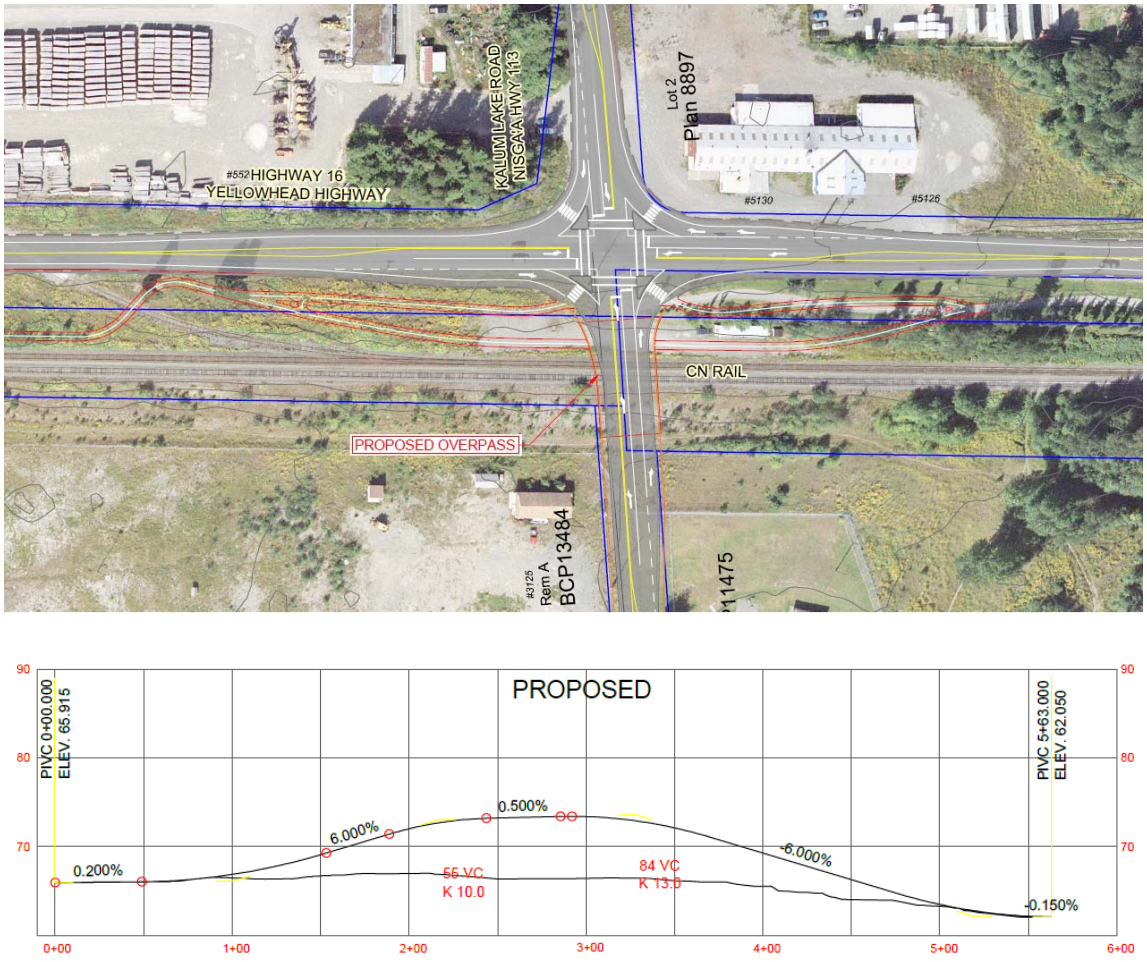


Figure 97: Conceptual Design of Kalum Lake Road Overpass

The new overpass and intersection must inherently be designed for the safe and accessible accommodation of pedestrians and cyclists. To maintain the continuity of the Grand Trunk Pathway, the trail should extend under the overpass, and also connect directly to the intersection. This would therefore provide the additional access to the trail that was requested by the public.

The cost of this improvement was estimated in the Infrastructure Upgrade Scoping Study (Ref. 12) to be approximately $27 Million.

9.1.2 Pedestrian Crossing

One of the critical transportation issues in Terrace is the need for a new pedestrian crossing of the CN rail line. The demand to connect the neighbourhoods on either side of the tracks is well-established, and recent incidents have underscored the extreme safety issues associated with pedestrians crossing the rail yard at grade.

The pedestrian desire line was noted by the public and stakeholders to be strongest at Kalum Street. A pedestrian/cyclist overpass was also proposed at this location in the Active Transportation Plan (Ref. 10). The concern with this location is that it crosses 14 rail lines at the widest point in the CN yard. Assuming that CN would agree to a bridge crossing through the centre of their yard, the bridge would have to be a clear span of approximately 100 metres, as there is no space available for bridge piers. A planning-level cost estimate for such a structure, with the necessary lighting, railings, and accessible bridge approaches, is approximately $10 to $15 Million (based on the costs of other pedestrian bridges in western Canada of comparable length).

A more cost effective alternative at Kalum Street would be a gondola system, which could be designed to automatically shuttle pedestrians and cyclists from ground level to ground level, and crossing the tracks at a clearance of 11 metres (see example, Figure 98). The typical speed for such an installation would be 3 m/s, making a crossing approximately 2 minutes in duration. These facilities are commonly used for active transportation connections outside North America. The cost is estimated at $3-4 Million for construction, with an estimated annual operating cost of $50k.

Figure 98: Pedestrian Gondolas, Washington, DC
(source: wtop.com)

A more conventional alternative for a grade-separated crossing of the CN tracks is an overpass where the crossing distance is manageable. At the east end of the CN yard, the tracks converge into 2-3 lines. An overpass at this location would be approximately $2 Million to construct. The benefit of this location is the opportunity to connect to the rest of the trail network, specifically the riverfront trails (existing and proposed), the proposed Highway 16 underpass, and the Lakelse Avenue trail to the Old Skeena Bridge (Figure 99). A new trail along the north side of the tracks could be constructed to connect the overpass to Kalum Street and the Millennium (Grand Trunk) Pathway system.

For pedestrians on Kalum Street traveling to and from the retail stores at the east end of the city, the walking distance to an overpass at the east end of the CN yard would be approximately 400 metres (i.e. the equivalent of four city blocks) longer than a trip directly through the CN yard. This improvement is therefore recommended. Secure fencing along the CN yard should be installed as part of this project to prevent any further at grade crossings of the rail lines.

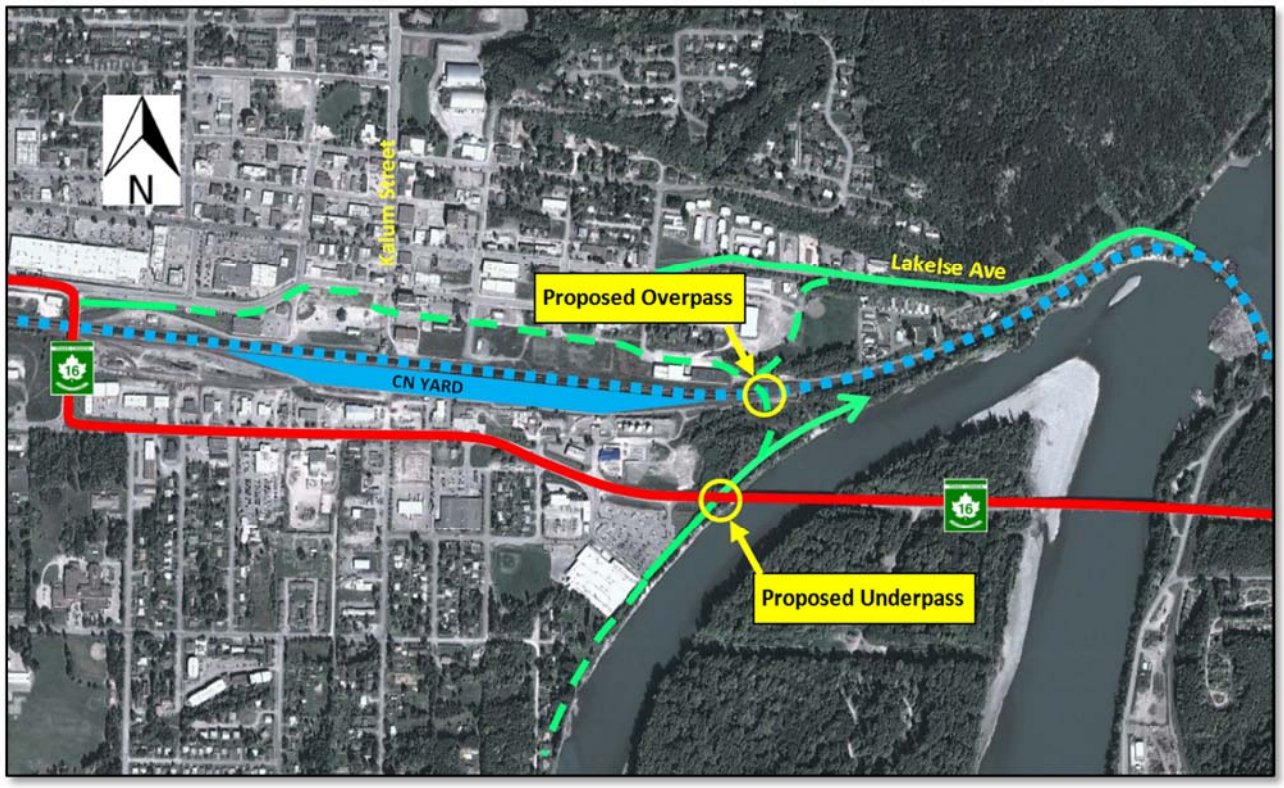


Figure 99: Recommended Location for a Pedestrian/Cyclist Overpass

9.2 CITY TRANSPORTATION CORRIDORS

9.2.1 Lanfear Drive and Skeenaview Drive

Both Lanfear Drive and Skeenaview Drive are classified as arterial roads, and connect the City Centre to the Upper Bench. However, the roads are generally less than 8 metres wide, and have steep grades and windy alignments. Adjacent pedestrians on narrow sidewalks exacerbate the safety concerns.

As the population grows, traffic is expected to increase significantly on these roads (especially Lanfear Drive. In the absence of any alternative routes, these roads must be widened and upgraded. A 10.0 metre paved road width with an adjacent sidewalk would satisfy the safety requirements for traffic, pedestrians and cyclists, and would help accommodate the expected traffic demand.

A typical cross section for Lanfear Drive (which would be similar to Skeenaview Drive) is shown in Figure 100. The cost of the Lanfear Drive widening was estimated at $5 Million. The cost of the Skeenaview Drive widening was estimated at $8 Million (Ref. 12). The Lanfear Drive improvements should be implemented first, due to its expected traffic demand. A conceptual design for Lanfear Drive is provided in Appendix D.

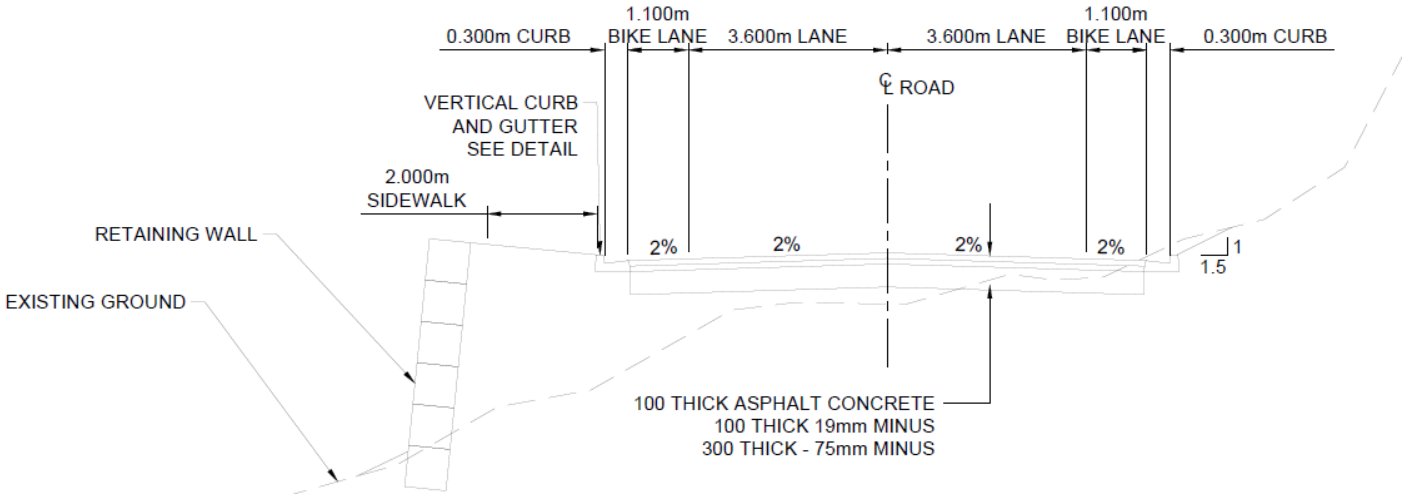


Figure 100: Proposed 10 metre Cross Section, Lanfear Drive

9.2.2 Keith Avenue

As part of the future designated truck route (see analysis, Section 5.7), and as a major collector serving the proposed Keith Estates, Keith Avenue will require significant widening and upgrading, including provisions for pedestrians and cyclists.

A 24 metre right-of-way is recommended, with either of the cross sections shown in Figure 38. Both cross sections are based on a 14.6 metre road width (curb-to-curb). Option B aligns more closely with the recommendations from the Keith Estates Neighbourhood Concept Plan (Ref. 19) by including a 3.0 metre multi-use trail along the north side of the road.

Only the section between Highway 16 (Sande Street) and Braun Street is expected to require upgrading within the foreseeable future due to its expected future designation as a formal truck route. Between Sande Street and Kenney Street, the existing 9-12 metre width will require significant upgrading. The existing ~14 metre wide section between Kenney Street and Braun Street could accommodate the proposed road laning with small adjustments to the widths of the bike lanes and Two Way Left Turn Lane widths, so a formal upgrade of this section could be delayed to a later date.

The improvements to Keith Avenue should be coordinated with the left turn lane improvements recommended at the Keith Avenue / Kenney Street intersection (Section 9.7.1).

9.2.3 Park Avenue

Park Avenue is classified as a collector. However, there are two sections of Park Avenue that are discontinuous. The section between Eby Street and Munroe Street is the most important from a network perspective, especially since this link would become the main route between Lanfear Drive and the Downtown.

The section of Park Avenue between Lanfear Drive and Kalum Lake Hill is desirable, but is not likely to have the traffic demand to warrant the cost of the extension for the foreseeable future.

As Park Avenue is a designated cycle route, bike lanes or other cycle accommodation should be considered, especially through the Downtown.

9.2.4 Lakelse Avenue

A lane diet should be implemented on Lakelse Avenue, between Eby Street and Emerson Street, and between Kalum Street and Clinton Street. The traffic volumes do not require the four lanes provided, and the extra width will improve safety for parking and vulnerable road users. The Two-Way Left Turn Lane will also improve safety and road capacity by removing left turn conflicts from the traffic stream.

There are three design issues that must be considered in the implementation of the proposed Lakelse lane diet:

1. The transitions to the two lane section between Emerson Street and Kalum Street will need to be designed to ensure traffic can flow smoothly between the different blocks;

2. The on-street parking on the north side of Lakelse, east of the Tim Hortons, will have to be removed to ensure any queuing issues from the drive through do not impact westbound traffic on Lakelse Avenue; and

3. Two of the busiest accesses on Lakelse Avenue are to the Tim Hortons and the Safeway Parking Lot. The locations of these opposing accesses would create an overlap in left turns. The placement of these accesses will need to be studied to ensure head-on conflicts are not created in the Two Way Left Turn Lane.

9.2.5 Kalum Street

The existing lane diet on Kalum Street ends at Park Avenue. Both the existing and forecast future volumes are expected to be manageable with two lanes and a Two Way Left Turn Lane. The collision history at the Kalum Street intersections south of Park Avenue appears to suggest that safety could be improved with a lane diet. Therefore, the lane diet on Kalum Street should be extended south to Greig Avenue.

As Kalum Street is a designated cycle route, bike lanes or other cycle accommodation should be considered, especially through the Downtown.

9.2.6 Haugland Avenue at Cassie Hall School

To address the concerns with pedestrian safety, the design of the sidewalks and crosswalks in the neighbourhood should be reviewed in the context of providing safe routes to school.

9.2.7 Trail Connection to Thornhill

The trail connections to Thornhill should be improved on either the Old Skeena Bridge and/or the new Skeena Bridge on Highway 16. The Old Skeena Bridge connection is recommended due to the lower traffic volumes and speeds, the one-way traffic, and the existing separated path.

9.3 CITY INTERSECTIONS

The following options are proposed for addressing the city intersections outlined in Table 34.

9.3.1 Keith Avenue at Kenney Street

The recent collision history and current traffic patterns at the Keith Avenue / Kenney Street intersection (ranked 2/20 in the Network Screening) warrant the installation of a four way stop. The traffic will also require turning lane improvements in the future to safely accommodate the demand. This should be done in advance (but in consideration) of the future upgrade of Keith Avenue.

9.3.2 Lakelse Avenue at Sparks Street

The existing offset T intersection at the Lakelse Avenue / Sparks Street intersection (ranked 15/20 in the Network Screening) causes safety issues and traffic delays. The expected increase in traffic volumes is expected to exacerbate these concerns. The only apparent opportunity to align the two approaches on Sparks Street is to realign the south leg of the intersection through the adjacent property (Figure 101). This improvement is expected to cost in the order of $800,000, not including property acquisition.

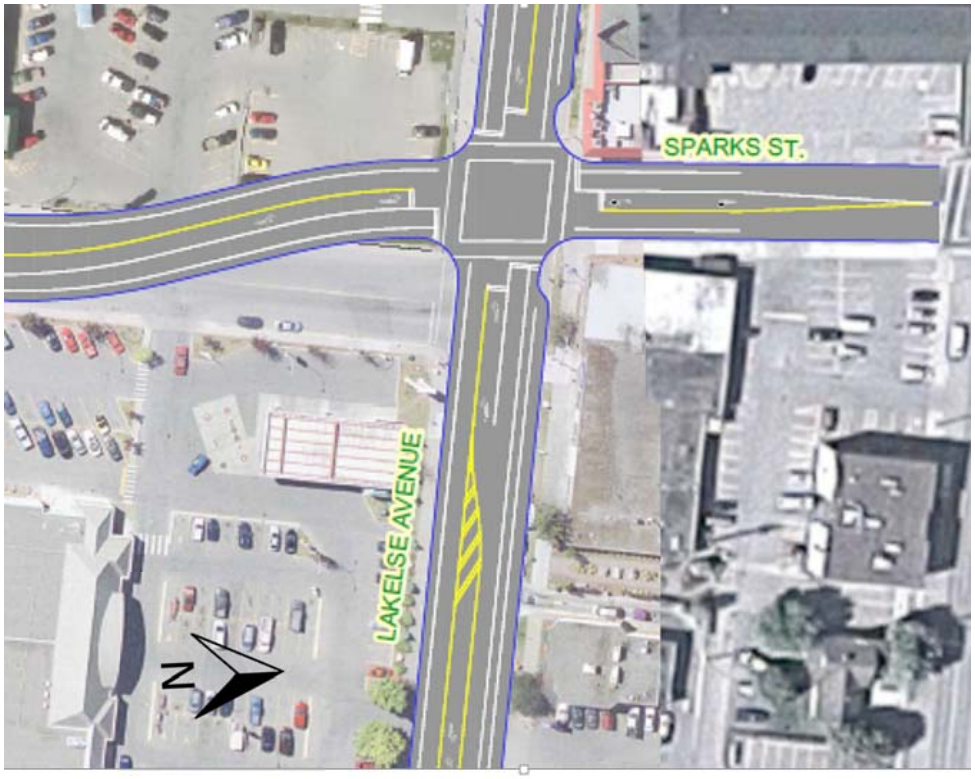


Figure 101: Proposed Realignment of Sparks Street at Lakelse Avenue

9.3.3 Lakelse Avenue at Eby Street

The existing traffic control at the Lakelse Avenue / Eby Street intersection was frequently identified as a concern, but did not translate into a trend in collisions (and was not included in the Top 20 intersections identified in the Network Screening). However, this intersection should be upgraded, especially to accommodate the 2025 traffic volumes, under which the existing traffic control is expected to fail.

There are two identified alternatives for reconfiguring the intersection. The first is to realign Lakelse Avenue to connect directly to the south leg of Eby Street (Figure 102). This option facilitates the connection between Highway 16 and Downtown, but does not address the significant traffic flow on Eby Street. Therefore, this option was not pursued further.

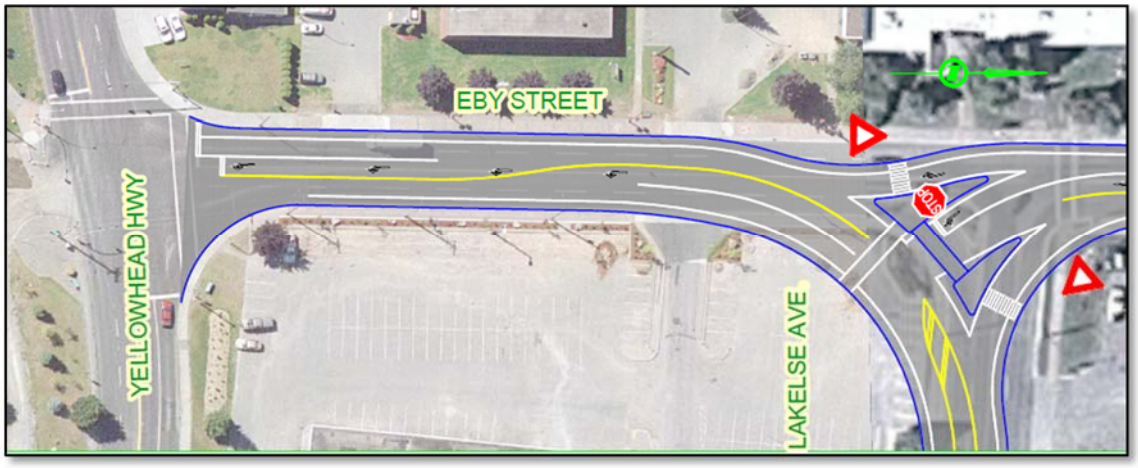


Figure 102: Potential Realignment at Lakelse Avenue and Eby Street

As the traffic volumes approach the warrants for a traffic signal (expected within 10 years), the intersection traffic pattern could be accommodated with a traffic signal, which would cost in the order of $150,000.

Another alternative would be a roundabout, which would create a safe and aesthetic gateway to the Downtown. However, a roundabout would enable vehicles to enter and leave the intersection in a continuous stream. This would adversely affect traffic movements at the Lazelle Avenue / Eby Street intersection, approximately 50 metres north. A roundabout at Lakelse Avenue may necessitate movement restrictions at Lazelle Avenue, which would increase the importance of the Park Avenue connector.

9.3.4 Thomas Street at McConnell Avenue / Cooper Drive

Although the intersection of Thomas Street / McConnell Avenue / Cooper Drive was not one of the Top 20 collision prone intersections, it is the subject of concerns due to traffic demand in the peak hours (especially the morning). The offset "T" configuration in particular impedes traffic flow. The McConnell Avenue (eastbound) approach could be realigned to the north to create a four-leg intersection. However, this would only address the intersection geometric issues.

A roundabout is the recommended alternative. This could resolve the geometric issues, while also facilitating safe traffic flows with reduced delays. The nature of the roundabout geometry would also act as a traffic calming device to reduce traffic speeds, especially on Lanfear Drive. The traffic volumes are likely to meet the warrants for signalization as the Upper Bench develops. At that time, a roundabout should be constructed. The estimated cost is $500,000.

A right turn lane would reduce the delays on the eastbound approach by facilitating right turns around left turning vehicles. However, this is only expected to save a few seconds delay per vehicle on average in the current peak hours, and would likely be discarded infrastructure when the intersection is upgraded. Depending on the timing of a major upgrade, a right turn lane may not be worthwhile.

9.3.5 Lanfear Drive at Pheasant Street

The existing safety concern with Lanfear Drive traffic diverting through Pheasant Street was identified in the public open house. The concern is likely to worsen as traffic volumes increase, but has not yet caused the location to be identified in the Network Screening. By closing this intersection (at least to southbound entering traffic), the safety concern can be addressed. The volume of traffic using this intersection is not sufficient to create a concern as it diverts to other routes.

As an alternative, the traffic turning from Lanfear Drive onto Pheasant Street could be slowed by the installation of an intersection bulb (Figure 103). This improvement would reduce traffic speeds at the intersection without eliminating the turning movement, and would also improve the safety of the intersection for pedestrians. The intersection bulb would have to be designed to accommodate the turning vehicles without overlapping the path of northbound traffic, such that the potential for southbound rear end conflicts on Lanfear Drive is minimized. Also, this solution would not necessarily prevent speeding traffic short-cutting through Pheasant Street after negotiating the turn at the intersection.

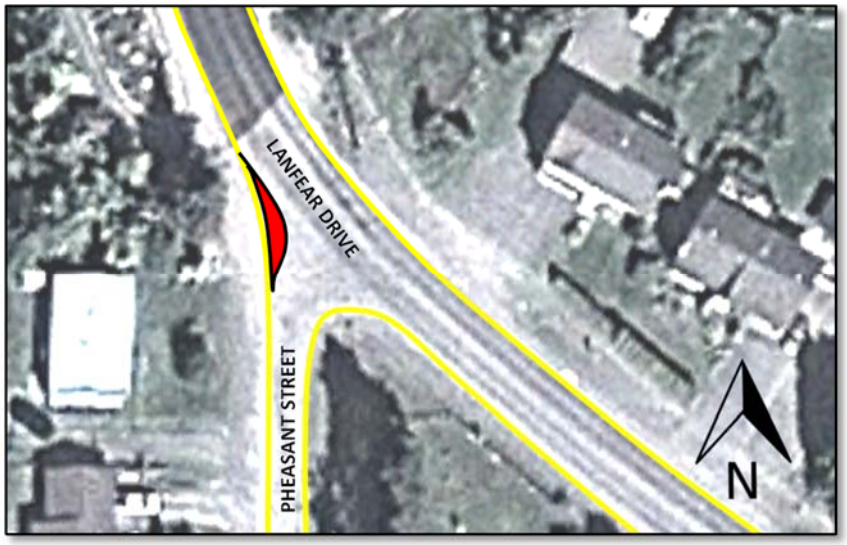


Figure 103: Potential Bulb on Pheasant Street at Lanfear Drive

Regardless of the improvement at the intersection, the safety of crossing pedestrians at the bottom of Lanfear Hill (especially at the trail) should be improved with a signed and marked crosswalk and pedestrian-activated flashing beacons. The location of the crosswalk should be sufficiently in alignment with the trails to be used by pedestrians and cyclists, while also being sufficiently set back from the Lanfear Drive hill to maximize the available sight distance.

9.3.6 Park Avenue at Kalum Street

The existing traffic signals at the Park Avenue / Kalum Street intersection (ranked 5/20 in the Network Screening) should be upgraded with higher intensity LED bulbs and reflective yellow backboards. This may be a candidate for cost sharing with ICBC.

9.3.7 Lakelse Avenue at Kalum Street

The existing traffic signals at the Lakelse Avenue / Kalum Street intersection (ranked 8/20 in the Network Screening) should be upgraded with higher intensity LED bulbs and reflective yellow backboards. This may be a candidate for cost sharing with ICBC. The lane diets proposed on Kalum Street and Lakelse Avenue are expected to have a negligible effect on traffic delays at the intersection, while improving safety.

9.3.8 Lazelle Avenue at Kalum Street

The northeast corner of the two-way stop-controlled intersection of Lazelle Avenue and Kalum Street (ranked 4/20 in the Network Screening) should have a sidewalk extension to improve the safety for pedestrians, and reduce the potential for rear end collisions.

9.3.9 Scott Avenue at Eby Street

The visibility of the stop conditions on Scott Avenue at the Eby Street intersection (ranked 6/20 in the Network Screening) should be improved by relocating the westbound stop sign closer to the road, ensuring the stop signs are made of micro-prismatic reflective sheeting, adding a westbound stop line, and adding reflective tape to the stop sign posts.

9.3.10 Skeenaview Drive at Munthe Avenue

The existing intersection appears to be operating well, with no collisions within the study period attributable to the limited sight lines looking down the hill. The convex mirror installed at the intersection appears to be compensating for the limited sight lines. However, as traffic volumes grow on Skeenaview Drive, the available capacity at this intersection may decrease. The City should monitor this intersection to determine if and when the westbound left turn from Munthe Avenue onto Skeenaview Drive (Sparks Street) should be restricted.

9.3.11 Walsh Avenue at Eby Street

The visibility of the stop conditions on Walsh Avenue at the Eby Street intersection (ranked 13/20 in the Network Screening) should be improved by ensuring the stop signs are made of micro-prismatic reflective sheeting, adding a westbound stop line, and adding reflective tape to the stop sign posts.

9.3.12 Haugland Avenue at Kalum Street

The visibility of the stop conditions on Haugland Avenue at the Kalum Street intersection (ranked 10/20 in the Network Screening) should be improved by ensuring the stop signs are made of micro-prismatic reflective sheeting, adding stop lines, and adding reflective tape to the stop sign posts.

9.3.13 Park Avenue at Kenney Street

The visibility of the stop conditions on Park Avenue at the Kenney Street intersection (ranked 16/20 in the Network Screening) should be improved by ensuring the stop signs are made of micro-prismatic reflective sheeting, adding stop lines, and adding reflective tape to the stop sign posts.

9.3.14 Lakelse Avenue at Emerson Street

The existing traffic signals at the Lakesle Avenue / Emerson Street intersection (ranked 19/20 in the Network Screening) should be upgraded to higher intensity LED bulbs and reflective yellow backboards. This may be a candidate for cost sharing with ICBC.

9.3.15 Lakelse Avenue at Apsley Street

The visibility of the stop conditions on Apsley Street at the Lakelse Avenue intersection (ranked 14/20 in the Network Screening) should be improved by ensuring the stop signs are made of micro-prismatic reflective sheeting, adding stop lines, and adding reflective tape to the stop sign posts.

9.3.16 Straume Avenue at Kalum Street

To improve the safety of the intersection of Straume Avenue at Kalum Street (ranked 20/20 in the Network Screening), the crosswalk on the south side of the intersection should be upgraded with standard signage.

9.3.17 Halliwell Avenue at Sparks Street

The safety concerns associated with the atypical three way stop condition at the four leg intersection can be addressed by upgrading the traffic control. Ideally, depending on the traffic volumes, the intersection should either be a two-way stop, or a four-way stop. If traffic is predominantly turning between two legs of the intersection, the geometry can be upgraded to recognize that as the primary movement.

9.3.18 Lazelle Avenue at Sparks Street

To prevent future sideswipes from concurrent right turn movements at the intersection of Lazelle Avenue and Sparks Street (ranked 18/20 in the Network Screening), a short right turn lane could be painted where width permits.

9.3.19 Lazelle Avenue at Kenney Street

A southbound left turn lane may be required to accommodate the turning demand in the future. If Park Avenue becomes the official route to the Downtown and/or if there are movement restrictions implemented at the intersection of Lazelle Avenue and Eby Street), the southbound left turn lane may be warranted at the Park Avenue intersection instead.

9.3.20 Park Avenue at Sparks Street

Park Avenue is functionally classified as a collector, and (with extensions implemented to the west) will become a key route to and from the Downtown. At the Sparks Street intersection, an offset T configuration creates awkward turning movements, and may have safety concerns under heavier traffic flows. In particular, the nature of the offset "T" configuration is such that opposing left turns on Sparks Street would overlap. The intersection should be realigned to create one four leg intersection (Figure 104).

Figure 104: Proposed Realignment of Park Avenue at Sparks Street

9.3.21 Lazelle Avenue at Emerson Street

The traffic signal does not appear warranted, and may be a candidate for removal. More study is required.

9.4 PROVINCIAL HIGHWAYS

The provincial highways fall under the jurisdiction of MoTI. However, the City is a key stakeholder and often funding partner for highway improvements. The following proposed recommendations should be submitted to MoTI for review and consideration. Those recommendations identified by the Safety Analysis may be candidates for ICBC funding.

1. The traffic signals along the Highway 16 corridor should be checked to ensure they meet current MoTI standards for visibility.

2. At the intersection of Highway 16 and Kenney Street (ranked 1/20 in the Network Screening), the installation of a red light camera could be considered for eastbound traffic. North and southbound left turn lanes will be warranted in future.

3. At the intersection of Highway 16 (Keith Avenue) and Kalum Street (ranked 3/20 in the Network Screening), a new westbound advance left turn phase, and the resolution of the queuing issues at the Tim Horton's drive-thru have likely helped reduce the potential for rear-end collisions. The addition of left turn lanes on the highway would also be beneficial, but would be costly in the narrow right-of-way.

4. Adequate sight lines should be maintained at the intersection of Highway 16 and Munroe Street (ranked 7/20 in the Network Screening).

5. A median island could be constructed on the eastbound approach to the intersection of Highway 16 (Sande Street) at Greig Avenue (ranked 9/20 in the Network Screening) to improve visibility for westbound drivers.

6. Left turn lanes at the intersection of Highway 16 (Keith Avenue) / Hall Street (ranked 11/20 in the Network Screening) would help reduce the potential for rear-end collisions. However, this would be costly in the narrow right-of-way.

7. Consideration should be given to installing emergency signal pre-emption with restricted southbound right turns for the ambulance service at the intersection of Highway 16 and Eby Street (ranked 12/20 in the Network Screening).

8. At the intersection of Highway 16 (Keith Avenue) and Tetrault Street (ranked 17/20 in the Network Screening), the primary hospital access should be relocated to the signalized intersection at Sande Street in order to reduce the turning conflicts at Tetrault Street. If the hospital route cannot be relocated, a westbound left turn lane should be considered at the Tetrault Street intersection.

9. The safety and comfort of pedestrians and cyclists on Sande Street should be improved as and where possible.

10. Truck movements from the bulk fuel plant should be improved, potentially at the Highway 16 / Kerr Street intersection.

The issue with the new signal at Highway 16 (Keith Avenue) and Sande Street was not included since MoTI is already addressing the recent increase in collisions.

9.5 GENERAL TRANSPORTATION SYSTEM

The list of general transportation system issues in Section 8.4 can be addressed as outlined below:

1. To improve the active transportation and accessibility in Terrace, the City should continue to implement the recommendations from the Active Transportation Study (Ref. 10), which has provided a prioritized list of future improvements.

2. To address issues with local traffic control, the Traffic Control Review jointly commissioned by the City and ICBC (in progress) will provide recommendations for adjusting local signage and paint markings to meet TAC guidelines.

3. To improve accessibility, the City should ensure new projects are free of barriers. Applicable accessibility standards should be incorporated into City bylaws.

4. To address concerns with the transit system, the City and BC Transit should jointly commission a comprehensive transit system review.

5. To manage and regulate truck traffic through Terrace, Keith Avenue and Braun Street should be officially designated as a truck route once Keith Avenue is upgraded and the overpass at Kalum Lake Road is constructed.

6. To address the concerns with Downtown parking, a formal parking study is required.

7. To reduce traffic speeds in local neighbourhoods, traffic calming measures should be implemented as and where applicable.

8. To improve the visibility of lane markings in Terrace, the City should install in-laid thermoplastic markings at strategic locations along the existing lane lines. These provide some traffic guidance when the paint is gone, and also facilitate layout.

9. To address concerns about snow removal and pavement condition, the City can ensure the public has access to the policies and strategies currently being used to guide operations.

10. To address concerns with Wayfinding, the Wayfinding Strategy (Ref. 4) should continue to be implemented.

11. To update the Road Functional Classification, the City can incorporate the recommendations from Section 5.1 into the Official Community Plan.

12. To address the large trend in parking-related collisions, revisit the parking design requirements for off-street parking in the Zoning Bylaw.

13. To address concerns with inadequate street lighting, the City could revisit street lighting strategies, and consider implementing Local Area Service programs. The collision analysis did not identify significant trends in collisions after dark.

10 IMPLEMENTATION PLAN

10.1 RECOMMENDED IMPROVEMENT PROGRAM

The recommended improvements identified in Section 9 are prioritized below for implementation.

10.1.1 Short Term (0-5 Year Horizon)

The following improvements should be implemented within the next five years.

1. Construct a new rail overpass on Highway 16 at Kalum Lake Road.
2. Construct a new pedestrian overpass at the east end of the CN yard, and upgrade the adjacent trail connections.
3. Widen Lanfear Drive to 10.0 metres (see conceptual design, Appendix D).
4. Upgrade the intersection of Keith Avenue at Kenney Street, including a four way stop (which should be implemented as soon as possible), and turning lanes (which should be implemented when funding permits.
5. Implement a lane diet on Lakelse, between Eby Street and Emerson Street, and between Kalum Street and Apsley Street.
6. Install a signed/marked crosswalk at the Howe Creek Trail crossing at the bottom of Lanfear Drive, with pedestrian-activated flashers.
7. Upgrade the existing traffic signals at the intersections of Park Avenue/Kalum Street, Lakelse Avenue/Kalum Street, and Lakelse Avenue/Emerson Street to higher intensity LED bulbs and reflective yellow backboards. Other signalized intersections should ideally be upgraded as well.
8. Upgrade the visibility of the stop conditions on the Scott Avenue approaches to Eby Street, the Walsh Avenue approaches to Eby Street, the Haugland Avenue approaches to Kalum Street, the Park Avenue approaches to Kenney Street, and the Apsley Street approaches to Lakelse Avenue.
9. Extend the existing lane diet on Kalum Street further south to Greig Avenue.
10. Upgrade the crosswalk signage on Kalum Street at Straume Avenue.
11. Review pedestrian network around Cassie Hall School on Haugland Avenue
12. Revisit the traffic control at Halliwell Avenue and Sparks Street
13. Consider painting short right turn lanes at Lazelle Avenue and Sparks Street if the turning demand becomes a concern.

14. For issues with provincial highways, the City should discuss with MoTI the issues outlined in Section 9.7.

The locations of all proposed Short Term improvements are shown in Figure 105.

Regarding the general or systemic issues, the City should:

1. Continue to implement the recommendations from the Active Transportation Plan.
2. Implement the identified higher priority recommendations from the forthcoming Traffic Control Review.
3. Ensure all new projects and initiatives are free from barriers to accessibility.
4. Commission a comprehensive Transit System Review.
5. Designate Keith Avenue and Braun Street as the local truck route after Keith Avenue is upgraded, and the overpass at Kalum Lake Road is constructed.
6. Commission a comprehensive Downtown Parking Study.
7. Implement traffic calming measures as and where applicable.
8. Add small applications of in-laid thermoplastic on the lane lines.
9. Ensure the public has access to the operational policies and strategies.
10. Continue to implement the recommendations from the Wayfinding Strategy.
11. Incorporate the revised Road Functional Classification into the OCP.
12. Revisit the off-street parking design requirements in the City Zoning Bylaw.

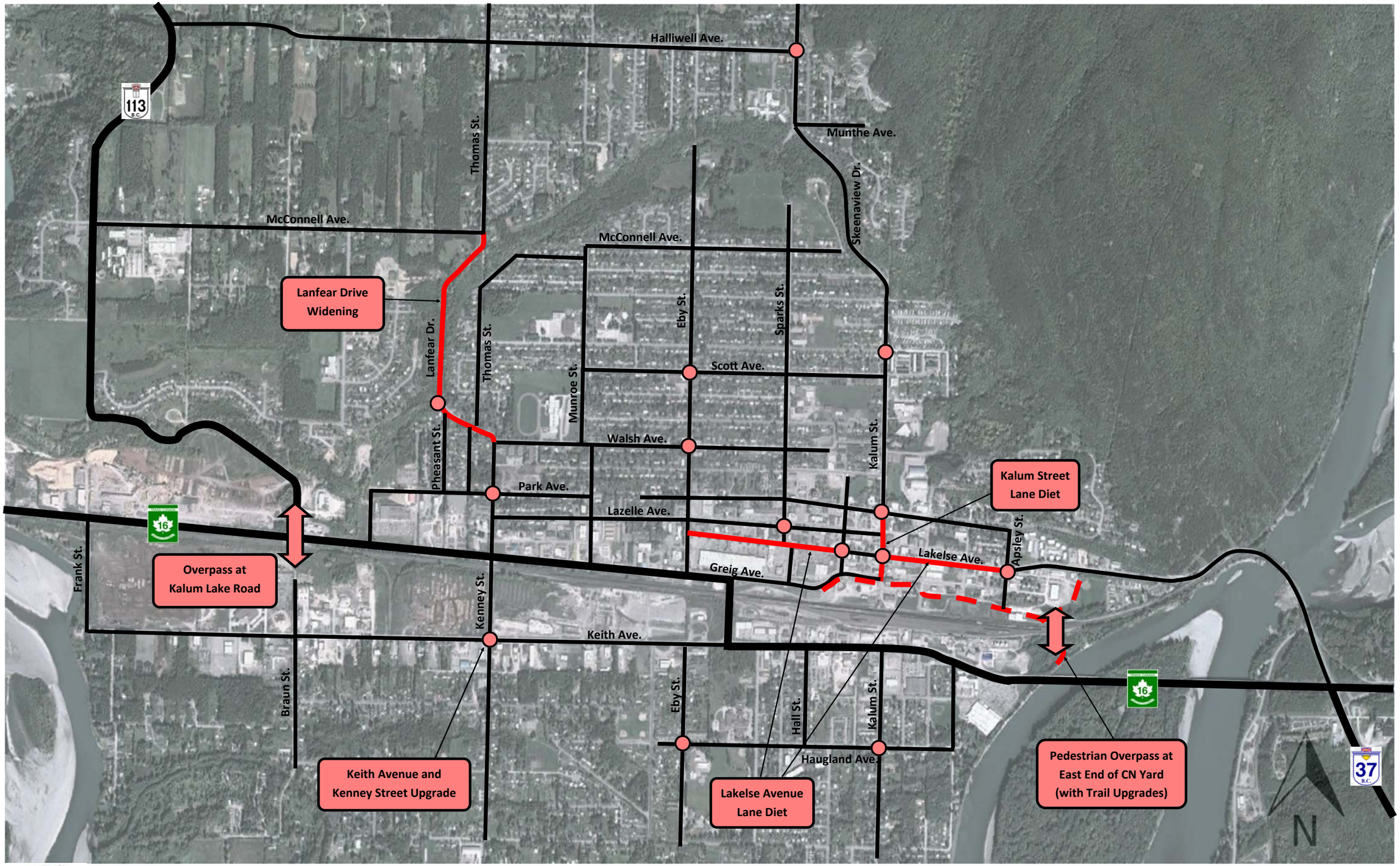


Figure 105: Short Term Improvements

10.1.2 Medium Term (5-10 Year Horizon)

The following improvements should be implemented within the five to ten year horizon:

1. Widen Skeenaview Drive to 10.0 metres.
2. Widen and upgrade Keith Avenue between Highway 16 (Sande Street) and Kenney Street.
3. Extend Park Avenue between Eby Street and Munroe Street.
4. Realign Sparks Street at Lakelse Avenue
5. Install traffic signal or roundabout at the Lakelse Avenue / Eby Street intersection. If a roundabout, movement restrictions at the Lazelle Avenue / Eby Street intersection to the north will likely be required.
6. Construct a roundabout at the intersection of Thomas Street and McConnell Avenue / Cooper Drive.
7. Close the Pheasant Street intersection at Lanfear Drive, at least to southbound (entering) traffic. Northbound exiting movements can still be permitted if desired. As an alternative, the intersection could be narrowed to slow the speed of turning traffic; however, this is not expected to address the issue with short-cutting traffic, or the traffic speeds south of the intersection.
8. Install a sidewalk extension on the northeast corner of the Lazelle Avenue / Kalum Street intersection.
9. Monitor the performance of the Skeenaview Drive and Munthe Avenue intersection to determine if and when the westbound movements should be restricted.
10. Install a southbound left turn lane on Kenney Street at the Lazelle Avenue or Park Avenue intersection, depending on which has the main traffic flow to the Downtown.
11. Realign Park Avenue at the Sparks Street intersection.
12. Work with MoTI to install northbound and southbound left turn lanes at Highway 16 / Kenney Street to meet future traffic demand.

The locations of all proposed Medium Term improvements are shown in Figure 106.

Regarding the general or systemic issues, the City should:

1. Incorporate accessibility standards into the next revisions of the City bylaws.
2. Revisit the street lighting strategy as required.

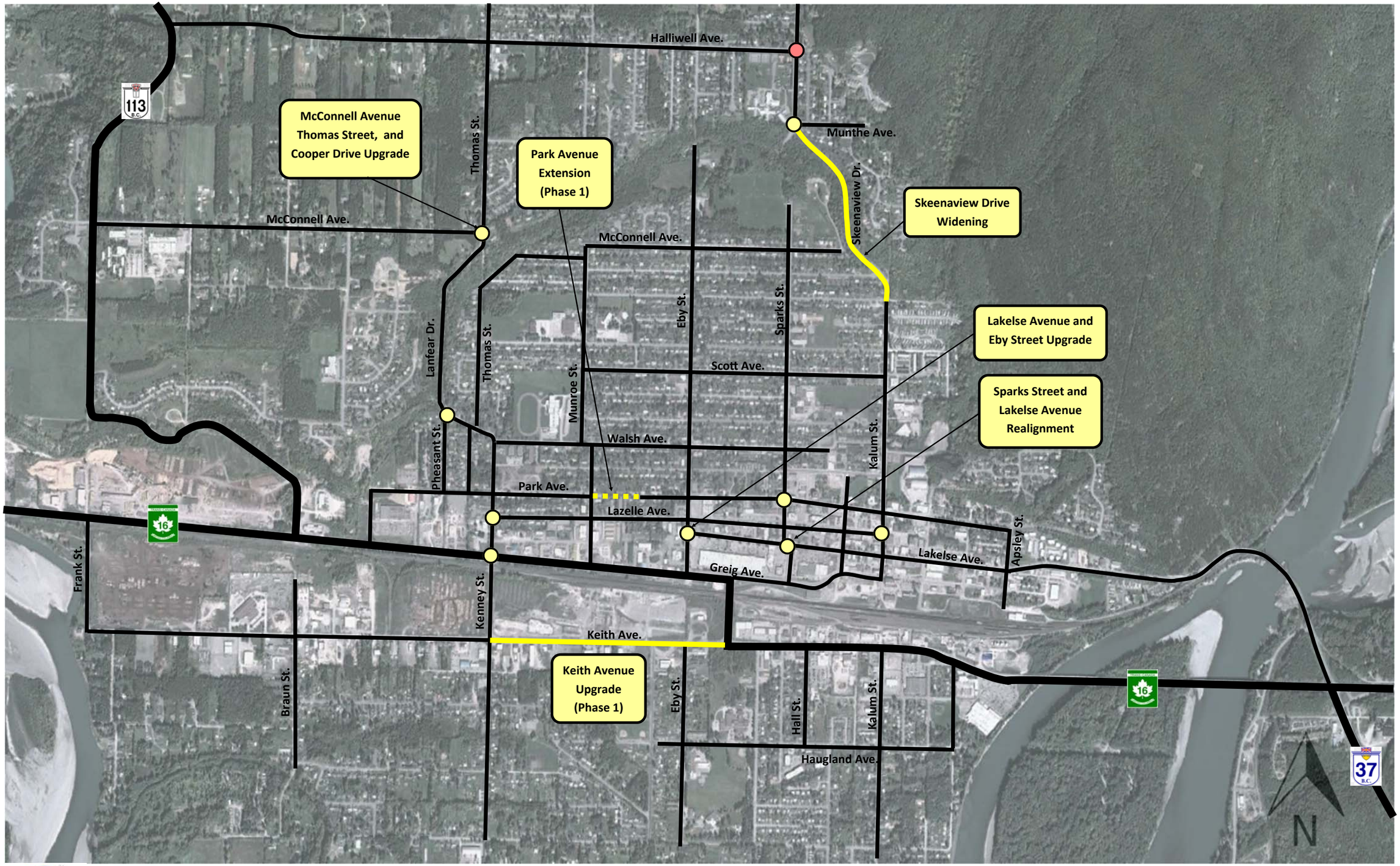


Figure 106: Medium Term Improvements

10.1.3 Long Term (10+ Year Horizon)

The following improvements can be delayed until past the 10 year horizon:

1. Upgrade Keith Avenue between Kenney Street and Braun Street.
2. Extend Park Avenue from Kalum Lake Road to Lanfear Drive
3. Improve the trail connections to Thornhill, especially via the Old Skeena Bridge.
4. Study the potential for removing the traffic signal at Lazelle Avenue at Emerson Street.

The locations of all proposed Long Term improvements are shown in Figure 107.

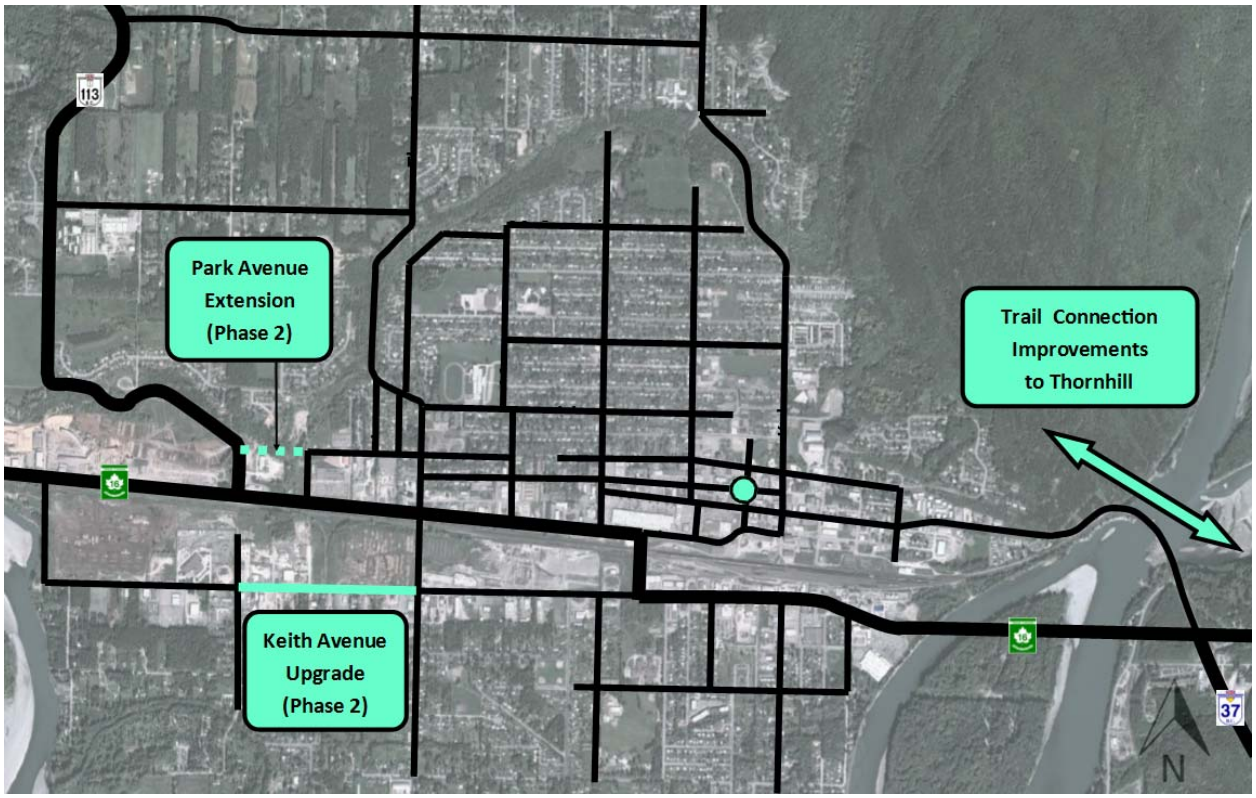


Figure 107: Long Term Improvements

10.2 TRAFFIC CALMING INITIATIVES

Traffic speeds are frequent concerns in communities. The severity of a pedestrian collision has been shown to increase dramatically with increases in vehicle speed (Figure 108).

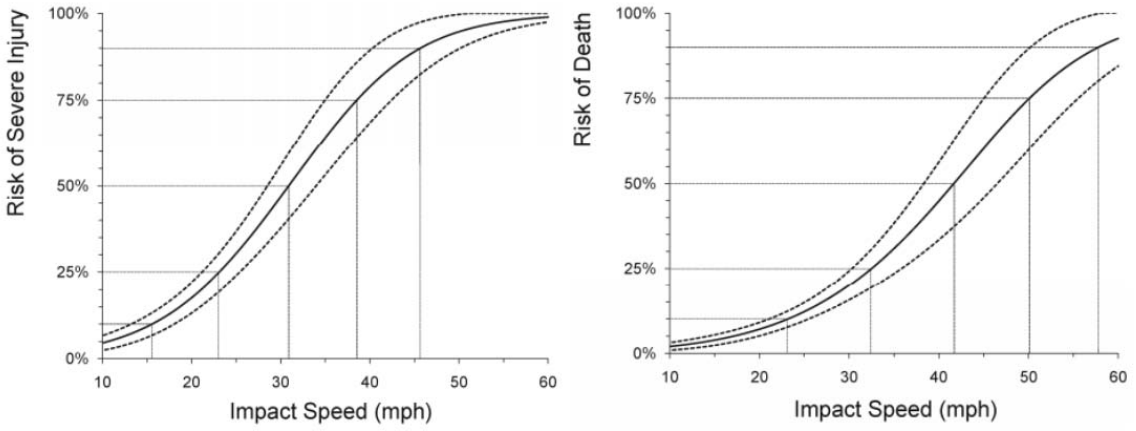


Figure 108: Pedestrian Collision Severity Versus Impact Speed
(source: AAA)

A number of traffic calming measures have been developed by the Transportation Association of Canada. However, these must be tailored to suit a northern climate, especially with the annual snowfall experienced by Terrace. The measures include:

1. Vertical deflections: the standard speed humps and raised crosswalks are effective at slowing vehicles in their vicinity. However, by virtue of being an obstacle in the roadway, these should be limited to local roads. Furthermore, as speed humps can be a hazard to snow ploughs, removable rubber speed humps should be used, such that they can be removed in the winter months. All speed humps require signage to alert drivers to their presence.

2. Horizontal deflections: among the more effective and aesthetic traffic calming measures are horizontal deflections, such as curb extensions ("sidewalk bulbs"), chicanes, and simple narrower roads. The reduction in the road width can be used to create more space for vulnerable road users and street-scaping, and may also reduce the amount of snow clearing required. Sidewalk bulbs have been used effectively throughout Downtown Terrace (Figure 109), and should be implemented wherever possible. To facilitate snow clearing around the bulbs, the bulbs should be developed with no more than a 30 degree angle from the original curb lines.

3. On-street parking: simply the provision of on-street parking can help reduce traffic speeds. However, the parking should be permitted in consideration of the need for unobstructed bicycle lanes, especially on the collector and arterial roads.

Figure 109: Sidewalk Bulb on Lakelse Avenue at Emerson Street

4. Intersection Treatments: local intersections with low traffic volumes could be candidates for traffic circles, which can be implemented by the placement of planters or other obstacles in the centre of the intersections. These can be problematic for truck turns, if present. A more common application is the modern roundabout, which can be applied to any class of street. These also slow traffic, but can accommodate large volumes of traffic and heavy truck movements, while signficantly reducing the frequency and severity of collisions.

5. Speed Watch Campaigns: as an alternative to engineering and enforcement measures, the City or neighbourhood representatives can coordinate a formal Speed Watch campaign. These involve the installation of speed reader boards to monitor and display the speeds of passing traffic. The boards can be temporary installations with attendants, or can be permanently affixed to a pole at a problematic location.

6. Road closures: as a last resort, speeding issues (especially those associated with short-cutting through local neighbourhoods) can be addressed by restricting some or all movements at the entrance to the road. This may be a candidate solution at the intersection of Lanfear Drive and Pheasant Street. To facilitate emergency response, a gate can be installed.

10.3 TRANSPORTATION DEMAND MANAGEMENT INITIATIVES

Transportation Demand Management (TDM) is the application of specific measures by a City to positively reduce or redistribute traffic demand. The target of these measures are often commuters in the peak hours.

The effective implementation of TDM measures can create numerous benefits for a city, including reducing traffic congestion, reducing greenhouse gas emissions, offsetting the need for major road and parking capacity improvements, and facilitating a healthier lifestyle for residents.

TDM initiatives are divided into two types:

- **Incentives** reward commuters for choosing the preferred travel behaviours. Typical incentives include subsidized bus fares, carpool programs, high occupancy vehicle lanes, and the provision of infrastructure and land use patterns that encourage healthy travel choices.

- **Disincentives** discourage commuters from choosing the non-preferred travel behaviours. Typical disincentives include parking fees, gasoline surcharges, congestion charges, bridge tolls, etc.

Many TDM measures are only effective in larger metropolitan centres. However, the City can implement a number of measures that manage transportation demand in the context of a relatively smaller northern city, such as:

1. Providing a strong pedestrian and cycle network.

2. Improving the transit service to attract ridership.

3. Continuing to densify and infill the existing city area, and discourage sprawl development.

4. Allowing developers to reduce their off-street parking requirements in exchange for accommodating trail and/or transit trips.

10.4 FURTHER STUDY

Some issues require further study to complete more detailed technical analysis, investigation, consultation, and evaluation, which would be outside the scope of the Transportation Master Plan. The additional studies recommended for consideration by the City are as follows:

1. Downtown Parking Study: the available parking in Downtown Terrace was listed frequently as a concern by the public and stakeholders. Furthermore, the Safety Analysis identified on-street parking conflicts as contributing to a trend in collisions. A study of the parking Downtown would allow the City to address current issues, and plan for the future parking demand as the population grows.

2. Transit Study: to improve the transit ridership, the current system should be studied in detail. The existing ridership should be considered in the context of existing and future origins and destinations. The study should also develop a plan for the on-street infrastructure, including a formal Downtown Transit Exchange.

3. Upper Bench Connector Study: a route study should be considered to determine if there are any remaining opportunities to construct new collector road(s) to the Upper Bench. The large amount of development expected in the north half of the city will create significant congestion on the existing routes.

4. Signal Warrants at Lazelle Avenue and Emerson Street: planning-level analysis suggests a signal may not be required at this location. A detailed study could be completed to determine if the signal is warranted by existing or future traffic demand, and what alternate traffic control may be more effective.

10.5 FUNDING INITIATIVES

There are significant costs associated with the identified transportation improvements. To ensure the priority projects receive the necessary funding for implementation, the following funding initiatives can be pursued.

1. Senior government grants frequently become available for projects that satisfy specific provincial and/or federal priorities at the time (e.g. economic stimulation, greenhouse gas reduction, etc). These grant programs often require shelf-ready designs. Therefore, as time permits, the City should pro-actively prepare designs for priority projects in anticipation of these grant programs.

2. Where a defined improvement to the roadway or traffic control can foreseeably reduce vehicle collisions, grants may be available through the Road Improvement Program (RIP) of the Insurance Corporation of British Columbia (ICBC). The Top 20 intersections identified in the Safety Analysis would generally be candidates for ICBC funding.

3. Pursuant to recent amendments to Section 906 of the Local Government Act, developers can contribute to the development of the City's Active Transportation System (either specific improvements, or a general fund) in lieu of constructing or paying a levy toward off-street parking facilities.

4. Proposed new sidewalk or lighting improvements which are not included in the City's Capital Plan can be funded by Local Area Service (LAS) agreements. Under these agreements, the City would pay for the improvement, and recover the cost from the adjacent property owner(s) though taxes over the following years. To generate more interest in this program, the City could contribute to LAS improvements in proportion to how much they benefit the transportation system.

5. The City can implement a Development Cost Charge Bylaw whereby developers would contribute to a fund to pay for major network improvements. The Bylaw would identify and provide estimated costs of the infrastructure. Then the developers would contribute to the fund in proportion to the magnitude of their developments.

6. Local corporations and businesses could sponsor some types of transportation infrastructure in exchange for naming rights and advertizing space, as currently occurs for the transit shelter and bench infrastructure.

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12 CLOSURE

This Transportation Master Plan has been prepared by McElhanney Consulting Services Ltd. (MCSL) for the benefit of the City of Terrace. The information and data contained herein represent MCSL's best professional judgment in light of the knowledge and information available to MCSL at the time of preparation.

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