

TRAFFIC AND SAFETY CONCERNS

Lawrence Grassi Ridge - Road Curve Analysis

* Disclaimer *

This presentation should not be interpreted or used as a rigorous and detailed engineering report. While effort was made to accurately collect and interpret data, conclusions are intended to clearly identify a physical road safety issue, but this illustration is not intended to precisely quantify that issue nor prescribe quantitative values for ensuring safety at this location.

A significant vertical curve (crested hill) and horizontal curve in the Lawrence Grassi Ridge roadway west of Kamenka Green present a quantifiable hazard to vehicular traffic safety. The area in question is immediately adjacent to the eastern UR parcel, and is largely demarcated by the existing "No Parking" area on the north side of the roadway.

Town of Canmore Engineering Services has identified that the horizontal curve has a radius of about 95m and that the Transportation Association of Canada standards guideline for neighborhoods recommends a minimum curve radius of 115m. The curve hazard is greatly exacerbated by the existence of a vertical curve in close proximity to the horizontal curve.

Research of road design literature clearly indicates that vertical curves and horizontal curves should not be coincident. The following excerpt is an example of accepted design practice:

A horizontal curve should not begin or end at or near the top of a crest vertical curve. This condition can be unsafe, especially at night, if the driver does not recognize the beginning or ending of the horizontal curve. Safety is improved if the horizontal curve leads the vertical curve, that is, the horizontal curve is made longer than the vertical curve in both directions.

http://www.massdot.state.ma.us/Portals/8/docs/designGuide/CH_4.pdf accessed Dec 3, 2014, p 4-46

Notwithstanding the Town's identification of the horizontal curve radius, due to the lack of precise data on the specific horizontal measurements, this analysis only addresses the vertical curve. Vertical curve data is based on actual measurements of one meter contour data between addresses 952 and 1000 Lawrence Grassi Ridge, taken 18 Nov 14, resulting in the Vertical Curve Profile as seen at Figure 1. The impact of the result of the vertical curve analysis on road safety is illustrated on the aerial view at Figure 5.

When constructing the vertical road curve analysis, the following standard accepted road design assessment and planning parameters were applied:

- Design Eye Height of the observer is 3.5 feet (1.067 m), which is representative of the seated eye height above ground of the driver of a standard sedan automobile
- Detected (downrange) obstacle height of 2 feet (0.610 m), which is representative of the height above ground of the tail lights or front side park lights of a standard sedan automobile
- The sum of perception time and reaction time is 2.5 seconds, per Transport Canada Design Considerations
- Stopping Sight Distance, defined as the sum of the distance travelled during perception and reaction time and braking distance, is 63 meters. The Town of Canmore Engineering Design Guidelines 2010, as well as many other jurisdictions, use 65 meters, presumably to provide for a factor of safety. This distance is adjusted for positive and negative road inclination using Transport Canada formulae.
- Road surface coefficient of friction is .35, representative of wet pavement

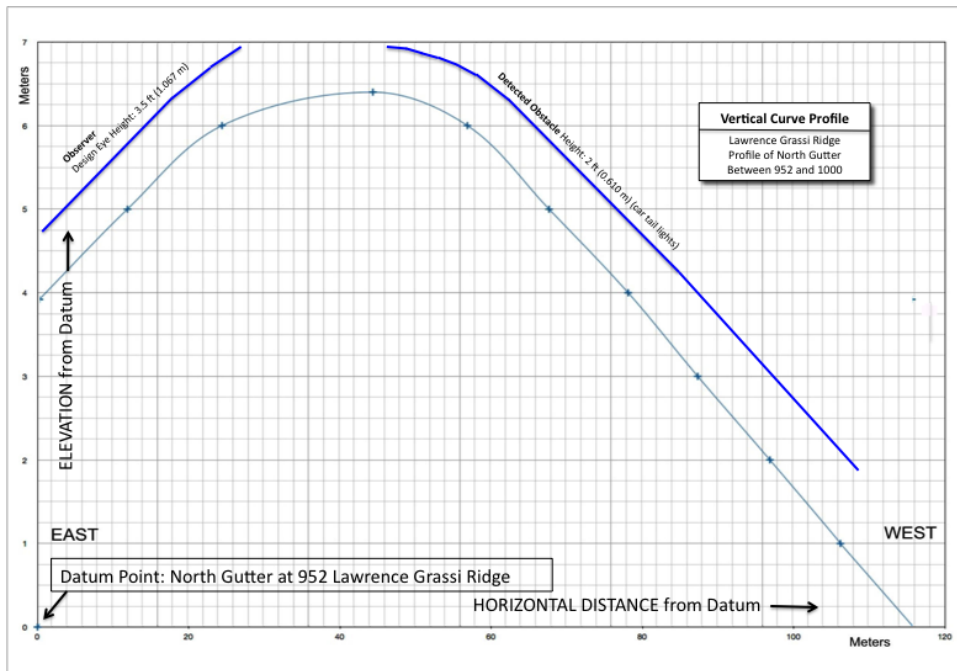


Figure 1: Vertical Curve Profile – Lawrence Grassi Ridge

The analysis indicates various positions of an observer vehicle travelling from east to west, or left to right on Figures 2 thru 4. The first measurement is taken at Point “a” on Figure 2, where the line of sight between the observer and the two-foot obstacle at the crest of the curve is tangential to the curve approach. The distance at which the obstacle can be seen at this point, referred to as the Line of Sight Detection Distance, is 48 meters while the Stopping Sight Distance is 59 meters (adjusted for uphill gradient). That is to say, it would take 11 meters further to stop the vehicle than the available distance to the obstacle.

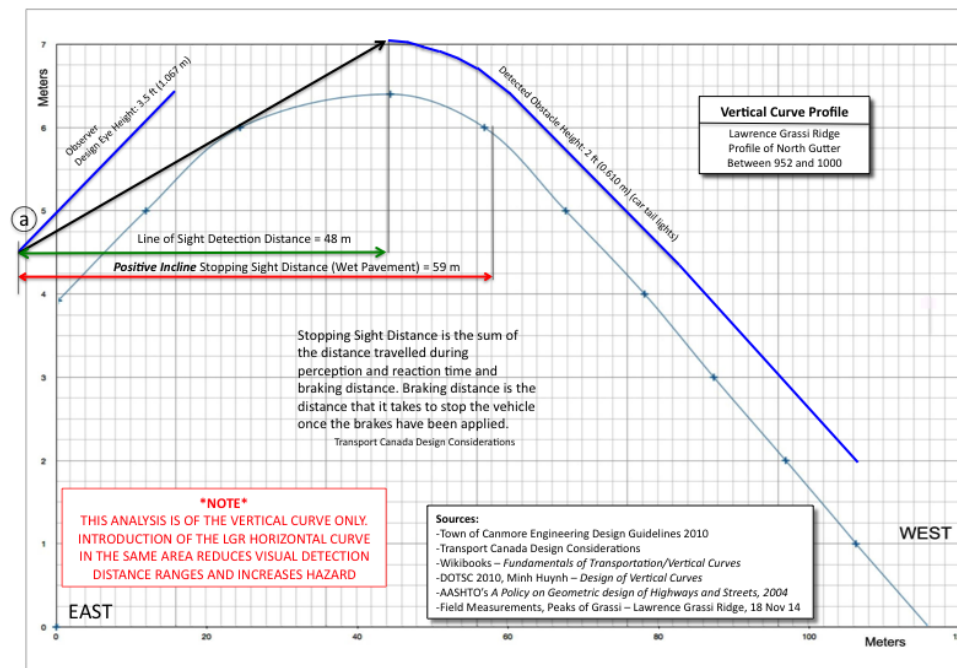


Figure 2 – First Vertical Curve Impact Assessment Point

The next measurement is taken at Point “b” on Figure 3, where the line of sight to the obstacle is tangential to the crest of the curve. At this point, the Line of Sight detection distance is 44 meters and the Stopping Sight Distance is 63 meters. This point is illustrated as an example on the aerial view shown at Figure 5.

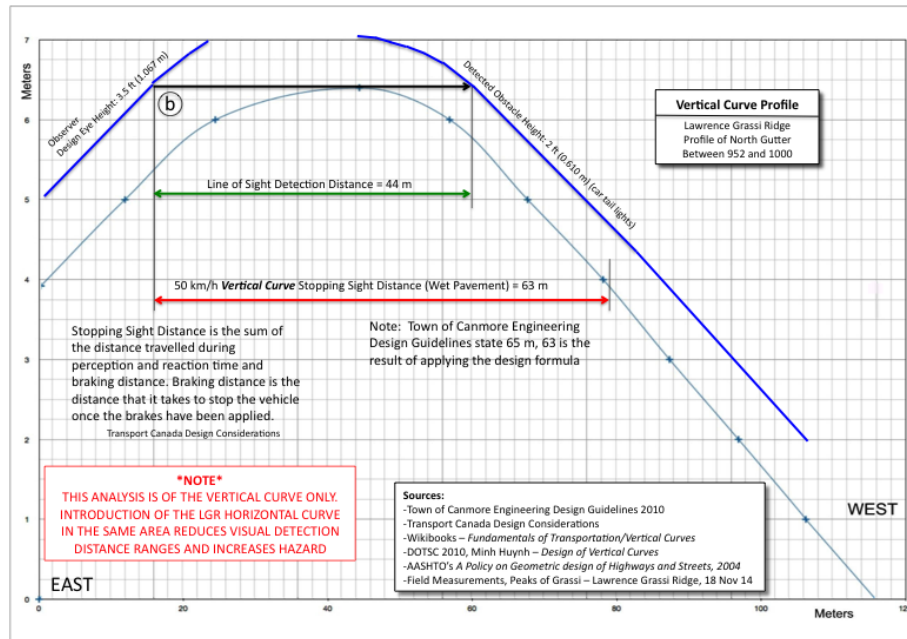


Figure 3 – Second Vertical Curve Impact Assessment Point

The final point measured at Point “c” on Figure 4 – the last point where the curve obstructs the line of sight. At this point, the Line of Sight detection distance is 54 meters and the Stopping Sight Distance is 67 meters (adjusted for downhill gradient).

At all three points of measurement, the Stopping Sight Distance exceeds the Line of Sight Detection distance by a considerable margin.

An illustration of how these findings relate to the physical layout of Lawrence Grassi Ridge is presented at Figure 5.

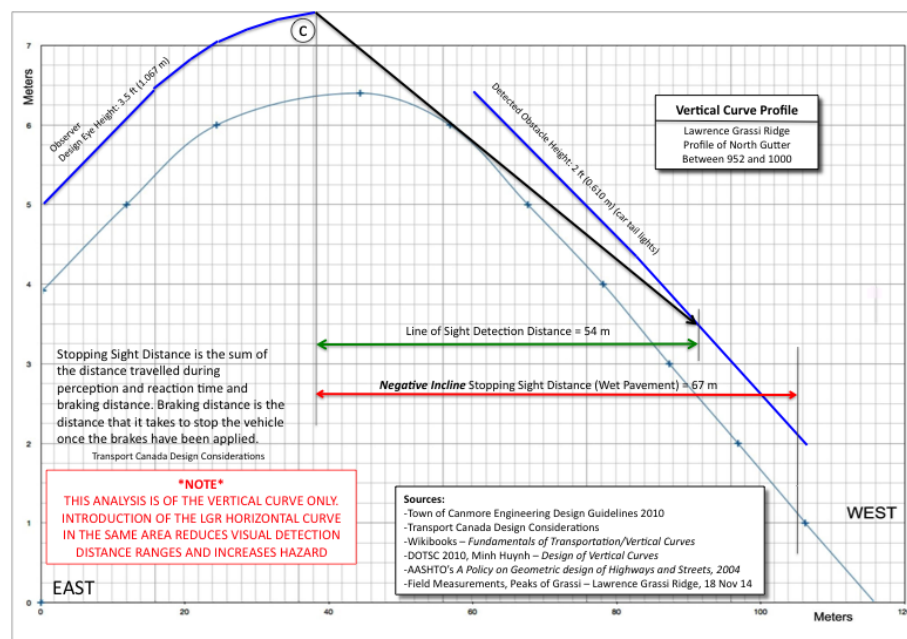


Figure 4 - Third Vertical Curve Impact Assessment Point

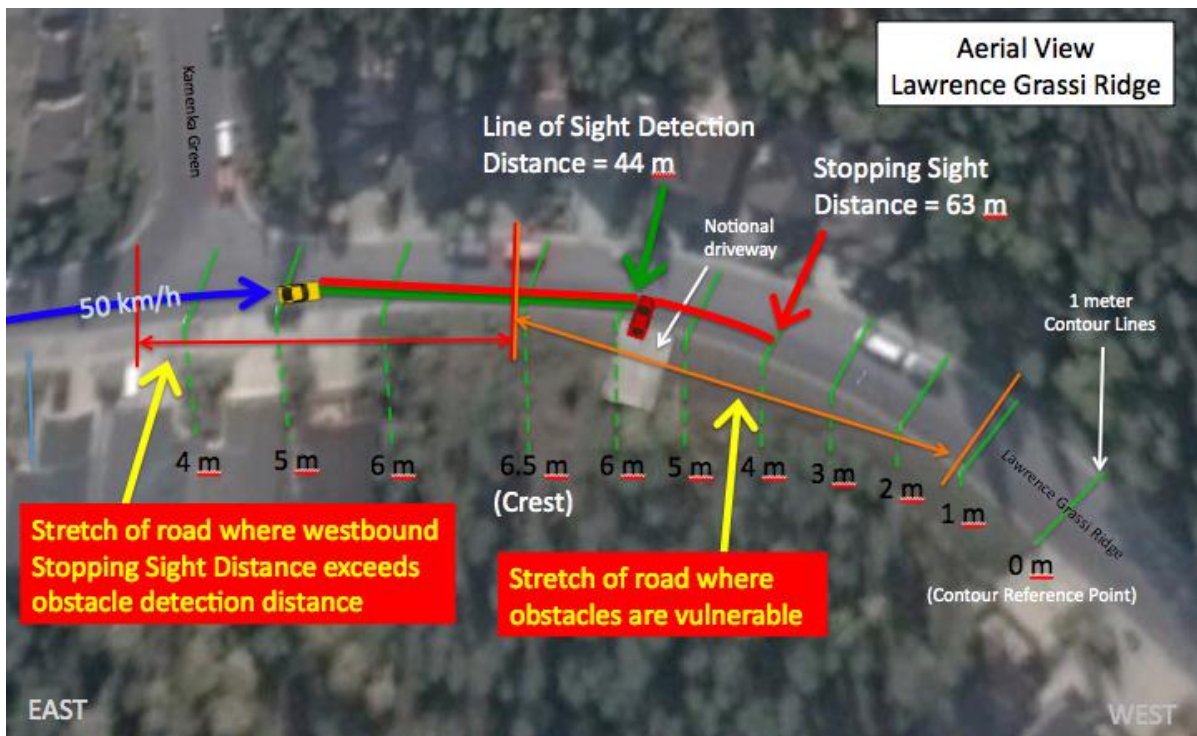


Figure 5: Lawrence Grassi Ridge Road Curve Analysis Impact

Figure 5 shows a vehicle traveling west at 50 km/h and detecting a car pulling out of a “notional” driveway in the UR area. This example corresponds to the measurements at Point “b” on the Vertical Curve Profile at Figure 3.

This analysis clearly indicates that a serious road hazard safety issue exists at this location, without factoring in the exacerbating reality of the coincident horizontal curve. It is also worth mentioning that due to the relative symmetrical dimensions of the vertical curve that an almost identical hazard exists in both directions.

There has been much anecdotal, as well as video evidence, of what could be stated at the very least as a need for extraordinary care and attention in this area, characterizing the conditions without exaggeration as hazardous.

This analysis has established that there is a problem with this road design. Increasing the amount of traffic on Lawrence Grassi Ridge will only exacerbate a serious situation. It would not be prudent to increase the risk to all residents, indeed all vehicular traffic including school buses, by adding driveway entry points on the north side of the roadway in this area. Furthermore, if parking were to be allowed on the north side of the street, it would seriously affect horizontal line of sight.

Even without enhancing this analysis with the inclusion of the horizontal curve data, it is clear that residential development of the north side of Lawrence Grassi Ridge in this area, and indeed increasing the number of traffic movements on Lawrence Grassi Ridge west of Kamenka Green is an unacceptable course of action.

No Parking Zone

The eastern-most of the subject parcels includes a major rock outcrop that has a “No Parking” zone on the north side of Lawrence Grassi Ridge. The Town of Canmore Manager of Engineering has advised that this “No Parking” zone was established to allow for snow storage during winter snow clearing even though he acknowledged that it is maintained with a year-round parking ban.

A long-time resident has advised that after moving into Peaks of Grassi in May 2001, she had a near head-on collision at this location because of the narrowing of the roadway by parked vehicles on both sides. She complained to the Town and the “No Parking” zone was established soon thereafter.

A curve comparison made by the Town of Canmore Engineering Services, referring to another curve of similar radius in the Peaks of Grassi, stated that the “curve in Peaks more than satisfies this recommendation (planning guidelines) as long as there is no parking permitted along the inside curve”. This supports the establishment of the No Parking Zone adjacent to the Eastern UR for traffic reasons (vice snow storage) and indicates that this zone will need to be preserved in order to satisfy the horizontal curve exigencies. Therefore, the developers’ intent is to build four houses with secondary suites in this UR with no possibility of on-street parking.

Maintaining the “No Parking” zone at this location will mean that visitors to these additional permanent residents at this hazardous location will be pushed down Lawrence Grassi Ridge where they will compete with other visitors to current residences for the limited available on-street parking to be found further west on Lawrence Grassi Ridge.

Conclusion

We have shown that the current road design, with no additional traffic or houses, presents serious safety concerns. Everyone who lives in this neighborhood and habitually copes with the extreme caution that is required on the vertical curve can attest to the problem.

Knowing what we know, it makes no sense to exacerbate the issues with hidden driveways and parking congestion.

The risk of a future incident or accident on Lawrence Grassi Ridge is high under present conditions. Adding additional houses, driveways, vehicles, cyclists, and pedestrians will not leave conflict to chance.