Safety Assessment – Grade Crossing

Executive Summary

Since the implementation of train whistle cessation at the Highway 824 CN Rail crossing, in Ardrossan, many residents have contacted the County and raised concerns of train whistle noise at crossings near their homes. Administration has reviewed three additional rail crossing locations for the possibility of implementing whistle cessation according to the order of priority presented in the March 2016 Priority Committee Meeting.

Range Road 231 at CN MILE 255.97
Range Road 223 at CN MILE 251.43
Range Road 220 at CN MILE 247.75

The train whistle cessation process follows the federally-controlled Railway Safety Act, where a municipality, as the road authority, is able to request the cessation of train whistles at an at-grade rail crossing. Whistle cessation is achieved through municipal Councils passing a resolution once any and all required safety measures are made. Transport Canada defines the standards for the required safety measures and specifies procedures consistent with the Railway Safety Act and grade crossing regulations. Strathcona County developed Policy SER-013-004 Train Whistle Cessation; the policy outlines the required steps to achieve whistle cessation within Strathcona County. The policy defines a benefitting area with a minimum of 50 households as being able to request and pursue train whistle cessation. Under the existing policy, all three proposed crossings qualify for whistle cessation.

Each crossing is unique and evaluated independently to ensure the required safety measures are in place and in compliance with Transport Canada's whistle cessation standards. Evaluations require engineering review and assessment to define the scope of work that may or may not be required to implement whistle cessation. At a minimum, each crossing must have bells, lights, and gates with appropriate signing, line marking and sufficient sightlines to be considered for train whistle cessation according to Transport Canada's Grade Crossing Standards. Currently, the crossings are equipped with flashing lights, bells and gates. Safety assessments for each crossing have been completed and reviewed by CN Rail. The outcome of the safety assessments includes safety upgrades that are required to be fulfilled prior to the approved implementation of whistle cessation.

The estimated cost of implementing the required safety measures are:

Range Road 231 at CN MILE 255.97	= $ 20,000
Range Road 223 at CN MILE 251.43	= $ 5,500
Range Road 220 at CN MILE 247.75	= $ 21,000
Total estimated cost	**= $ 46,500**

The required safety measures include, adjusting the gate arm clearance times, which need to be completed by CN Rail. Residents have expressed noise concerns living nearby each of the three railway crossings. Should whistle cessation be desired, Strathcona County would contact and inform residents prior to the whistle cessation resolution at Council.

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1.0 Introduction

Train whistling is a proven and effective deterrent to vehicle/train collisions at grade crossings. However, the noise pollution can lead to problems for residents along the rail corridor by reducing the quality of life.

The purpose of this report is for the evaluation of the feasibility of completing cessation of train whistles on railway crossings at the following locations:

- Range Road 231 at Mile 255.97 on CN Rail's Wainwright subdivision
- Range Road 223 at Mile 251.43 on CN Rail's Wainwright Subdivision
- Range Road 220 at Mile 247.75 on CN Rail's Wainwright Subdivision

Deficiencies in meeting safety requirements according to the Rail Safety Act, Grade Crossing Regulations, and industry accepted standards at the crossing have been identified in the detailed reports, Appendix A. The information that has been collected will allow the Railway Company; Transport Canada, and the road authority to make engineering decisions in which the safety of all grade crossing users is considered.

2.0 Safety Assessment

Detailed safety assessments for each railway crossing were conducted by Strathcona County's Traffic Safety Engineer. The fundamental objectives for the assessments were to reduce crash risk and minimize the frequency and severity of preventable crashes. The assessment includes the review of standards and guidelines considering the site characteristics, existing traffic control system, and the railway and roadway operational characteristics. Field data was collected in accordance with the Transport Canada Field Guide to conduct the Detailed Safety Assessments.

3.0 Procedure for Eliminating Train Whistles

Strathcona County is following the procedure according to Transport Canada guidelines and is consistent with the requirements of section 23.1 of the Railway Safety Act, section 104 of Grade Crossing Regulations and Appendix D of the Grade Crossing Standards. Transport Canada's Procedures for Eliminating Whistling at Public Grade Crossing is;

- *Interest from the residents and municipality receives request from a resident or Council to stop train whistling at one or multiple crossings*
- *Municipality contact with rail company to assess the feasibility of the whistling cessation request*
- *Municipality issues notifications to all relevant associations or organizations*
- *Municipality and the railway company assess the crossings against the prescribed requirements in the Grade Crossing Standards and Grade Crossing Regulations*
- *Municipality and Railway agree that the crossing meet the requirements as per Grade Crossing Standards, and Grade Crossing Regulations*

- *Municipality and Railway request a final decision from Transport Canada*
- *Council passes a resolution declaring that it agrees that whistle should not be used in that area, thereby prohibiting train whistling*
- *Railway Company notifies Transport Canada and informs the Municipality within 30 days that it has arranged to have whistling ceased at the crossing*
- *Municipality and railway share the responsibility for monitoring and maintaining the conditions that support the cessation of train whistling at the crossing*

4.0 Requirements for Whistle Cessation

The requirements for whistle cessation at grade crossing are specified in section 104 of the Grade Crossing Regulations and Appendix D of the Grade Crossing Standards.

Table 1- Requirements for Warning Systems at Public Grade Crossings within an Area without Whistling

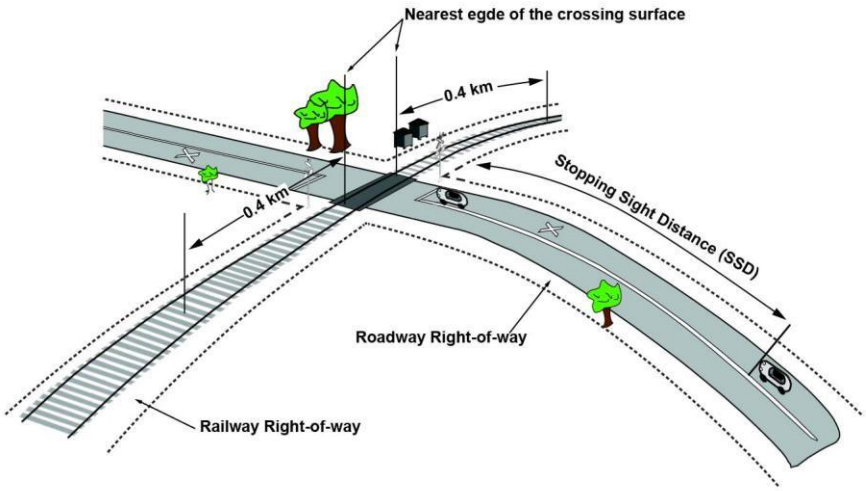
Railway Design Speed	Motor Vehicle Crossing (No. of Tracks)	
	1	2 or more
1-25 km/h	FLB	FLB
25-81 km/h (16-50 mph)	FLB	FLB & G
Over 81 km/h (50 mph)	FLB & G	FLB & G

Where:

FLB is warning system consisting of flashing lights and a bell (FLB)

FLB & G is a warning system consisting of flashing lights, a bell and gates (FBL&G)

Figure 1 – prescribed area for whistling cessation as per article 23.1 of the RSA



5.0 Findings

Table 2 below presents the safety deficiencies along with the required safety upgrades identified through the detailed safety assessment to facilitate the safe implementation of whistle cessation and provide cost estimates for each crossing.

Location	Safety Deficiencies	Recommendations	Cost
CN MILE 255.97/RR 231	Existing gate arm clearance time = 7 s	Increase gate arm clearance time to 12 s	$20,000
	No warning signs	Install 'NO TRAIN WHISTLE' warning signs	
CN MILE 251.43/RR 223	Existing gate arm clearance time = 10.8 s	Increase gate arm clearance time to 12 s	$5,500
	No warning signs	Install 'NO TRAIN WHISTLE' warning signs	
	Sightlines obstructed due to overgrown vegetation along the tracks	Remove vegetation	-
CN MILE 247.45/RR 220	Existing gate arm clearance time = 10.5 s	Increase gate arm clearance time to 14 s	$21,000
	No warning signs	Install 'NO TRAIN WHISTLE' warning signs	

Total Cost = $46,500.00

Table 2: Safety Deficiencies and Recommendations

APPENDIX 'A'

SAFETY ASSESSMENT FOR GRADE CROSSING

CN MILE 255.97 @ RANGE ROAD 231

1.1 CN Mile 255.97

The railway crossing is located on Range Road 231, north of Highway 16. For the purpose of this report, Range Road 231 crossing is described north-south orientation, while rail line is described in east-west orientation. The crossing has two tracks, and has an active warning system (Flashing lights, bells, and gates). There are about 6500 households living within a three km radius of the crossing.
Field investigation and safety audit was conducted to identify the mitigation measures necessary to facilitate the safe implementation of anti-whistling and provide associated cost estimates provided by CN Rail.

1.2 General Information

- Railway Authority – CN Rail
- Track Type – Main Line
- Number of Tracks – 2
- Railway Subdivision – Wainwright
- Road Authority – Strathcona County
- Road Name – Range Road 231
- Road Classification – Class 2
- Design Classification – UAU60
- Type of Grade Crossing – Active Crossing equipped with Standard Railway Crossing Sign (SRCS), Flashing lights, Bells, and Gates (FLBG)

1.3 Rail Operations

- Maximum Railway Operating Speed – 60 mph on the north track, and 25 mph on the south track
- No switching operation within 400m (1/4 mile) of crossing
- Daily train volume – 34 freight and one passenger train

1.4 Collision History

- Two Collisions occurred within 50m of crossing in last five years (2011-2015). None of the collisions involved train;
    - Run-off-road, Right – August 29, 2014 (Property Damage Only)
    - Rear End – May 27, 2015 (Minor Injury)

1.5 Road Advance Warning Signs

- Railway Crossing Ahead sign (WA-18) with bump sign (WA-22) are present and in good condition on both approaches.

1.6 Road Operations

- Average weekday traffic is 2,500 vehicles per day.
- School Bus Route – Yes
- Dangerous Goods Route – No
- Posted speed limit – 60 km/h

1.7 Trespassing

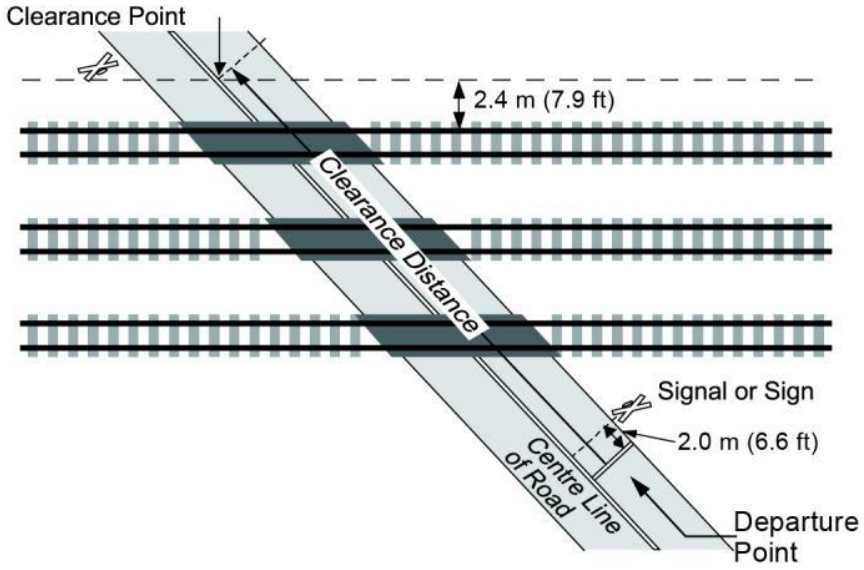
- There is no evidence of trespassing within 400m of the crossing

1.8 Grade Crossing Surface

- The surface material is rubber on north track and concrete on south track
- Road surface – Asphalt
- Flangeway width is 50 mm and depth is 25 mm
- Field side gap – zero

1.9 Design Calculations

- Design vehicle – WB-20 (Tractor-Semitrailer)
- Clearance Distance – Distance between the departure point in advance of crossing to the clearance point beyond the farthest rail
    - **Cd** = 16.2m



- Vehicle Travel Distance – Total distance; design vehicle must travel during acceleration to pass completely through the clearance distance;
    - **S=cd+L**; **cd**=clearance distance, **L**=length of design vehicle
    - **S**=38.9m
- Departure Time – Time required for design vehicle ($\mathbf{T_D}$) or pedestrian ($\mathbf{T_P}$) to pass completely through clearance distance (**cd**) from stopped position
- Maximum approach grade within 'S' = 0%
    - $\mathbf{T_D = J + T}$
        - J = Perception-reaction time; 2 seconds
        - T = the time, for design vehicle to travel though clearance distance (**S**)
    - **T= t x G**
        - **T =** the time, required for design vehicle to accelerate through the vehicle travel distance (S) from assumed acceleration curves from *Geometric Design Guide for Canadian Roads*
    - T_D = 2 + 12.7 =14.7 seconds
    - T_P = cd/V_P= 16.2 seconds; V_P=1.0 m/s

- Departure Time = 16.2 seconds; $T_P > T_D$

1.10 Gate Arm Clearance Time

- Gate Arm Clearance Time is the greater of time required for design vehicle to pass gate arm either from stopping sight distance (SSD) position ($T_{G\ ssd}$) or the stop position or ($T_{G\ stop}$);

$$\text{TG ssd} = \frac{CdG\ ssd}{0.27\ X\ Vroad}$$

  - SSD = 130 m Design vehicle stopping sight distance for 60 km/h road
  - $C_{dG\ ssd}$ = SSD + L + 2m = 130+22.7+2 = 154.7 m
  - V_{road} = Design speed in Km/h
  - $T_{G\ ssd}$ = 9.27 seconds

- $T_{G\ stop}$ = J + (t x G)
  - J = Perception-reaction time; 2 seconds
  - t = time required for design vehicle to accelerate through the Gate Arm Clearance Distance ($C_{dG\ stop}$)
  - $C_{dG\ stop}$ = L + 2m= 24.7m; where L = length of design vehicle
  - $T_{G\ stop}$ = 11.5 seconds
- Gate Arm Clearance Time = 11.5 seconds
- **Existing Gate Arm Clearance Time = 7 Seconds**
- **Gate Arm Clearance Time; recommended = 12 seconds**

1.11 Sightlines

- Sightlines are clear on all quadrants
- $D_{stopped}$ = 430m; the distance along railway track from the grade crossing at the maximum railway operating speed will travel during the departure time for design vehicle or pedestrian

1.12 Safety Deficiency

Based on design calculations and field investigation; the safety deficiency is;

- Existing Gate Arm Clearance Time is not sufficient for the design vehicle to pass by the gate arm before it descends to block the vehicle path.

1.13 Recommendations

The requirements for train whistle cessation at this crossing are met as per Grade Crossing Standards. Deficiencies in meeting the Grade Crossing Standards should be fulfilled to improve safety of the crossing.

- It is recommended to install 'NO TRAIN WHISTLE' tabs under existing Railway Crossing Ahead warning signs on either side of crossing.
- Gate Arm Clearance time should be extended to 12 seconds.

1.14 Cost Estimate

- 'NO TRAIN WHISTLE' sign tabs = $100.00
- Increase Gate Arm Clearance Time = $16,623 (provided by CN Rail; attached)
- Total Cost estimate with Design and contingency = $20,000.00

APPENDIX 'B'

SAFETY ASSESSMENT FOR GRADE CROSSING

CN MILE 251.43 @ RANGE ROAD 223

2.1 CN Mile 251.43

The railway crossing is located on Range Road 223, south of Highway 16. For the purpose of this report, Range Road 223 crossing is described north-south orientation, while rail line is described in east-west orientation. The crossing has one track, and has an active warning system (Flashing lights, bells, and gates). There are about 650 households living within a three km radius of the crossing.
Field investigation and safety audit was conducted to identify the mitigation measures necessary to facilitate the safe implementation of anti-whistling and provide associated cost estimates provided by CN Rail.

2.2 General Information

- Railway Authority – CN Rail
- Track Type – Main Line
- Number of Tracks – 1
- Railway Subdivision – Wainwright
- Road Authority – Strathcona County
- Road Name – Range Road 223
- Road Classification – Class 2
- Design Classification – RLU80
- Type of Grade Crossing – Active Crossing equipped with Standard Railway Crossing Sign (SRCS), Flashing lights, Bells, and Gates (FLBG)

2.3 Rail Operations

- Maximum Railway Operating Speed – 60 mph
- No switching operation within 400m (1/4 mile) of crossing
- Daily train volume – 34 freight and one passenger train

2.4 Collision History

- No collision history within 50 m of the crossing in last five years (2011-2015)

2.5 Road Advance Warning Signs

- Railway Crossing Ahead sign (WA-18) with bump sign (WA-22) are present and in good condition on both approaches.

2.6 Road Operations

- Average weekday traffic is 500 vehicles per day.
- School Bus Route – Yes
- Dangerous Goods Route – No
- Posted speed limit – 80 km/h

2.7 Trespassing

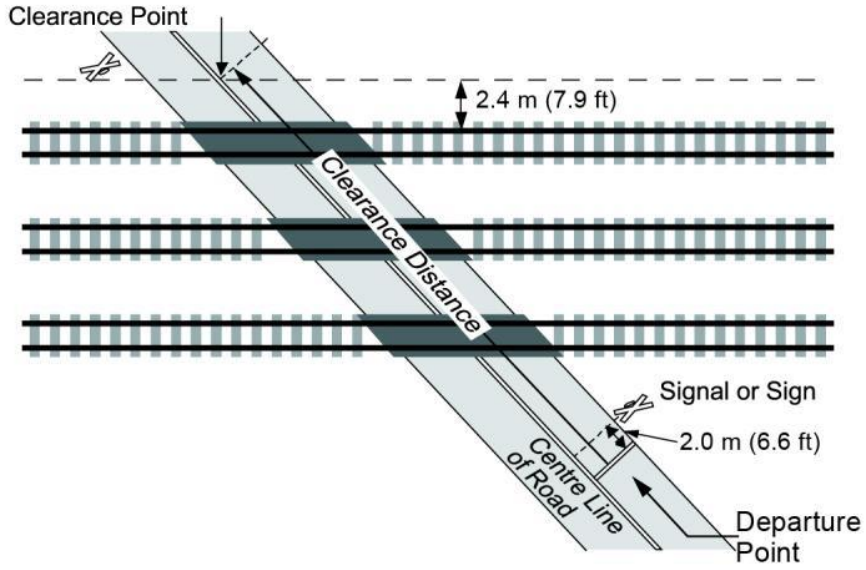
- There is no evidence of trespassing within 400m of the crossing

2.8 Grade Crossing Surface

- The surface material is wood
- Road surface – Asphalt
- Flangeway width is 70 mm and depth is 150 mm
- Field side gap width is 65 mm and depth is 150 mm

2.9 Design Calculations

- Design vehicle – WB-20 (Tractor-Semitrailer)
- Clearance Distance – Distance between the departure point in advance of crossing to the clearance point beyond the farthest rail
    - **Cd** = 9 m



- Vehicle Travel Distance – Total distance; design vehicle must travel during acceleration to pass completely through the clearance distance;
    - **S=cd+L**; **cd**=clearance distance, **L**=length of design vehicle
    - **S**=31.7 m
- Departure Time – Time required for design vehicle ($\mathbf{T_D}$) or pedestrian ($\mathbf{T_P}$) to pass completely through clearance distance (**cd**) from stopped position
- Maximum approach grade within 'S' = 0%
    - $\mathbf{T_D = J + T}$
        - J = Perception-reaction time; 2 seconds
        - T = the time, for design vehicle to travel though clearance distance (**S**)
    - **T= t x G**
        - **T =** the time, required for design vehicle to accelerate through the vehicle travel distance (S) from assumed acceleration curves from *Geometric Design Guide for Canadian Roads*
    - T_D = 2 + 11 =13 seconds
    - T_P = cd/V_P= 9 seconds; V_P=1.0 m/s

- Departure Time = 13 seconds; $T_D > T_P$

2.10 Gate Arm Clearance Time

- Gate Arm Clearance Time is the greater of time required for design vehicle to pass gate arm either from stopping sight distance (SSD) position ($T_{G\ ssd}$) or the stop position or ($T_{G\ stop}$);

- TG ssd $= \frac{CdG\ ssd}{0.27\ X\ Vroad}$

  - SSD = 210 m Design vehicle stopping sight distance for 80 km/h road
  - $C_{dG\ ssd}$ = SSD + L + 2m = 210+22.7+2 = 234.7 m
  - V_{road} = Design speed in Km/h
  - $T_{G\ ssd}$ = 10.55 seconds

- $T_{G\ stop}$ = J + (t x G)
  - J = Perception-reaction time; 2 seconds
  - t = time required for design vehicle to accelerate through the Gate Arm Clearance Distance ($C_{dG\ stop}$)
  - $C_{dG\ stop}$ = L + 2m= 24.7m; where L = length of design vehicle
  - $T_{G\ stop}$ = 11.5 seconds
- Gate Arm Clearance Time = 11.5 seconds
- **Existing Gate Arm Clearance Time = 10.8 Seconds**
- **Gate Arm Clearance Time; recommended = 12 seconds**

2.11 Sightlines

- Sightlines are not clear for the motorists in the stopped position on the southeast and southwest corners.
- $D_{stopped}$ = 350m; the distance along railway track from the grade crossing at the maximum railway operating speed will travel during the departure time for design vehicle or pedestrian

2.12 Deficiencies

Based on design calculations and field investigation; the deficiencies identified are;

- Existing Gate Arm Clearance Time is not sufficient for the design vehicle to pass by the gate arm before it descends to block the vehicle path.
- Sightlines are not clear on the southeast and southwest corners
- Wooden blocks at the crossing surface are worn out

2.13 Recommendations

The requirements for train whistle cessation at this crossing are met as per Grade Crossing Standards. Deficiencies in meeting the Grade Crossing Standards should be fulfilled to improve safety of the crossing.

- It is recommended to install 'NO TRAIN WHISTLE' tabs under existing Railway Crossing Ahead warning signs on either side of crossing.
- Gate Arm Clearance time should be extended to 12 seconds.
- Remove vegetation from the southeast and southwest corner to maintain $D_{stopped.}$
- Field Side Gap should be decreased to 50 mm.

2.14 Cost Estimate

- 'NO TRAIN WHISTLE' sign tabs = $100.00
- Increase Gate Arm Clearance Time = $4,366 (provided by CN Rail; attached)
- Vegetation removal = To be determined
- Total Cost estimate with design and contingency = $5,500

APPENDIX 'C'

SAFETY ASSESSMENT FOR GRADE CROSSING

CN MILE 247.45 @ RANGE ROAD 220

3.1 CN Mile 247.45

The railway crossing is located on Range Road 220, south of Twp Rd 530. For the purpose of this report, Range Road 220 crossing is described north-south orientation, while rail line is described in east-west orientation. The crossing has two tracks, and has an active warning system (Flashing lights, bells, and gates). There are about 385 households living within a three km radius of the crossing.
Field investigation and safety audit was conducted to identify the mitigation measures necessary to facilitate the safe implementation of anti-whistling and provide associated cost estimates provided by CN Rail.

3.2 General Information

- Railway Authority – CN Rail
- Track Type – Main Line
- Number of Tracks – 2
- Railway Subdivision – Wainwright
- Road Authority – Strathcona County
- Road Name – Range Road 220
- Road Classification – Class 2
- Design Classification – RLU80
- Type of Grade Crossing – Active Crossing equipped with Standard Railway Crossing Sign (SRCS), Flashing lights, Bells, and Gates (FLBG)

3.3 Rail Operations

- Maximum Railway Operating Speed – 60 mph
- No switching operation within 400m (1/4 mile) of crossing
- Daily train volume – 34 freight and one passenger train

3.4 Collision History

- One Collision occurred within 50m of crossing in last five years (2011-2015) and train was not involved in the incident;
    - Run-off-road, Left – Feb 6, 2015 (Property Damage Only)

3.5 Sightlines

- Sightlines are clear on all quadrants

3.6 Road Advance Warning Signs

- Railway Crossing Ahead sign (WA-18R) are present and in good condition on both approaches.

3.7 Road Operations

- Average weekday traffic is 660 vehicles per day.

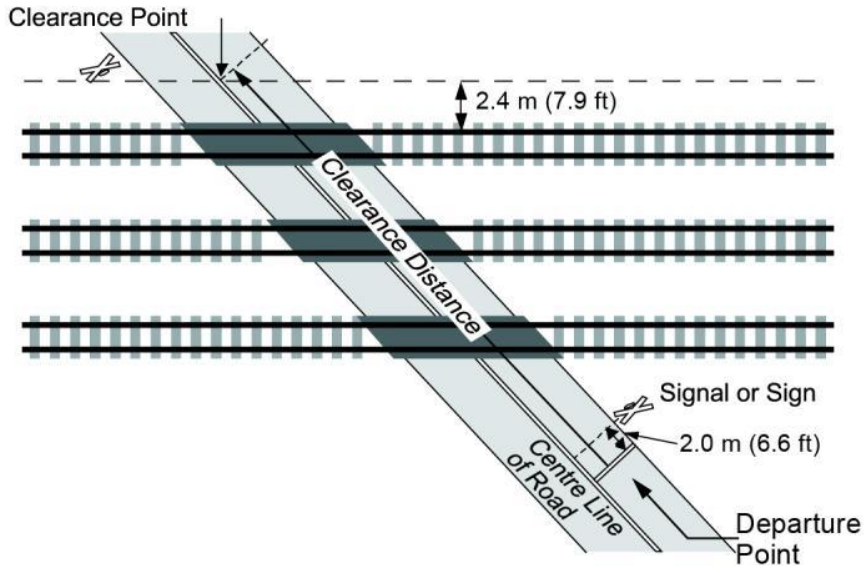
- School Bus Route – No
- Dangerous Goods Route – No
- Posted speed limit – 80 km/h

3.8 Trespassing

- There is no evidence of trespassing within 400m of the crossing

3.9 Design Calculations

- Design vehicle – WB-20 (Tractor-Semitrailer)
- Clearance Distance – Distance between the departure point in advance of crossing to the clearance point beyond the farthest rail
    - **Cd** = 17.1 m



- Vehicle Travel Distance – Total distance; design vehicle must travel during acceleration to pass completely through the clearance distance;
    - **S=cd+L**; **cd**=clearance distance, **L**=length of design vehicle
    - **S**=39.8 m
- Departure Time – Time required for design vehicle ($\mathbf{T_D}$) or pedestrian ($\mathbf{T_P}$) to pass completely through clearance distance (**cd**) from stopped position
- Maximum approach grade within 'S' = 2%
    - $\mathbf{T_D = J + T}$
        - J = Perception-reaction time; 2 seconds
        - T = the time, for design vehicle to travel though clearance distance (**S**)
    - **T= t x G**
        - **T =** the time, required for design vehicle to accelerate through the vehicle travel distance (S) from assumed acceleration curves from *Geometric Design Guide for Canadian Roads*
    - T_D = 12.7x1.2 + 2 =17.2 seconds

- T_P = cd/V_P= 17.1 seconds; V_P=1.0 m/s
- Departure Time = 17.2 seconds; $T_D > T_P$

3.10 Gate Arm Clearance Time

- Gate Arm Clearance Time is the greater of time required for design vehicle to pass gate arm either from stopping sight distance (SSD) position ($T_{G\ ssd}$) or the stop position or ($T_{G\ stop}$);

- TG ssd $= \frac{CdG\ ssd}{0.27\ X\ Vroad}$

  - SSD = 210 m Design vehicle stopping sight distance for 80 km/h road
  - $C_{dG\ ssd}$ = SSD + L + 2m = 210+22.7+2 = 234.7 m
  - V_{road} = Design speed in Km/h
  - $T_{G\ ssd}$ = 10.55 seconds

- $T_{G\ stop}$ = J + (t x G)
  - J = Perception-reaction time; 2 seconds
  - t = time required for design vehicle to accelerate through the Gate Arm Clearance Distance ($C_{dG\ stop}$)
  - $C_{dG\ stop}$ = L + 2m= 24.7m; where L = length of design vehicle
  - $T_{G\ stop}$ = 13.4 seconds
- Gate Arm Clearance Time = 13.4 seconds
- **Existing Gate Arm Clearance Time = 10.5 Seconds**
- **Gate Arm Clearance Time; recommended = 14 seconds**

3.11 Safety Deficiency

Based on design calculations and field investigation; the existing Gate Arm Clearance Time is not sufficient for the design vehicle to pass by the gate arm before it descends to block the vehicle path.

3.12 Recommendations

The requirements for train whistle cessation at this crossing are met as per Grade Crossing Standards. Deficiencies in meeting the Grade Crossing Standards should be fulfilled to improve safety of the crossing.

- It is recommended to install 'NO TRAIN WHISTLE' tabs under existing Railway Crossing Ahead warning signs on either side of crossing
- Gate Arm Clearance time should be extended to 14 seconds

3.13 Cost Estimate

- 'NO TRAIN WHISTLE' sign tabs = $100.00
- Increase Gate Arm Clearance Time = $17,354 (provided by CN Rail; attached)
- Total Cost estimate with design and contingency = $21,000.00