ROAD SAFETY AUDIT

PHASE 1

NORTH OF RON McNEIL LINE

FOR

THE CORPORATION OF THE TOWNSHIP OF MALAHIDE

CJDL
Consulting Engineers

1531
15 November 2018

CJDL Consulting Engineers

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ROAD SAFETY AUDIT – PHASE 1
NORTH OF RON McNEIL LINE

1.0 BACKGROUND AND INTRODUCTION

Cyril J. Demeyere Limited (CJDL) has been retained by the Township of Malahide to complete Phase 1 of a Road Safety Audit consisting of all Township roads located north of Ron McNeil Line and Catt Line; the extents of which are illustrated in Figure 1. The purpose of this Audit is to review physical features of the approximately 100km of roadways within the study area and identify hazards with the potential to affect road user safety.

This report provides a recommended priority listing for corrective and/or mitigation measures to be implemented in order to rectify the observed deficiencies within the project limits. Detailed geometric and grading design of the recommended corrective measures is beyond the scope of work of this project; however, may be completed supplementally on project specific basis upon request.

2.0 CRITERIA REVIEW

Road Safety criteria was evaluated in accordance with guidance material found in 'Geometric Design Guide for Canadian Roads' (TAC, 1999), 'Roadside Safety Manual' (MTO, 1993), and 'Rural Intersection Safety Handbook' (Transport Canada, 2006) and sound engineering judgment. Site observations made by CJDL staff during site visits to each road segment were documented using a standardized evaluation template, where areas of non-conformance were flagged for further examination. Completed Criteria Review sheets with site photographs are included in Appendix B for reference.

2.1 Geometry

The recommended 'rural' cross-section to be applied to the studied road segments is as follows for design speed of 80 km/h and Average Annual Daily Traffic (AADT) counts for the ranges identified in subsection 3; (2x) 3.6m vehicular travel lanes, (2x) 1.0m gravel shoulders, with (2x) 5.46m boulevard width remaining assuming (66' (20.12m)ROW) to construct drainage facilities in accordance with Municipal Engineers Association, 1984 and TAC, 1999 recommendation, unless site conditions warrant otherwise.

Each of the studied road segments are considered two-lane rural cross-sections, and have been assumed to generally be centred within the right-of-way. Cross-fall over the vehicular travel lanes is recommended as 2.0%, and gravel shoulders should have maximum crossfall of 4-6%.

2.2 Drainage

A cursory review of drainage in areas impacting these road segments was completed during the site visits. Roadside swales should generally contain roadway flows to within the right-of-way and, following existing topography, should convey flows to Municipal Drains or other outlets intersecting the areas of study.

2.3 Vertical Alignment

For a posted speed of 80 km/hr, maximum segment grades within 6-8% are generally considered appropriate; however, may be modified depending on existing topography in the region. The maximum/minimum recommended Rate of Vertical Curvature for this design speed is k=36 on crests and k = 16 on sags (TAC, 1999).

For a design speed of 80 km/hr, the minimum design passing sight distance required is 550m (TAC, 1999). When passing sight distance is reviewed with respect to pavement markings, TAC recommends a minimum of 275m be required; this value has been used as a minimum for the purpose of this analysis.

CJDL identified areas of suspected non-conforming vertical alignment within the project limits and surveyed the centreline profile of each suspected deficient road segment using GPS survey equipment to plot a centreline profile and review conformance to recommended design criteria. Plots completed have been included in Appendix B.

2.4 Horizontal Alignment

For 80 km/hr, the minimum recommended design radius is 230 to 280m for a corresponding maximum superelevation of 0.08 to 0.04 m/m (TAC, 1999).

2.5 Intersections

The design stopping sight distance for passenger vehicles is 115 - 140m and 155 - 210m for trucks at a design speed of 80 km/hr. A line of sight distance of 250 - 330m is recommended to permit passenger vehicles approaching a stop controlled intersection to turn left into oncoming traffic without impacting the 80 km/hr travel speed of approaching traffic. Vertical or horizontal curves within these sight distances are not recommended.

Intersection alignment is preferred at 90°; however, this may not be feasible to achieve depending on site specific circumstances. It is recommended that horizontal intersection alignment does not skew by greater than 20° from perpendicular (Transport Canada, 2006). Further, the preferred rural intersection corner radius is >12 m to permit turning of farm equipment and trucks (Transport Canada, 2006).

2.6 Clear Zone

A significant number of serious accidents and injuries can be reduced if a clear zone is provided from the edge of the travelled portion of the roadway. The clear zone should be generally free of obstacles which can potentially cause damage to a vehicle. The recommended clear zone for paved road sections with a design speed of 80 km/hr and a low AADT value is 4m; 3m is acceptable for 50-60 km/hr and a low AADT.

2.7 Embankments, Bridges, Structures or Culverts

Roadside embankments parallel with the flow of traffic were reviewed to determine if protection is warranted to be installed. Areas where fill heights approach 3 m (from roadside swale to centreline road) and/or slopes are 3:1 or steeper were reviewed in greater detail to determine if embankment protection is warranted (MTO, 1993).

2.8 Visual Aid

The presence of pavement marking and advanced warning signage, together with horizontal and vertical alignment considerations, may provide a greater factor of safety to a road segment. AADT counts for each road section were reviewed together with the above criteria to determine whether existing markings and signage are adequate, or where additional consideration is warranted to increase safety for vehicular traffic.

Generally, it is recommended that all surface treated roads receive centre pavement markings, to assist with indication of safe passing zones and restrictive passing at vertical curves. Stop bars are additionally required at all stop controlled intersections, save and except for those with gravel return aprons.

2.9 Active Transportation

The 'Draft Elgin - St. Thomas Cycling Master Plan' (June 2014) has been initiated to develop and implement a network throughout Elgin County that encourages active forms of transportation and recreation. Against a number of criteria, The Cycling Master Plan study selected a number of designated routes throughout the County in an attempt to improve connections between Aylmer and Tillsonburg, and recommended improvements (i.e. bicycle lanes, multi-use trail, paved shoulder, etc.) along these routes. Please refer to the referenced study for further information.

Lyons Line (Elgin Road 48) is the only road within this section that has been designated by the Master Plan as a proposed on-road active transportation route. No other roads within Phase 1 are designated as a proposed active transportation route.

3.0 ROAD SEGMENT ANALYSIS

The following sections provide a detailed outline of methodology and criteria used to evaluate road safety of road segments within the study area, including a summary of noted deficiencies and recommended corrective measures.

Priority rankings are identified in their respective sections herein as:

- PRIORITY 'A' = Immediate priority
- PRIORITY 'B' = medium priority
- PRIORITY 'C' = low priority

PRIORITY 'A' rankings potentially pose a current safety risk, where a portion of the assessed segment falls outside of TAC, MTO, and Transport Canada guidelines, and the recommended corrections should be investigated immediately.

PRIORITY 'B' rankings include segments which may marginally fall outside of the recommended guidelines, however do not pose an immediate safety concern. Recommended corrections should be investigated in the medium term, 1 to 5 year timeframe.

PRIORITY 'C' ranking include those segments of marginal non-conformance to the recommended guidelines. An immediate safety concern is not present, however corrections should be investigated as the opportunity arises. Segments which are absent of a priority rating do not require further investigation.

3.1 Catt Line: Springwater Road to Rogers Road

AADT: 50
Surface Treatment: Gravel
Priority 'B'

3.1.1 Geometry / Alignment

Catt Line is a two-lane rural cross-section. Lane widths were measured to vary from 2.8m to 3.2m with no shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.1.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.1.3 Vertical Alignment

No vertical curves requiring further review exist within this road segment.

3.1.4 Horizontal Alignment

A horizontal curve with a centreline radius of 90m exists at the mid-point between Springwater Road and Rogers Road. The curve is signed with curve ahead signs and for a speed reduction of 30 km/hr, both of which is considered appropriate. Sign placement should be checked to ensure sufficient warning is given per OTM. Chevron warning signs are absent and are recommended along the outside of the radius.

3.1.5 Intersections

Catt Line is stop controlled at Rogers Road and Springwater Road. <210m stopping sight distance is realized at Rogers Road and stop sign ahead signage should be installed; 330m+ line of sight distance is afforded and is considered adequate. 210m+ stopping sight distance and 330m+ line of sight distance is afforded at Springwater Road are therefore considered adequate.

3.1.6 Clear Zone

There is significant encroachment by trees/forest into the recommended 3m clear zone throughout the majority of this roadway section. Consideration could be given to selected clearing in the areas of worst encroachment.

3.1.7 Embankments, Bridges, Structures or Culverts

Embankment protection is warranted on the south side of Catt Line 440±m west of Rogers Road. Post and cable guiderail is considered acceptable due to low AADT. Guiderail length and road offset should be set in accordance with MTO recommendations. Refer to Appendix B for executed warrant guide.

3.1.8 Visual Aid

Speed limit signage is not present on this section of road and is not required due to a low AADT.

3.1.9 Recommendations

i. Road widening to suit recommended Geometry.

ii. Signage improvements at horizontal curve.

iii. Embankment protection on the south side of Catt Line 440±m west of Rogers Road.

iv. Stop sign ahead at approach to Rogers Road.

3.2 Century Line: Newell Road to Pigram Line

AADT: 26-82
Surface Treatment: Gravel
Priority 'C'

3.2.1 Geometry

Century Line is a two-lane rural cross-section. Lane widths were measured as 3.5m± with no shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.2.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.2.3 Vertical Alignment

No vertical curves requiring further review exist within this road segment.

3.2.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.2.5 Intersections

Century Line is stop controlled at the intersections of Newell Road, Whittaker Road, Putnam Road and Pigram Line. Each intersection is afforded with 210m+ stopping sight distance and 330m+ line of sight distance and therefore is considered adequate. The through intersection at Empey Road is discussed in *Section 3.8* herein.

3.2.6 Clear Zone

There were no other significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.2.7 Embankments, Bridges, Structures or Culverts

There were no embankments >3m in height, or structures/culverts impacting road safety present.

3.2.8 Visual Aid

Speed limit signage is not present on this section of road and is not required due to a low AADT. Oversize stop sign (Ra-101) required due to posted speed, in lieu of the standard size (Ra-1).

3.2.9 Recommendations

i. Road widening to suit recommended Geometry.

ii. Replace standard size stop sign with oversize Ra-101.

3.3 Corless Road: Wilson Line to Yorke Line

AADT: 10
Surface Treatment: Gravel
Priority 'C'

3.3.1 Geometry / Alignment

Corless Road is a two-lane rural cross-section. Lane widths were measured as 2.65m± with no shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.3.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.3.3 Vertical Alignment

Topographic survey included as Drawing 1 in Appendix B indicates all segment grades are less are than 8% which fall within the recommended design parameters for a posted speed of 80km/hr. There are three (3) instances where minimum crest value was exceeded (k = 25.0 at STN 0+279, k = 5.9 at STN 0+531, k = 4.0 at STN 0+626), and one (1) instance where minimum recommended sag value is exceeded (k = 8.8 at STN 0+413). Speed reduction to 50km/hr should be posted for the entire road segment to account for reduced stopping sight distance afforded by vertical curves.

3.3.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.3.5 Intersections

Corless Road is stop controlled at Yorke Line and Wilson Line. All intersections are afforded with 210m+ stopping sight distance and are considered adequate. Through traffic is discussed in *Sections 3.15 and 3.16* respectively herein.

3.3.6 Clear Zone

There were no other significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.3.7 Embankments, Bridges, Structures or Culverts

There were no embankments >3m in height, or structures/culverts impacting road safety present.

3.3.8 Visual Aid

Speed limit signage is not present on this section of road. Due to vertical alignment deficiencies, a posted speed of 50 km/hr is recommended for the entire road length.

3.3.9 Recommendations

i. Road widening to suit recommended geometry.

ii. Speed limit reductions to 50 km/hr should be considered as an interim measure until opportunity for possible correction with future road reconstruction. Vertical alignment corrections should be prioritized based on AADT.

3.4 Crossley Hunter Line: Imperial Road to Pigram Road

AADT: 37-103
Surface Treatment: Gravel
Priority 'C'

3.4.1 Geometry / Alignment

Crossley Hunter Line is a two-lane rural cross-section. Lane widths were measured to vary from 2.9m to 3.55m with no shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.4.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.4.3 Vertical Alignment

Topographic survey included as Drawings 2 and 3 in Appendix B indicate all segment grades are less than 8% which falls within the recommended design parameters for design speed of 80km/hr. There are two (2) instances where minimum crest value was exceeded (k = 6.5 at STN 12+453, k = 16.4 at STN 12+673). Accordingly, speed reduction to 60km/hr should be posted from 12+400 to 12+700 to account for reduced stopping sight distance afforded by vertical curves. Minimum recommended sag value is not exceeded throughout this segment.

3.4.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.4.5 Intersections

Crossley Hunter Line is stop controlled at Imperial Road, Whittaker Road and Putnam Road. Each intersection is afforded with 210m+ stopping sight distance and 330m+ line of sight distance and therefore is considered adequate. The intersections at Whittaker Road and Pigram Line are discussed in *Section 3.14 and 3.12* herein.

3.4.6 Clear Zone

Consideration should be given to move utility poles beyond the clear zone if upgrades and/or replacement become planned for future works; however, are not considered a priority due to low AADT.

3.4.7 Embankments, Bridges, Structures or Culverts

There is an existing guiderail at the NE and NW corner of Putnam Road and Crossley Hunter Line intersection offering embankment protection at the Municipal Drain crossing; guiderail appears to be in satisfactory condition. There were no other embankments >3m in height, or structures/culverts impacting road safety present.

3.4.8 Visual Aid

Speed limit signage is not present on this section of road and is not required due to a low AADT. Stop sign ahead signage should be installed at the approach to Pigram Line due to vertical curves.

3.4.9 Recommendations

i. Road widening to suit recommended Geometry.

ii. Speed limit reduction to 60 km/hr should be installed in areas of vertical alignment deficiencies and be considered as an interim measure until opportunity for possible correction with future road reconstruction. Vertical alignment corrections should be prioritized based on AADT.

iii. Stop sign ahead signage at Pigram Line approach.

3.5 Crossley Hunter Line: Imperial Road to Belmont Line

AADT: 519-577 (highest among roads studied)
Surface Treatment: Double surface treatment
Priority 'C'
Notes: 6 reported motor vehicle collisions between 2011 - 2016

3.5.1 Geometry / Alignment

Crossley Hunter Line is a two-lane rural cross-section. Lane widths were measured as 3.6m with 0.5m± shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.5.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.5.3 Vertical Alignment

No vertical curves requiring further review exist within this road segment.

3.5.4 Horizontal Alignment

No horizontal curves requiring review exist within this road segment.

3.5.5 Intersections

Crossley Hunter Line is stop controlled at Belmont Road and Imperial Road. Each intersection is afforded with 210m+ stopping sight distance and 330m+ line of sight distance, therefore providing the vehicles with safe opportunity to turn into oncoming traffic. Dorchester Road is stop controlled at Crossley Hunter Line. The intersection provides <210m stopping site distance for northbound traffic; stop sign ahead signage is present, but recommended to be checked for conformance to OTM Manual. Southbound traffic is afforded 210m+ stopping distance and is acceptable. Sightlines both east and west on Crossley Hunter Line are <330m; intersection ahead signage per OTM is recommended in each direction.

3.5.6 Clear Zone

A number of large diameter trees can be found near the bottom of ditch on the south side of the road within the clear zone at Mun. No. 47654 Crossley Hunter Line. These trees do not pose a significant present danger as sight lines are extended a great distance east and west. There were no other significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.5.7 Embankments, Bridges, Structures or Culverts

The Catfish Creek Municipal Drain crosses Crossley Hunter line east of Dorchester Road in a precast concrete structure. Concrete jersey barriers are provided at the culvert crossing in addition to steel beam guiderail at the bridge approaches and leaving ends, complete with energy attenuators. Condition of the concrete jersey barriers should be monitored to ensure adequate condition is maintained.

There were no other embankments >3m in height, or structures/culverts impacting road safety present.

3.5.8 Visual Aid

Line painting exists on this road section to indicate passing zones. Adequate sight lines of at least 275m are provided for passing zones, and intersection ahead with solid line painting is provided at the intersection approach to Dorchester Road to restrict passing.

Speed limit signage is absent throughout this section of roadway. While the AADT count is still considered low, it is the highest travelled section within the study limits. Due in part to the undersized shouldering, and six reported animal related collisions spanning 2011 to 2016, speed limit signage should be installed within the leaving end sight distance at all intersections, placement of which should be in accordance with MTO Book 1B, section 12.

Speed reduction to 60 km/hr should be in place within 150m in either direction beyond the limits of the South Dorchester Public School property in accordance with MTO Book 5, Section 5.

3.5.9 Recommendations

i. Shoulder widening to suit recommended Geometry.

ii. Install speed limit and animal crossing signage at the leaving end of the Imperial Road, Dorchester Road and Belmont Line intersections.

iii. Intersection ahead signage should be installed for the eastbound and westbound approaches to Dorchester Road and stop sign ahead for northbound traffic on Dorchester Road at Crossley Hunter Drive due to decreased visibility.

iv. Install speed reduction signage in either direction beyond the limits of the South Dorchester Public School property.

v. Provide centreline and stop bar painting in accordance with MTO Book 11.

3.6 Dalby Road: Lyons Line to End

AADT: 10
Surface Treatment: Gravel
Priority 'C'

3.6.1 Geometry / Alignment

Dalby Road is a two-lane rural cross-section. Lane widths were measured as 3.2m± with no shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.6.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.6.3 Vertical Alignment

No vertical curves requiring further review exist within this road segment.

3.6.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.6.5 Intersections

Dalby Road is stop controlled at Lyons Line and is afforded with 210m+ stopping sight distance, considered adequate. Sightline west on Lyons Line is <330m; intersection ahead signage per OTM is recommended. Sightline east is 330m+ and is considered adequate.

3.6.6 Clear Zone

There were no other significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.6.7 Embankments, Bridges, Structures or Culverts

There were no embankments >3m in height, or structures/culverts impacting road safety present.

3.6.8 Visual Aid

Speed limit signage is absent throughout this section of roadway. AADT count of 10 is considered low and installation of speed limit signage is not required. The 'Dead End' signage located at the south end of Dalby Road should be corrected to meet OTM requirements.

3.6.9 Recommendations

i. Road widening to suit recommended Geometry.

ii. The 'Dead End' signage located at the south end of Dalby Road should be corrected to meet OTM requirements.

iii. Intersection ahead signage should be installed on Lyons Line for the eastbound approach to Dalby Road due to decreased visibility.

3.7 Dorchester Road: Avon Drive to Ron McNeil Line

At the time of inspection, Dorchester Road north of Yorke Line within this road segment was under construction to include surface treatment and associated ditching. Dorchester Road includes double surface treatment for 100m± either side of the Wilson Line and Crossley Hunter Line intersections, and from Lyons Line to Ron McNeil Line, with gravel surface in all other sections.

AADT: 209-319
Surface Treatment: Double Surface Tratment
Priority 'A'

3.7.1 Geometry / Alignment

Dorchester Road is a two-lane rural cross-section. Lane widths were measured as 3.6m with 0.5m± shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.7.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.7.3 Vertical Alignment

No vertical curves requiring further review exist within this road segment.

3.7.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.7.5 Intersections

Dorchester Road is stop controlled at Avon Drive, Yorke Line, Wilson Line, Crossley Hunter Line, Lyons Line, Mapleton Line and Ron McNeil Line. All intersections are afforded with 210m+ stopping sight distance and are considered adequate, except for the northbound approach to Crossley Hunter Drive reviewed in *Section 3.5* herein. Further review of the Dorchester Road / Yorke Line intersection can be found in *Section 3.16*, Mapleton Line / Dorchester Road intersection in *Section 3.10,* and Wilson Line / Dorchester Road intersection in *Section 3.15*.

The centreline of Dorchester Road is offset 5±m crossing Yorke Line. The intersection, however is offset such that driving lanes meet from opposing directions and sight lines of left-turning vehicles onto Yorke Line will not be obstructed. This, together with low AADT for this section does not present safety concerns; however, consideration could be given to alignment improvements in possible future reconstruction.

3.7.6 Clear Zone

There were no other significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.7.7 Embankments, Bridges, Structures or Culverts

Embankment protection is existing on either side of the bridge at the Hunter Municipal Drain/Kettle Creek Municipal Drain crossing and appears to be in general conformance with 'Embankment Protection Warrant Guide'.

Since time of site inspections, the existing concrete box culvert at the Kettle Creek Municipal Drain (south branch) (400±m north of Yorke Line) has been reconstructed as a CSP culvert. Embankment protection is warranted as fill height exceeds 3m. Post and cable guiderail is considered acceptable due to low AADT. Guiderail length and offset should be set in accordance with MTO recommendations.

3.7.8 Visual Aid

Speed limit signage is not present on this section of road and is not required due to a low AADT. Centreline painting should be provided to indicate safe passing zones and restrictions.

3.7.9 Recommendations

i. Shoulder widening to suit recommended Geometry.

ii. Embankment protection on the east and west sides of Dorchester Road at the Kettle Creek Municipal Drain (south branch) crossing.

iii. Provide centreline and stop bar painting in accordance with MTO Book 11.

3.8 Empey Road: Ron McNeil Line to Century Line

AADT: 9
Surface Treatment: Gravel
Priority 'C'

3.8.1 Geometry / Alignment

Empey Road is a two-lane rural cross-section. Lane widths were measured as 2.75m± with no shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.8.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.8.3 Vertical Alignment

No vertical curves requiring further review exist within this road segment.

3.8.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.8.5 Intersections

Empey Road is stop controlled at Ron McNeil Line and Century Line and is afforded with 210m+ stopping sight distance, considered adequate. Sight lines west at the intersection of Century Line have recently been improved by the Township's removal of a number of large trees inside the Century Line R.O.W. and 330m+ of visibility to traffic approaching the Empey Road intersection is provided and considered adequate; sight line east on Century Line and east and west on Ron McNeil Line are 330m+ and is considered adequate.

3.8.6 Clear Zone

There were no other significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.8.7 Embankments, Bridges, Structures or Culverts

There were no embankments >3m in height, or structures/culverts impacting road safety present.

3.8.8 Visual Aid

Speed limit signage is not present on this section of road and is not required due to a low AADT.

3.8.9 Recommendations

i. Road widening to suit recommended Geometry.

3.9 Helder Road: Yorke Line to Avon Drive

AADT: 29
Surface Treatment: Gravel
Priority 'A'

3.9.1 Geometry / Alignment

Helder Road is a two-lane rural cross-section. Lane widths were measured as 2.6m± with no shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.9.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.9.3 Vertical Alignment

Topographic survey included as Drawings 4 and 5 in Appendix B indicate all segment grades are less than 8% which fall within the recommended design parameters for a design speed of 80km/hr. There is one (1) instance where minimum crest value was exceeded (k = 18.8 at STN 0+365) and one(1) instance where minimum sag value was exceeded (k = 10.8 at STN 0+098). Speed reduction to 60 km/hr should be posted for the entire road segment to account for reduced stopping sight distance afforded by vertical curves.

3.9.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.9.5 Intersections

Holder Road is stop controlled at Yorke Line and Avon Drive. All intersections are afforded with 210m+ stopping sight distance and are considered adequate. Sight lines both east and west on Avon Drive are 330m+ and therefore provide vehicles with safe opportunity to turn into oncoming traffic. The intersection at Yorke Line is discussed in *Section 3.16* herein.

3.9.6 Clear Zone

There were no other significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.9.7 Embankments, Bridges, Structures or Culverts

A narrow bridge crossing exists at the Kettle Creek Drain 300±m south of Avon Drive. Narrow bridge warning signs exist, however, 'One Lane' tabs should be added per OTM recommendations. The steel beam guiderail on each of its approach and leaving ends should be supplemented with proper energy attenuators or end treatments per OPSD Guidelines.

There were no other embankments >3m in height impacting road safety present.

3.9.8 Visual Aid

Speed limit reduction to 60 km/hr should be considered as an interim measure until opportunity for possible correction with future road reconstruction. Vertical alignment corrections should be prioritized based on AADT.

3.9.9 Recommendations

i. Road widening to suit recommended Geometry.

ii. Speed limit reductions in areas of vertical alignment deficiencies should be considered as an interim measure until opportunity for possible correction with future road reconstruction. Vertical alignment corrections should be prioritized based on AADT.

iii. Narrow bridge 300±m south of Avon Drive recommended to have signage and guiderails improved. This should be considered the highest priority among road segments studied and should be prioritized for correction.

3.10 Mapleton Line: Imperial Road to Belmont Road

AADT: 218-598
Surface Treatment: Double Surface Treatment
Priority 'C'

3.10.1 Geometry / Alignment

Mapleton Line is a two-lane rural cross-section. Lane widths were measured as 3.6m with 0.5m shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.10.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.10.3 Vertical Alignment

No vertical curves requiring further review exist within this road segment.

3.10.4 Horizontal Alignment

Back to back horizontal curves are present east of the intersection with Belmont Road. The west-most radius was measured as 230m± with a maximum superelevation of 4%; the east-most radius was measured as 450m± compliance with recommended criteria for a maximum posted speed of 80 km/hr. The west-most radius falls within the low end of the recommended range (230 to 280m); due to the close proximity to the Belmont Road intersection, and reported motor vehicle collisions at this curve in 2014 and 2016, it is recommended warning signage should be posted per OTM Book 6, including 'Curve Ahead', including Chevron Alignment Signs. Further, hidden driveway signage should be provided at the west bound approach to Municipal No. 46544 in the north shoulder.

3.10.5 Intersections

Mapleton Line is top controlled at the intersections of Belmont Road and Imperial Road. Through traffic on Mapleton Line has the right-of-way at Springwater Road and Dorchester Road.

The intersection at Imperial Road is afforded with 210m+ stopping sight distance and 330+m line of sight distance. The intersection at Belmont Road has deficient stopping sight distance; placement of existing stop sign ahead signage should be confirmed to be in accordance with OTM. Sight lines south on Belmont Road are 330m+; sight line north is deficient due to horizontal curve and intersection ahead signage is recommended.

The intersection at Dorchester Road is afforded 330+m line of sight distance in each direction on Mapleton Line and is considered sufficient.

The intersection at Springwater Road has deficient line of sight for eastbound traffic and intersection ahead signs should be installed; line of sight for westbound traffic 330+m and is considered satisfactory.

3.10.6 Clear Zone

There were no significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.10.7 Embankments, Bridges, Structures or Culverts

Fill height at the Catfish Creek Municipal Drain crossing on the south side of Mapleton Line was examined and is less than 3m in height, therefore does not require further consideration for embankment protection.

There were no other embankments >3m in height, or structures/culverts impacting road safety present.

3.10.8 Visual Aid

Speed limit signage is absent throughout this section of roadway. While AADT count of 194-273 is still considered low, consideration should be given to the slightly undersized shouldering, and speed limit signage should be installed within the passing sight distance at the leaving end of all intersections, placement of which should be in accordance with MTO Book 1B, section 12.

Line painting does not exist on this road section to indicate passing zones. Given the presence of horizontal curvature, line painting is recommended throughout this road section to indicate appropriate passing zones, and restriction at intersections.

3.10.9 Recommendations

i. Road widening to suit recommended Geometry.

ii. Install speed limit signage at the leaving end of Belmont Road, Dorchester Road and Imperial Road.

iii. Install hidden driveway signage at the west-bound approach to Mun. No. 46544.

iv. Provide centreline and stop bar painting in accordance with MTO Book 11.

v. Intersection ahead signage for southbound traffic and stop sign ahead signage for westbound traffic at the intersection of Mapleton Line and Belmont Road.

vi. Intersection ahead signage for eastbound traffic at the intersection of Springwater Road and Mapleton Line.

3.11 Newell Road: Ron McNeil Line to Lyons Line

AADT: 23-31
Surface Treatment: Gravel
Priority 'C'

3.11.1 Geometry / Alignment

Newell Road is a two-lane rural cross-section. Lane widths were measured as 3.0m with no shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.11.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.11.3 Vertical Alignment

No vertical curves requiring further review exist within this road segment.

3.11.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.11.5 Intersections

Newell Road is stop controlled at Ron McNeil Line and Lyons Line. Each intersection is provided with 210m+ stopping sight distance and 330m+ line of sight distance. Through intersections at Century Line is provided with 210m+ stopping sight distance and 330m+ sight distance in each direction, therefore providing vehicles safe opportunity to turn into oncoming traffic.

3.11.6 Clear Zone

Utility pole line is located within the clear zone on the east side of Newell Road extending from the intersection at Ron McNeil Line, approximately 200m± north to Mun. No. 12307. Consideration should be given to move utility poles beyond the clear zone if upgrades and/or replacement become planned for future works; however, is not considered a priority due to low AADT.

3.11.7 Embankments, Bridges, Structures or Culverts

There were no embankments >3m in height, or structures/culverts impacting road safety present.

3.11.8 Visual Aid

Speed limit signage is not present on this section of road and is not required due to a low AADT.

3.11.9 Recommendations

i. Road widening to suit recommended Geometry.

3.12 Pigram Line: Avon Drive to Lyons Line

AADT: 108-189
Surface Treatment: Double Surface Treatment (Wilson to Ostrander) and Gravel
Priority 'C'

3.12.1 Geometry / Alignment

Pigram Line is a two-lane rural cross-section. Lane widths were measured as 3.5m with varying shoulder (no shoulder from Avon Drive to Yorke Line, 0.5m± shoulder from Yorke Line to Ostrander Road, and 1.0m± shoulder from Ostrander Road to Lyons Line); recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.12.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.12.3 Vertical Alignment

Topographic survey included as Drawings 6 to 9 in Appendix B indicate all segment grades are less than 8% which fall within the recommended design parameters for a design speed of 80km/hr. There are five (5) instances where minimum crest value was exceeded (k = 5.0 at STN 7+572, k = 8.6 at STN 8+500, k = 8.1 at STN 10+417, k = 12.7 at STN 12+101 and k = 13.7 at STN 12+393). Minimum recommended sag value is not exceeded within this road segment. Speed reduction to 50 km/hr should be posted at either approach to STA 7+572 and 8+500, and to 60 km/hr at 10+417 and from 12+101 to 12+393 to account for reduced stopping sight distance afforded by vertical curves.

3.12.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.12.5 Intersections

Pigram Line is stop controlled at Avon Drive and Lyons Line. Through traffic on Pigram Line has the right-of-way at Yorke Line, Airport Road, Wilson Line, Ostrander Road, Crossley Hunter Line, and Keswick Road.

Each intersection is afforded with 210m+ stopping sight distance and 330+m line of sight distance, therefore providing vehicles with safe opportunity to turn into oncoming traffic, except for northbound traffic on Pigram Line at Crossley Hunter Line. Line of sight is 100±m in this location; intersection ahead signage, coupled with speed reductions/correction of vertical alignment deficiencies in this location should be considered.

3.12.6 Clear Zone

Utility poles are located within the clear zone on the east side of Pigram Line from Ostrander Road to Wilson Line. Consideration should be given to move utility poles beyond the clear zone if upgrades and/or replacements become planned for future works; however, are not considered a priority due to low AADT count.

3.12.7 Embankments, Bridges, Structures or Culverts

Fill height at the Proctor Municipal Drain crossing was examined and is less than 3m in height, therefore does not require further consideration for embankment protection.

There were no embankments >3m in height, or structures/culverts impacting road safety present.

3.12.8 Visual Aid

Line painting does not exist on asphalt paved sections in this road section to indicate passing zones. Centreline painting should be provided to indicate safe passing zones, and restrictions at intersections.

'Paved Road Ends' signage should be installed north of Wilson Line and south of Ostrander Road.

Four animal related collisions occurred on Pigram Line spanning from 2009 – 2014. As such 'Animal Crossing' signage should be placed near all wooded areas.

3.12.9 Recommendations

i. Road widening, in deficient areas, to suit recommended Geometry.

ii. Speed limit reduction to 50 km/hr and 60 km/hr should be installed in areas of vertical alignment deficiencies and be considered as an interim measure until opportunity for possible correction with future road reconstruction. Vertical alignment corrections should be prioritized based on AADT.

iii. 'Paved Road Ends' signage should be installed north of Wilson Line, south of Ostrander Road.

iv. 'Animal Crossing' signage should be placed near all wooded areas.

v. Intersection ahead should be placed on the north-bound approach to Crossley Hunter Line due to decreased visibility.

vi. Provide centreline and stop bar painting in accordance with MTO Book 11.

3.13 Springwater Road: Ron McNeil Line to Mapleton Line

AADT: 410
Surface Treatment: Double Surface Treatment
Priority 'C'

3.13.1 Geometry / Alignment

Springwater Road is a two-lane rural cross-section. Lane widths were measured as 3.6m with no shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.13.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.13.3 Vertical Alignment

No vertical curves requiring further review exist within this road segment.

3.13.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.13.5 Intersections

Springwater Road is stop controlled at Ron McNeil Line and Mapleton Line. The intersection at Ron McNeil Line is provided with 210m+ stopping sight distance and 330m+ line of sight distance, therefore providing vehicles with safe opportunity to turn into oncoming traffic. Refer to *Section 3.10* for review of Mapleton Line intersection.

3.13.6 Clear Zone

There were no significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.13.7 Embankments, Bridges, Structures or Culverts

There were no embankments >3m in height, or structures/culverts impacting road safety present.

3.13.8 Visual Aid

Speed limit signage is not present on this section of road and is not required due to a low AADT. Centreline painting should be provided to indicate safe passing zones and restrictions.

3.13.9 Recommendations

i. Road widening to suit recommended Geometry.

ii. Provide centreline and stop bar painting in accordance with MTO Book 11.

3.14 Whittaker Road: Avon Drive to Lyons Line

Whittaker Road from Wilson Line to Yorke Line was not reviewed as part of this Road Safety Audit, as construction is planned to include surface treatment, ditching and vertical curvature correction.

AADT: 100
Surface Treatment: Double Surface Treatment
Priority 'C'

3.14.1 Geometry / Alignment

Whittaker Road is a two-lane rural cross-section. Lane widths were measured as 3.6m with 0.5m± shoulder from Wilson Line to Lyons Line (double surface treatment) and 2.9m with no shoulder from Yorke Line to Avon Drive (gravel); recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.14.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.14.3 Vertical Alignment

Topographic survey included as Drawings 10 and 11 in Appendix B indicate all segment grades are less than 8% which fall within the recommended design parameters for design speed of 80km/hr. There are two (2) instances where minimum crest value was exceeded (k = 11.6 at STN 11+804 and k = 18.0 at STN 12+715). Accordingly, speed reduction signage to 60 km/hr should be posted from either approach at 11+804 through to 12+715 to account for reduced stopping sight distance afforded by vertical curves. Minimum recommended sag value is not exceeded within this road segment.

3.14.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.14.5 Intersections

Whittaker Road is stop controlled at Yorke Line, Wilson Line, Lyons Line and Avon Drive. Through traffic on Whittaker Road has the right-of-way at Crossley Hunter Line.

The intersections at Crossley Hunter Line and Wilson Line are each afforded with 210m+ stop sight distance and 330m+ line of sight distance, and are considered adequate. The centreline of Whittaker Road has a horizontal correction occurring south of the Crossley Hunter Line; this correction results in the north and south approaches at Crossley Hunter Line skewed 4±° from perpendicular, and therefore does not present safety concerns.

Whittaker Road is stop controlled at Lyons Line. The intersection provides <210m stopping sight distance for southbound traffic; stop sign ahead signage is recommended. Line of sight distance is 330m+ in each direction and is acceptable.

Whittaker Road is stop controlled at Yorke Line. The intersection provides <210m stopping sight distance for both north and southbound traffic; stop sign ahead signage is recommended. Line of sight distance is 330m+ and is acceptable. The south centreline approach of Whittaker Road is offset 15±m at Yorke Line. The intersection, however is offset such that driving lanes meet from opposing directions and sight lines of left-turning vehicles onto Yorke Line will not be obstructed. This, together with low AADT for this section does not present immediate safety concerns; however, consideration could be given to alignment improvements in possible future reconstruction.

Whittaker Road is stop controlled at Avon Drive. The intersection provides 210m+ stopping sight distance for north and southbound traffic; line of sight distance is <330m west on Avon Drive and intersection ahead signage is recommended.

3.14.6 Clear Zone

There were no other significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.14.7 Embankments, Bridges, Structures or Culverts

There were no embankments >3m in height, or structures/culverts impacting road safety present.

3.14.8 Visual Aid

Speed limit signage is not present on this section of road and is not required due to a low AADT. Centreline painting should be provided to indicate safe passing zones and restrictions. Stop sign ahead signage should be provided at Lyons Line due to vertical curve. Oversize stop sign (Ra-101) required at Wilson Line and Crossley Hunter due to posted speed, in lieu of standard size (Ra-1).

3.14.9 Recommendations

i. Road widening in deficient areas to suit recommended Geometry.

ii. Speed limit reduction to 60 km/hr should be installed in areas of vertical alignment deficiencies and be considered as an interim measure until opportunity for possible correction with future road reconstruction. Vertical alignment corrections should be prioritized based on AADT.

iii. Intersection ahead signage should be installed for eastbound traffic on Avon Drive. Stop sign ahead should be installed for southbound traffic at Lyons Line and north and southbound at Yorke Line.

iv. Future alignment improvements to Yorke Line intersection offset.

v. Provide centreline and stop bar painting in accordance with MTO Book 11.

vi. Replace standard size stop sign with oversize Ra-101.

3.15 Wilson Line: Belmont Road to Pigram Line

AADT: 217-569
Surface Treatment: Double Surface Treatment
Priority 'C'

3.15.1 Geometry / Alignment

Wilson Line is a two-lane rural cross-section. Lane widths were measured as 3.6m with 0.5m± shoulder, except from Imperial Road to Putnam Road where there is no shoulder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.15.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.15.3 Vertical Alignment

Topographic survey included as Drawings 12 to 19 in Appendix B indicate all segment grades are less than 8% which fall within the recommended design parameters for a design speed of 80km/hr. There are three (3) instances where minimum crest value was exceeded (k = 11.3 at STN 11+345, k = 20.2 at STN 12+775, k = 28.6 at STN 16+481. Accordingly, speed reduction signage to 60 km/hr should be posted at either approaches to 11+345, and to 70 km/hr at either approaches to 12+775 and 16+481 to account for reduced stopping sight distance afforded by vertical curves. Minimum recommended sag value is not exceeded within this road segment.

3.15.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.15.5 Intersections

Wilson Line is stop controlled at Imperial Road, Putnam Road, Belmont Road, and Pigram Line. Through traffic on Wilson Line has the right-of-way at Dorchester Road, Whittaker Road, and Corless Road.

Intersections at Imperial Road, Belmont Road, Pigram Line, and Dorchester Road are afforded 210m+ stopping sight distance and 330m+ line of sight distance and are considered adequate.

The intersection at Corless Road has <330m line of sight east; intersection ahead signage is recommended for westbound traffic. The intersection at Putnam Road has <210m stopping sight distance for east and westbound traffic; stop sign ahead signage is recommended to be installed. Putnam Road has 330m+ line of sight distance and is considered adequate.

The intersection at Whittaker Road is discussed in *Section 3.14* herein.

3.15.6 Clear Zone

There were no other significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.15.7 Embankments, Bridges, Structures or Culverts

Fill height at the Giret Wilson Municipal Drain was examined and is less than 3m in height, therefore does not require further consideration for embankment protection.

There were no embankments >3m in height, or structures/culverts impacting road safety present.

3.15.8 Visual Aid

Due to poor visibility, hidden driveway signage should be provided on the approaches to Mun. No. 52407. Centreline painting should be provided to indicate safe passing zones and restrictions.

Line painting does not exist on this road section to indicate passing zones. Due to the presence of many vertical curves partnered with 8 motor vehicle collisions from 2010 to 2016, line painting is recommended from Dorchester Road to Pigram Line to indicate appropriate passing zones.

3.15.9 Recommendations

i. Road widening in deficient areas to suit recommended Geometry.

ii. Intersection ahead signage should be installed for the westbound approach to Corless Road and stop sign ahead signage for both the east and westbound approach to Putnam Road.

iii. Speed limit reductions in areas of vertical alignment deficiencies should be considered as an interim measure until opportunity for possible correction with future road reconstruction. Vertical alignment corrections should be prioritized based on AADT.

iv. Hidden driveway signage should be installed on approaches to Mun. No. 52407 due to reduced visibility.

v. Provide centreline and stop bar painting in accordance with MTO Book 11.

3.16 Yorke Line: Belmont Road to Pigram Line

AADT: 41-396
Surface Treatment: Gravel (Putnam to Pigram) and Double Surface Treatment (Belmont to Putnam)
Priority 'B'

3.16.1 Geometry / Alignment

Yorke Line is a two-lane rural cross-section. Lane widths were measured as 3.6m with 0.5m± shoulder (typical), no shoulder from Imperial to Helder; recommended cross-section is 3.6m lane widths with 1.0m shoulder.

3.16.2 Drainage

No drainage deficiencies were noted that may impact road safety.

3.16.3 Vertical Alignment

Topographic survey included as Drawings 20 to 24 in Appendix B indicate all segment grades are less than 8% which fall within the recommended design parameters for design speed of 80km/hr. There is one (1) instance where minimum crest value was exceeded (k = 34.1 at STN 12+432). This exceedance is considered minor and falls above the lower range which would require a speed reduction. Minimum recommended sag value is not exceeded throughout this segment.

3.16.4 Horizontal Alignment

No horizontal curves requiring further review exist within this road segment.

3.16.5 Intersections

Yorke Line is stop controlled at Belmont Road, Imperial Road, Putnam Road, and Pigram Line. Through traffic on Yorke Line has the right-of-way at Dorchester Road, Whittaker Road, Helder Road, and Corless Road.

The intersections at Belmont Road, Putnam Road, Corless Road and Pigram Road are afforded with 210m+ stopping sight distance and 330m+ line of sight distance, and are considered adequate. The intersection at Dorchester road has 210m+ stopping sight distance and 330m+ line of sight distance for westbound traffic; line of sight distance for eastbound traffic is deficient and intersection ahead signage should be installed. The intersection at Imperial Road has 210m+ stopping sight distance for eastbound traffic and 330m+ line of sight in each direction; stopping sight distance is <210m for westbound traffic, and stop sign ahead signage is required. The intersection at Helder Road has 210m+ stopping sight distance and 330m+ line of sight distance for westbound traffic; line of sight distance for eastbound traffic is deficient and intersection ahead signage should be installed. The intersection at Yorke Line was previously reviewed in *Section 3.14*.

3.16.6 Clear Zone

Utility poles are located within the clear zone on the north side of Yorke Line from Mun. No. 51918 to Mun. No. 52076 and from Mun. No. 52199 to Corless Road. Consideration should be given to move utility poles beyond the clear zone if upgrades and/or replacement become planned for future works; however, is not considered a priority due to low AADT.

There were no other significant sources of encroachment into the recommended clear zone found that pose a safety concern.

3.16.7 Embankments, Bridges, Structures or Culverts

Embankment protection is warranted on the north side of Yorke Line at the Kettle Creek Municipal Drain crossing where fill height exceeds 3m. Post and cable guiderail is considered acceptable due to low AADT. Guiderail length and offset should be set in accordance with MTO recommendations. Refer to Appendix B for executed warrant guide and photos.

3.16.8 Visual Aid

Speed limit signage is not present on this section of road and is not required due to a low AADT. Centreline painting should be provided from Belmont Road to Putnam Road to indicate safe passing zones and restrictions.

3.16.9 Recommendations

i. Road widening to suit recommended Geometry.

ii. Intersection ahead signage should be installed for eastbound traffic at Dorchester Road and Helder Road and stop sign ahead signage should be installed for westbound traffic at Imperial Road due to decreased visibility.

iii. Speed limit reductions to 70 km/hr in areas of vertical alignment deficiencies should be considered optional as an interim measure until opportunity for possible correction with future road reconstruction. Vertical alignment corrections should be prioritized based on AADT.

iv. Provide centreline and stop bar painting in accordance with MTO Book 11.

v. Embankment protection on the north side of Yorke Line at the Kettle Creek Municipal Drain crossing.

4.0 Conclusions

The suggested mitigation measures reviewed in section 3 above as summarized in the Appendix 'A' Deficiency Priority Ranking in the recommended order of priority are based on AADT and sound engineering judgment in each independent section, and severity of deficiency. Deficiencies are presented by road segment, to ease in creation of a master priority listing consistent with budget considerations allotted.

Evaluation of these deficiency recommendations has been completed in accordance with recommendations from:

"Draft Elgin - St. Thomas Cycling Master Plan" (2014)

"Geometric Design Guide for Canadian Roads" (TAC, 1999)

"Municipal Works Design Manual" (Municipal Engineers Association, 1984)

"Roadside Safety Manual" (MTO, 1993)

"Rural Intersection Safety Handbook" (Transport Canada, 2006)

If there are any questions, please do not hesitate to contact this office.

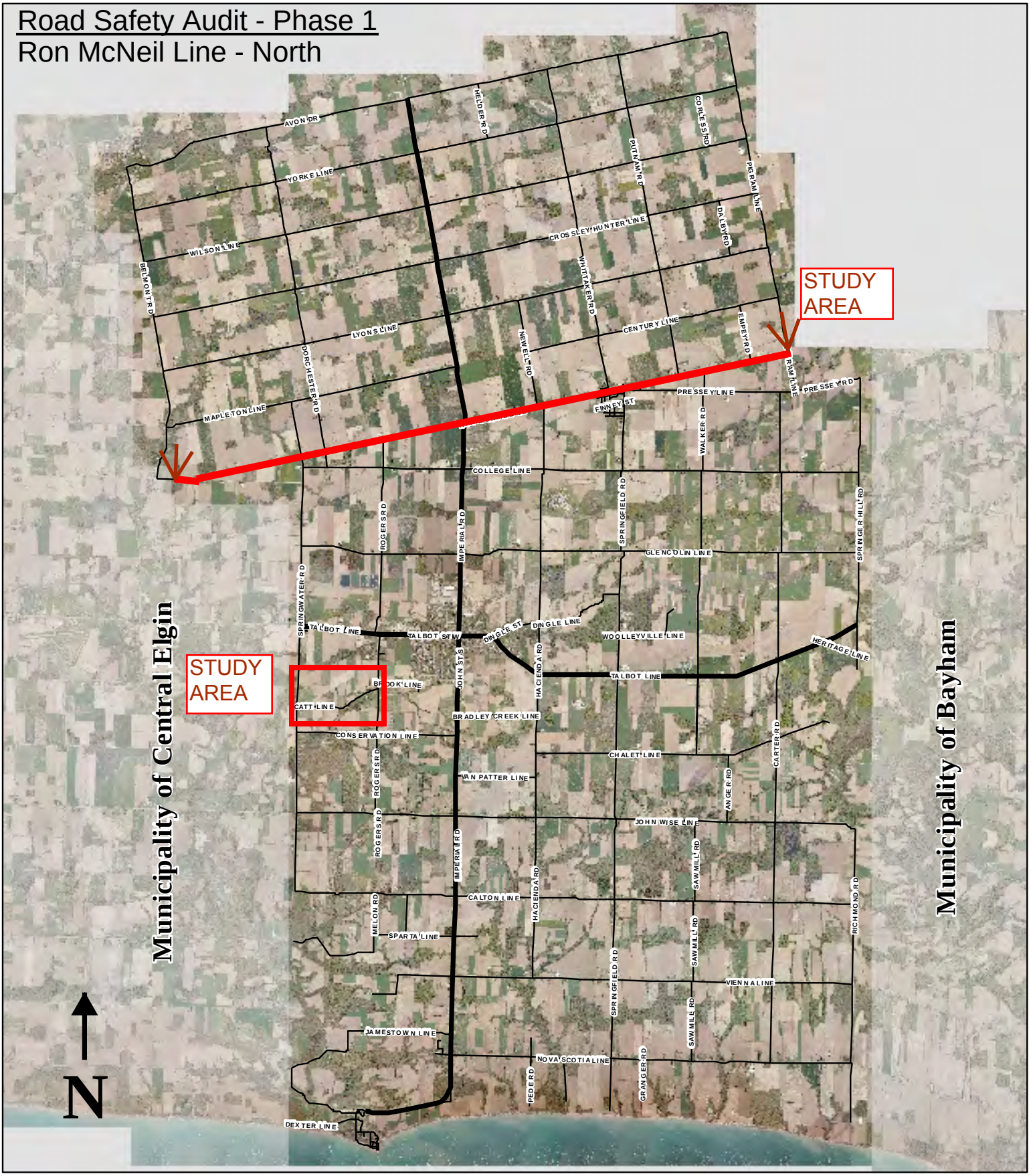
All of which is respectfully submitted by,

Deren Lyle, P. Eng.

DL/MDS/sed

Township of Malahide

Road Safety Audit - Phase 1
Ron McNeil Line - North



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Meters

Map Produced by:
Township of Malahide GIS Department
Projection: NAD 83 UTM Zone 17
Date: Oct 01, 2009
This drawing is neither a legally recorded map nor a survey and is not intended to be used as one.

APPENDIX ‘A’

- **Deficiency Priority Ranking**

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Project No. 1531
Date: 14-Nov-18
MDS

APPENDIX A:
DEFICIENCY PRIORITY LISTING

Priority Ranking	Road Name	From	To	*AADT	Surface Treatment	Geometry Lane Width	Geometry Shoulder Width	Drainage	Vertical Alignment	Horizontal Alignment	Intersections	Clear Zones	Embankment	Visual Aid	Comments
A	Catt Line	Springwater Road	Rogers Road	50	Gravel	2.8 - 3.2m	None			Horizontal curve present.	Poor sight line approaching Rogers Road	Consider clearing trees within 3m of edge of road	Protection warranted 440m west of Rogers Road	Add chevron warning signs at horizontal curves Add stop sign ahead signage at Rogers Road approach	
C	Century Line	Newell Road	Pigram Line	26-82	Gravel	3.5m	No Shoulder							Stop Sign at Century Line / Whittaker Road too small No speed limit signage	
C	Corless Road	Wilson Line	Yorke Line	10	Gravel	2.65m	No Shoulder		STA 0+279 (Crest, K=25.0) STA 0+413 (Sag, K=8.8) STA 0+531 (Crest, K=5.9) STA 0+626 (Crest, K=4.0)		Intersection ahead signage at Wilson Line due to vertical curve			No speed limit signage Reduced speed to 50 km/h at vertical curves	
B	Crossley Hunter Line	Pigram Road	Imperial Road	37-103	Gravel	2.9 - 3.5m	No Shoulder		Poor visability on approach to Pigram Road STA 12+453 (Crest, K=6.5) STA 12+672 (Crest, K=16.4)			Hydro poles within clear zone on north side, west of Mun. No. 51986 Crossley Hunter Line Hydro poles within clear zone on north side, west of Mun. No. 51222 Crossley Hunter Line		Recommend 'stop sign ahead' signage at Pigram Line due to vertical curve No speed limit signage Stop sign ahead signage recommended at Pigram Line approach Reduce speed to 60 km/h at vertical curves	
B	Crossley Hunter Line	Imperial Road	Belmont Line	519 - 577	Surface Treatment	3.6m	0.5m				Intersection ahead signage present at Dorchester Road	Trees within clear zone on south side of road at Mun. No. 47654		Install speed limit and animal crossing signage at leaving end of Imperioal Road, Dorchester Road, and Belmont Line Provide intersection ahead signage at approaches to Dorchester Road, and stop sign ahead signage for northbound traffic on Dorchester Road Reduce spped to 60 km/h in either direction of South Dorchester Public School Provide centreline and stop bar painting per MTO Book 11	6 animal related collisions from 2011 to 2016
C	Dalby Road	Lyons Line	End	10	Gravel	3.2m	No Shoulder				Intersection ahead signage on Lyons Line (eastbound)			No speed limit signage Current dead end signage to meet OTM Provide intersection ahead signageat eastbound approach to Dalby Road	
A	Dorchester Road	Avon Drive	Ron McNeil Line	100-217	Surface Treatment	3.6m	0.5m			Offset intersection at Yorke Line			Protection warranted 400±m north Yorke Line	Provide centreline and stop bar painting per MTO Book 11	Yorke Line to Avon Line under construction at time of site audit
C	Empey Road	Ron McNeil Line	Century Line	Unknown	Gravel	2.75m	No Shoulder					Deep ditch (2m± Depth) within clear zone		No speed limit signage	
A	Helder Road	Yorke Line	Avon Drive	29	Gravel	2.6m Narrow Bridge at Kettle Creek Drain	No Shoulder		STA 0+097 (Sag, K=10.8) STA 0+365 (Crest, K=18.8)				No energy attenuators or end treatment on steel beam guide rail at Kettle Creek Drain crossing	Speed limit signs only present at north end Reduce speed to 60 km/h at vertical curves Correct narrow bridge signage	
B	Mapleton Line	Imperial Road	Belmont Road	194 - 273	Surface Treatment	3.6m	0.5m (No shoulder from Imperial to Putnam)			Horizontal Curve at Belmont Road approach				Recommend advanced warning and horizontal curve chevron signage at Belmont Road approach Provide speed limit signage at leaving end of Belmont Road, Dorchester Road and Imperial Road Provide hidden driveway signage at west-bound apporach to Mun No. 46544 Provide centreline and stop bar painting per MTO Book 11 Provide intersection ahead signage at westbound approach to Belmont Road, and for eastbound approach at Springwater Road	Speed related vehicular accident in 2014 & 2016 (snow) at horizontal curve
C	Newell Road	Ron McNeil Line	Lyons Line	23-31	Gravel	3m	No Shoulder					Hydro pole and ditching within clear zone on east side of road, south of Mun. No. 12307		No speed limit signage	
B	Pigram Line	Lyons Line	Avon Drive	189	Surface Treatment/ Gravel	3.5m	No shoulder to 1.0m		STA 7+572 (Crest, K=5.0) STA 8+500 (Crest, K=8.6) STA 10+417 (Crest, K=8.1) STA 12+101 (Crest, K=12,7) STA 12+393 (Crest, K=13.7)			Steep ditch at Proctor Drain crossing Hydro poles within clear zone at Mun. No. 7175 Poor sight lines to east at Avon Drive due to Avon Drive horizontal curve		Reduce speed to 50 km/h Intersection ahead signage required at north-bound approach to Crossley Hunter Line Paved Road Ends signage to be installed north of Wilson Line Animal crossing signage should be placed near all wooded areas Provide centreline painting per MTO Book 11 Consider hidden driveway signage	4 animal related collisions from 2009 - 2014
C	Springwater Road	Ron McNeil Line	Mapleton Line	50	Surface Treatment	3.6m	<0.5m							No speed limit signage Provide centre line painting per MTO Book 11	
C	Whittaker Road Whittaker Road	Wilson Line Lyons Line	Avon Drive Wilson Line	53 90	Gravel Surface Treatment	2.9m 3.6m	No Shoulder <0.5m		STA 11+804 (Crest, K=11.6) STA 12+715 (Crest, K=18.0)	Offset intersection at Yorke Line				No speed limit signage Recommend 'stop sign ahead' signage at Lyons Line due to vertical curve Stop signs too small at Crossley Hunter and at Wilson Line Reduce speed to 60 km/h at vertical curves Provide intersection ahead signage at eastbound approach to Avon Drive Provide centreline and stop bar painting per MTO Book 11	
B	Wilson Line	Belmont Road	Pigram Line	103-218	Surface Treatment				STA 11+345 (crest, K=11.3) STA 12+775 (crest, K=20.2) STA 16+481 (crest, K=28.6)			Steep slope on south side of road, east of Mun No. 52407 within clear zone		Intersection ahead signage required at westbound approach to Corless Road Recommend stop sign ahead signage at east and westbound approach to Putnam Road Speed limit reductions recommended at vertical curves Provide hidden driveway signage at approaches to Mun. No. 52407 Provide centre line painting per MTO Book 11	8 animal related collisions from 2010 to 2016 on Wilson Line
A	Yorke Line	Belmont Road	Pigram Road	41-296	Surface Treatment/ Gravel	7.1m	<0.5m No Shoulder		STA 12+432 (Crest, K=34.1) Generally poor passing sight distance / decision sight distance throughout			Steep ditch (2m±) west of Dorchester road within clear zone Hydro poles within clear zone on north side of road	Protection warranted on north side at Kettle Creek Municipal Drain crossing	No speed limit signage Intersection ahead signage required at eastbound approach to Dorchester Road, and Helder Road Recommend stop sign ahead signage at westbound approach to Imperial Road Reduce speed to 70 km/h at vertacle curve Provide centreline and stop bar painting per MTO Book 11	

NOTE:
*AADT Counts in the above table have been updated to reflect 2018 counts. AADT count included in Appendix B Criteria Review sheets have been taken from the 2015 Municpal Inventory Condition Assessment, and may differ from that shown above.

PRIORITY 'A' = IMMEDIATE PRIORITY
PRIORITY 'B' = MEDIUM PRIORITY
PRIORITY 'C' = LOW PRIORITY

APPENDIX ‘B’

- **Road Segment Evaluations**

Catt Line

Springwater Road to Rogers Road

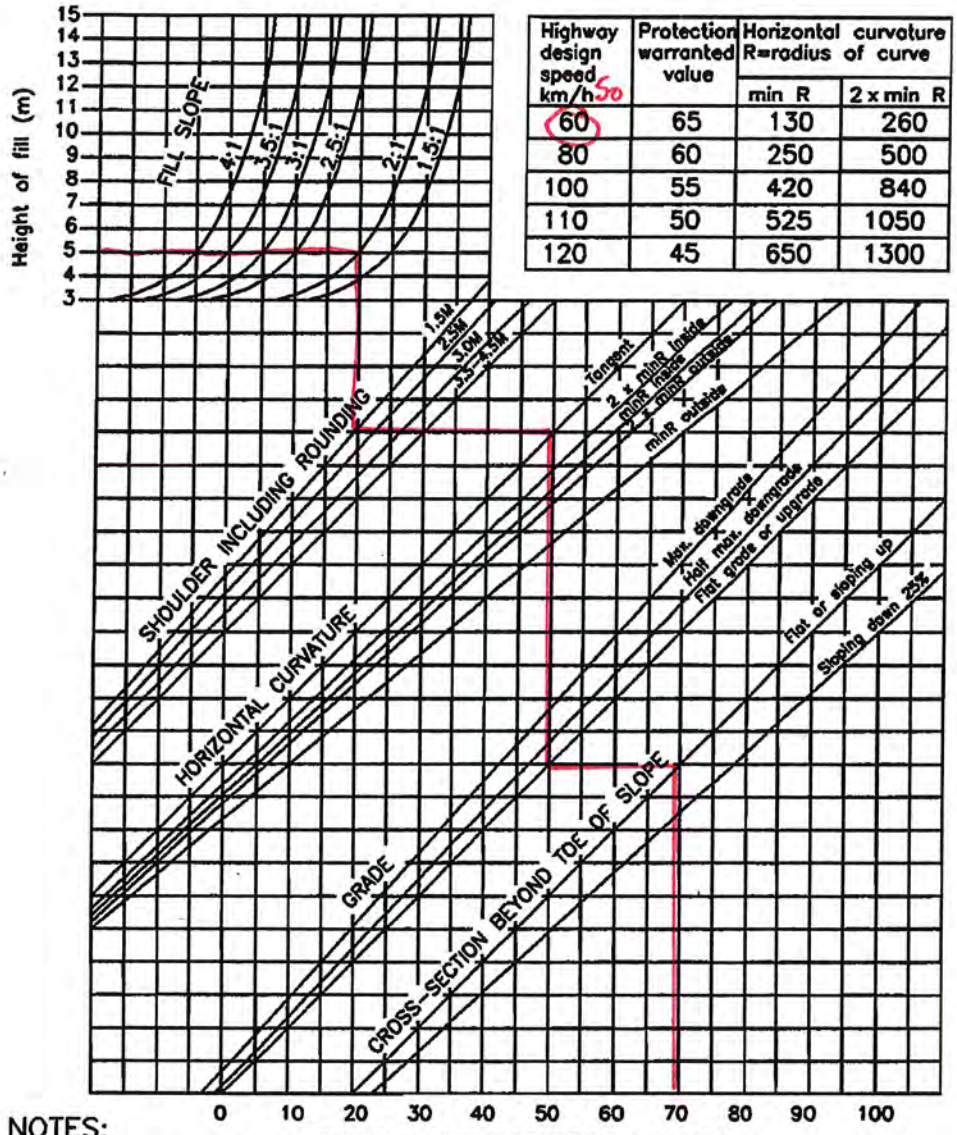
- **Criteria Review Sheet**
- **Embankment Protection Warrant**

2.0 Criteria Review

Road Name: CATT LINE	Study Section: SPRINGWATER RD TO ROGERS RD.
Direction of Travel: EAST / WEST.	Total Distance Analysed: _____ km
Posted Speed: 50	AADT:
Right-of-Way Width: *20m (66')*	Date of Site Inspection:

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -Cross-Section CL alignment: Crown Centered	5.6m WIDE (WEST END) 6.5m (MIDDLE) NO SHOULDERS	
	Surface Treatment	-Comment on surface treatment	GRAVEL - GOOD CONDITION	
	Drainage	-Roadside swales? -Municipal Drains:	LONGITUDINAL SWALES DRAIN CROSSINGS ARE ADEQUATE FOR ROAD TRAVEL	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)		
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)		
Intersections	List of intersections within project limits	SPRINGWATER -Intersection control: Stop Sign -Stopping sight distance: 50m	NO STOP AHEAD SIGN CHECKERBOARD SIGN	
	List of intersections within project limits	ROGERS ROAD -Intersection control: STOP SIGN -Stopping sight distance:	NO STOP AHEAD SIGN CHECKERBOARD SIGN	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m		
	Embankments	-Slope? -Height? -Protection required? Limits?		
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?		
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	N/A	
Active Transportation		-Designation by the Master Plan?		

CATT LINE
EAST of DRAIN
SOUTH SIDE



Highway design speed km/h	Protection warranted value	Horizontal curvature R=radius of curve	
		min R	2 x min R
60	65	130	260
80	60	250	500
100	55	420	840
110	50	525	1050
120	45	650	1300

EMBANKMENT PROTECTION WARRANT GUIDE

NOTES:

1 Guide rail is not required for:
Undivided Hwys
–On fill heights less than 3 metres.
–Slopes 3:1 or flatter.

Divided Hwys
–On fill heights less than 2 metres.
–Slopes 4:1 or flatter.

2 When the embankment protection index is greater than the protection warranted value guide rail or slope flattening is required.

FIGURE 2.5.1 Embankment Warrant Guide

Century Line

Newell Road to Pigram Line

- **Criteria Review Sheet**

2.0 Criteria Review

Road Name: *Century Line*	Study Section: Newell Rd to Pigram Rd
Direction of Travel: East to West	Total Distance Analysed: 6.57 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *24-81* Per 2015 Municipal Road Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 27 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	No Shoulder Road width adequate 7.1 m	
	Surface Treatment	-Comment on surface treatment	loose gravel (if paving considered, re-evaluation of drainage + deer zones required)	
	Drainage	-Roadside swales? -Municipal Drains: Lamb Drain, John Eaton Drain, Hoshai Drain, Harkes Drain, Shively Drain	-Swale runs longitudinal -All municipal drain crossings adequate for road travel	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A – no curve	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999) (Decision sight distance)	✓	
Intersections	List of intersections within project limits	Century Line/Newell Road -Through traffic -Intersection control: Stop Sign on Newell Rd. -Stopping sight distance: 50m	-NO stop sign ahead sign	
	List of intersections within project limits	Century Line/Whittaker Road ~~-Through traffic~~ -Intersection control: Stop Sign on Century Line -Stopping sight distance: 50m	-no stop sign ahead sign -stop sign possibly too small	
	List of intersections within project limits	Century Line/Putnam Road ~~-Through traffic~~ -Intersection control: Stop Sign on Century Line. -Stopping sight distance: 50m	-intersection ahead sign ✓ -stop sign possibly too small	
	List of intersections within project limits	Century Line/Empey Road -Through traffic -Intersection control: Stop Sign on Empey Rd. -Stopping sight distance: 50m	-no intersection ahead sign	
	List of intersections within project limits	Century Line/Pigram Line ~~-Through traffic~~ -Intersection control: Stop Sign on Century Line -Stopping sight distance: 50m	-intersection ahead sign ✓	

Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	NO obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	NO embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A Outside of clear zone	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	Speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

Corless Road

Wilson Line to Yorke Line

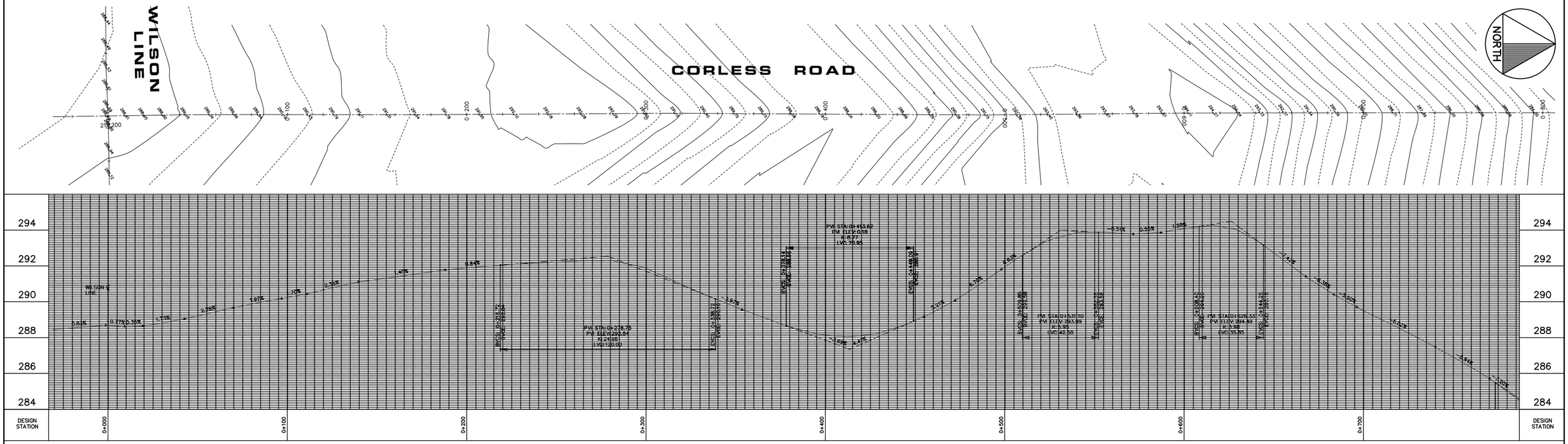
- **Criteria Review Sheet**
- **Site Photographs**
- **Centreline Profile Drawing**

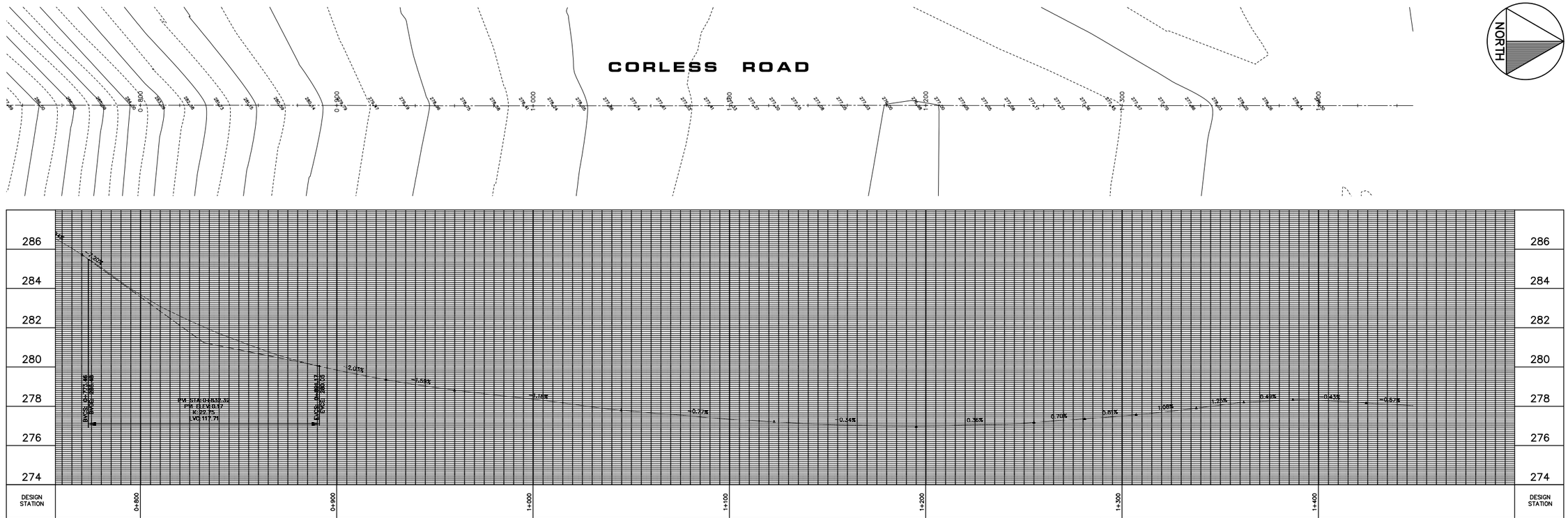
2.0 Criteria Review

Road Name: *Corless Road*	Study Section: *Wilson Line to Yorke Line*
Direction of Travel: North to South	Total Distance Analysed: 1.40 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *10* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	no shoulder road width inadequate: 5.3m	
	Surface Treatment	-Comment on surface treatment	loose gravel (reevaluation of drainage + clear zones required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Teskey Drain	-Swale runs longitudinal -Teskey drain crossing adequate	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	TBD	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	adequate sight distance	
Intersections	List of intersections within project limits	Corless Road/Yorke Line ~~-Through traffic~~ -Intersection control: Stop Sign on Corless Rd -Stopping sight distance: 50m	-no intersection ahead sign -good sight lines -adequate SSD	OK
	List of intersections within project limits	Corless Road/Wilson Line ~~-Through traffic~~ -Intersection control: Stop Sign on Corless Rd -Stopping sight distance: 50m	↓	Recommend Stop sign ahead signage
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	Speed limit signs absent.	
Active Transportation		-Designation by the Master Plan?		

Corless Road – Poor visibility approaching Wilson Line intersection due to vertical alignment.





LEGEND

280 — EXISTING CONTOURS (CJDL, 2017)

LICENSED PROFESSIONAL ENGINEER — M.D.R. SWEETLAND 100171341 — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — D.J. LYLE 100174772 — PROVINCE OF ONTARIO

METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

No.	REVISION	DATE	BY

TOWNSHIP OF MALAHIDE

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DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1

CORLESS ROAD

STA 0+000 TO STA 1+450

DRAWING No. 1

Crossley Hunter Line

Imperial Road to Pigram Road

- **Criteria Review Sheet**
- **Site Photographs**
- **Centreline Profile Drawing**

2.0 Criteria Review

Road Name: *Crossley Hunter Line*	Study Section: *Pigram Road to Putnam Road*
Direction of Travel: West to East	Total Distance Analysed: 2.84 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *103* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

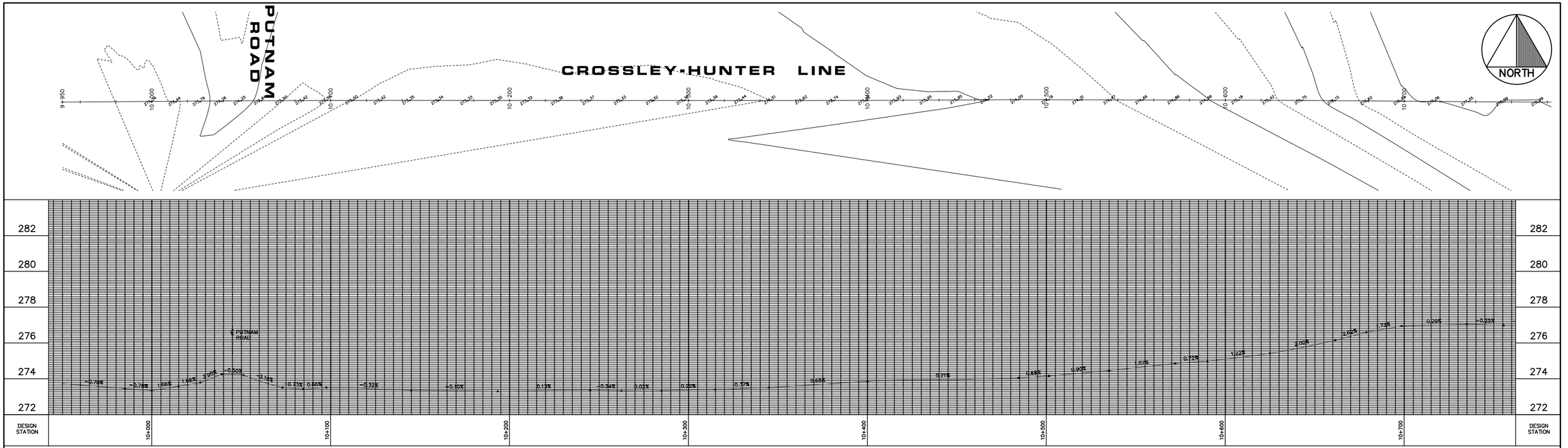
Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -varies -Cross-Section CL alignment: Crown Centered	-no shoulder -road width: 6.1 m (W end) 5.8 m (E end)	
	Surface Treatment	-Comment on surface treatment	loose gravel (re-evaluation of drainage & clear zones required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Clapton-Farrow Drain	-swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value		
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	Adequate passing sight distance (except within 300+ m of Pigram Rd)	
Intersections	List of intersections within project limits	Crossley Hunter Line/Pigram Line ~~-Through traffic~~ -Intersection control: Stop Sign on Crossley Hunter Ln. -Stopping sight distance: 50m	-poor visibility to south due to Pigram Ln vertical alignment -stop sign ahead sign recommended -adequate SSD	
	List of intersections within project limits	Crossley Hunter Line/Dalby Road -Through traffic -Intersection control: Stop Sign on Dalby Rd. -Stopping sight distance: 50m	-good visibility -adequate SSD	
	List of intersections within project limits	Crossley Hunter Line/Putnam Road ~~-Through traffic~~ -Intersection control: Stop Sign on Crossley Hunter Ln -Stopping sight distance: 50m	-good visibility -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	hydro poles within clear zone, on N side, W of Mun No 51986 to Putnam Rd	
	Embankments	-Slope? -Height? -Protection required? Limits?	No embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-speed limit signs absent	

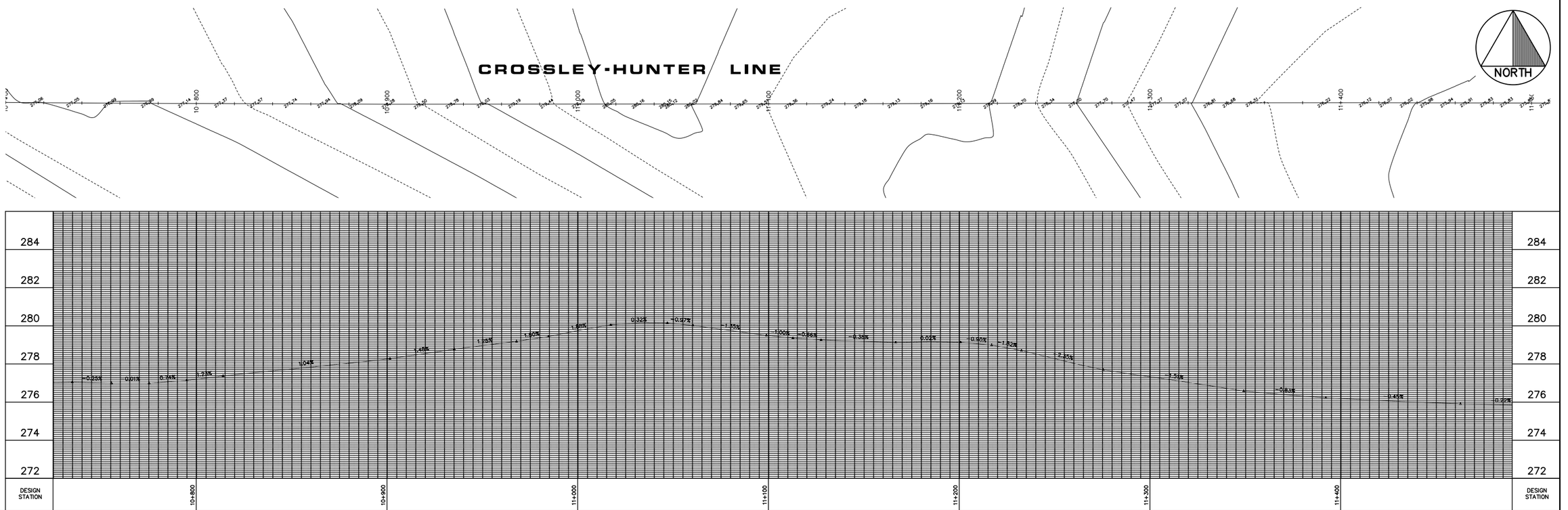
Active Transportation		-Designation by the Master Plan?		

Additional notes: Hidden intersection sign present on Pigram Rd. approach to Crossley Hunter Ln from south

Crossley Hunter Line – Poor visibility approaching Pigram intersection (facing east) due to vertical alignment.

Crossley Hunter Line – Poor visibility on Pigram intersection facing south, due to vertical alignment.





LEGEND

280 EXISTING CONTOURS (CJDL, 2017)

PROFESSIONAL ENGINEER — M.D.R. SWEETLAND — 100171341 — PROVINCE OF ONTARIO

PROFESSIONAL ENGINEER — D.J. LYLE — 100174772 — PROVINCE OF ONTARIO

METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

No.	REVISION	DATE	BY

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DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1

CROSSLEY–HUNTER LINE

STA 10+000 TO STA 11+475

DRAWING No. 2

Crossley Hunter Line

Imperial Road to Belmont Line

- **Criteria Review Sheet**
- **Site Photographs**
- **Centreline Profile Drawing**

2.0 Criteria Review

Road Name: *Crossley Hunter Line*	Study Section: *Putnam Road to Whittaker Road*
Direction of Travel: West to East	Total Distance Analysed: 1.8~~6~~ km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *40 Per 2015 Municipal Rd. Inventory Condition Assessment*
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -varies -Cross-Section CL alignment: Crown Centered	-no shoulder -road width adequate (7.1 m)	
	Surface Treatment	-Comment on surface treatment	loose gravel (re-evaluation of drainage & clear zones required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Catfish Creek Drain	-swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	Adequate passing sight distance	
Intersections	List of intersections within project limits	Crossley Hunter Line/Putnam Road -~~Through traffic~~ -Intersection control: Stop Sign on Crossley Hunter -Stopping sight distance: 50m	-paved with 1 m shoulder -good sight lines -adequate SSD	
	List of intersections within project limits	Crossley Hunter Line/Whittaker Road -~~Through traffic~~ -Intersection control: Stop Sign on Crossley Hunter -Stopping sight distance: 50m	-good sight lines -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	hydro poles within clear zone on N side, W of Mun ND 51222 to Whittaker Rd.	
	Embankments	-Slope? -Height? -Protection required? Limits?	ND embankment risks within clear ?	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Crossley Hunter Line*	Study Section: *Whittaker Road to Imperial Road*
Direction of Travel: West to East	Total Distance Analysed: 3.70 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *41* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -varies -Cross-Section CL alignment: Crown Centered	-no shoulder -road width = 6.7m	
	Surface Treatment	-Comment on surface treatment	loose gravel (re-evaluation of drainage + clear zones required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: - WF Burks Drain, Putnam Drain	swales run longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	Adequate passing sight distance	
Intersections	List of intersections within project limits	Crossley Hunter Line/Whittaker Road ~~-Through traffic~~ -Intersection control: Stop Sign on Crossley Hunter -Stopping sight distance: 50m	-good sight lines -adequate SSD	
	List of intersections within project limits	Crossley Hunter Line/Imperial Road ~~-Through traffic~~ -Intersection control: Stop Sign on Crossley Hunter -Stopping sight distance: 50m	-good sight lines -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-speed ~~sign~~ limit signs absent	
Active Transportation		-Designation by the Master Plan?		

Crossley Hunter Line – Hydro poles within clear zone on north side (facing west), west of municipal number 51222.

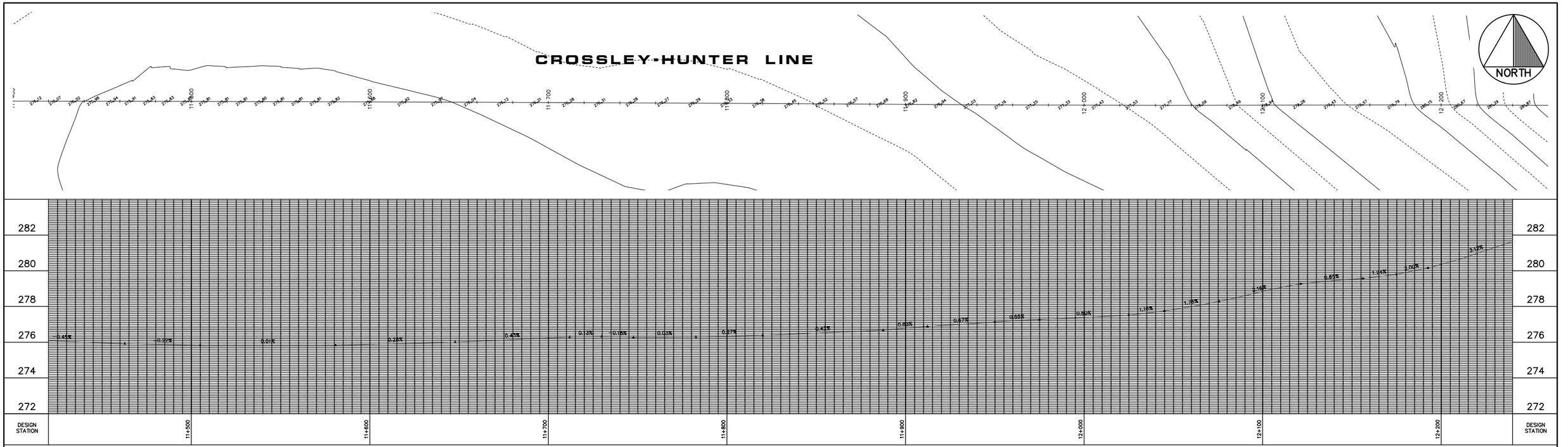
Crossley Hunter Line – Hydro poles within clear zone on north side (facing west), west of municipal number 51986.

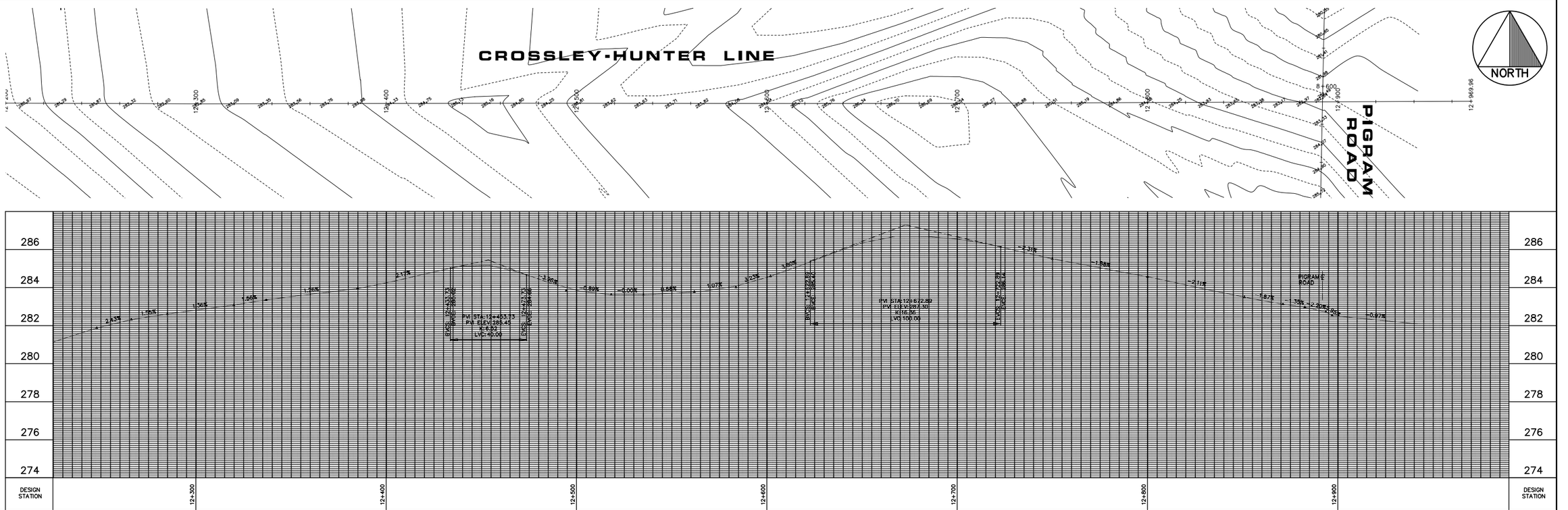
2.0 Criteria Review

Road Name: *Crossley Hunter Line*	Study Section: *Imperial Road to Belmont Road*
Direction of Travel: West to East	Total Distance Analysed: 7.42 km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *307* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.5m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	shoulder ≤0.5m	
	Surface Treatment	-Comment on surface treatment	paved asphalt	
	Drainage	-Roadside swales? -Municipal Drains: Ketchebaw Drain, Leslie Thomson Drain, VanBommel Drain, Willsy Drain, Catfish Creek	-longitudinal swale -drains outside of clear zone	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	-adequate passing sight distance	
Intersections	List of intersections within project limits	Crossley Hunter Line/Belmont Road ~~-Through traffic~~ -Intersection control: Stop Sign on Crossley Hunter Ln -Stopping sight distance: 67m	-good visibility -adequate SSD	
	List of intersections within project limits	Crossley Hunter Line/Dorchester Road -Through traffic -Intersection control: Stop Sign on Dorchester -Stopping sight distance: 67m	↓	
	List of intersections within project limits	Crossley Hunter Line/Imperial Road ~~-Through traffic~~ -Intersection control: Stop Sign on Crossley Hunter Ln -Stopping sight distance: 67m	↓	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions exist within clear zone. Trees on South side @ 47654 Crk Line.	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	bridge outside of clear zone, concrete barriers and guardrail in good condition at Catfish Creek crossing	

Visual Aids		-Line painting: Yes -Signage?	speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		





LEGEND

280 — EXISTING CONTOURS (CJDL, 2017)

LICENCED PROFESSIONAL ENGINEER — M.D.R. SWEETLAND — 100171341 — PROVINCE OF ONTARIO

LICENCED PROFESSIONAL ENGINEER — D.J. LYLE — 100174772 — PROVINCE OF ONTARIO

METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

No.	REVISION	DATE	BY
1	ISSUED FOR CLIENT REVIEW	XX JULY 17	MDS

TOWNSHIP OF MALAHIDE

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DESIGN BY: MDS DJL | DRAWN BY: TJW AER | CHECKED BY: MDS DJL

PROJECT NO. 1531 | SURVEY BY: TPM | DATE: OCT 2018

TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1

CROSSLEY–HUNTER LINE

STA 11+400 TO STA 12+900

DRAWING No. 3

Dalby Road

Lyons Line to North End

- **Criteria Review Sheet**

2.0 Criteria Review

Road Name: *Dalby Road*	Study Section: *Lyons Line to north end (dead end)*
Direction of Travel: South to North	Total Distance Analysed: 1.43 km
Posted Speed: *N/A – Dirt Road; Assume 60km/h*	AADT: *10* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -varies- -Cross-Section CL alignment: Crown Centered	no shoulder road width = 6.4m	
	Surface Treatment	-Comment on surface treatment	Loose gravel (reevaluation of drainage + deer zones required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Kyle Van Gurp Drain (to the west), Brooks Drain	swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	Adequate passing sight distance	
Intersections	List of intersections within project limits	Dalby Road/Lyons Line -Through traffic -Intersection control: Stop Sign -Stopping sight distance: 50m	-good sight lines -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-Speed limit sign absent -Warnings of dead end	
Active Transportation		-Designation by the Master Plan?		

Dorchester Road

Avon Drive to Ron McNeil Line

- **Criteria Review Sheet**

2.0 Criteria Review

Road Name: *Dorchester Road*	Study Section: *Avon Drive to Ron McNeil Line*
Direction of Travel: South to North	Total Distance Analysed: 8.49 km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *100-217* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.5m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	shoulders ≤0.5m	
	Surface Treatment	-Comment on surface treatment	asphalt paved (except from Yorke to Avon; under construction)	
	Drainage	-Roadside swales? Kettle Creek Drain, -Municipal Drains: Catfish Creek, Jamains Drain, Hunter Drain	drain outside of clear zone	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	adequate passing sight distance	
Intersections	List of intersections within project limits	Dorchester Road/Avon Drive -~~Through traffic~~ -Intersection control: Stop Sign on Dorchester Rd -Stopping sight distance: 67m	-good sight lines -adequate SSD	
	List of intersections within project limits	Dorchester Road/Yorke Line -~~Through traffic~~ -Intersection control: Stop Sign on Dorchester Rd -Stopping sight distance: 67m	-intersection offset	
	List of intersections within project limits	Dorchester Road/Wilson Line -~~Through traffic~~ -Intersection control: Stop Sign on Dorchester Rd -Stopping sight distance: 67m		
	List of intersections within project limits	Dorchester Road/Crossley Hunter Line -~~Through traffic~~ -Intersection control: Stop Sign on Dorchester Rd -Stopping sight distance: 67m		
	List of intersections within project limits	Dorchester Road/Lyons Line -~~Through traffic~~ -Intersection control: Stop Sign on Dorchester Rd -Stopping sight distance: 67m		

	List of intersections within project limits	Dorchester Road/Mapleton Line -Through traffic -Intersection control: Stop Sign -Stopping sight distance: 67m		
	List of intersections within project limits	Dorchester Road/Ron McNeil Line -Through traffic -Intersection control: Stop Sign -Stopping sight distance: 67m		
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	bridge outside of clear zone ✓ (South of Mun. No. 15452)	
Visual Aids		-Line painting: No -Signage?	-speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

→ barriers and guiderail in good condition at Kettle Creek Bridge Crossing
- guiderail or headwall not present at south most Kettle Creek Crossing
- no advanced warning signs for bridge at south most Kettle Creek Crossing

Empey Road

Ron McNeil Line to Century Line

- **Criteria Review Sheet**
- **Site Photographs**

2.0 Criteria Review

Road Name: *Empey Road*	Study Section: *Ron McNeil Line to Century Line*
Direction of Travel: North to South	Total Distance Analysed: 1.47 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT:
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 27 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -Cross-Section CL alignment: Crown Centered	-deficient road width (5.5 m) -no shoulder	
	Surface Treatment	-Comment on surface treatment	loose gravel	
	Drainage	-Roadside swales? -Municipal Drains: Shively Drain, Adam Empey Drain	Swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	✓	
Intersections	List of intersections within project limits	Empey Road / Ron McNeil Line ~~-Through traffic~~ -Intersection control: Stop Sign on Empey Rd -Stopping sight distance: 50m	Good sight lines	
	List of intersections within project limits	Empey Road / Century Line ~~Through traffic~~ -Intersection control: Stop Sign on Empey Rd -Stopping sight distance: 50m	Inadequate sight lines to west due to large trees within Century Line R.O.W.	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	Ditch within clear zone ~2m deep	
	Embankments	-Slope? -Height? -Protection required? Limits?	"	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	No speed limit signs.	
Active Transportation		-Designation by the Master Plan?		

Empey Road – Inadequate road width (5.5m) with no shoulder; South of Century Line, facing South

Empey Road – Intersection with Century Line, facing West (trees block sight lines)

Helder Road

Yorke Line to Avon Drive

- **Criteria Review Sheet**
- **Centreline Profile Drawing**

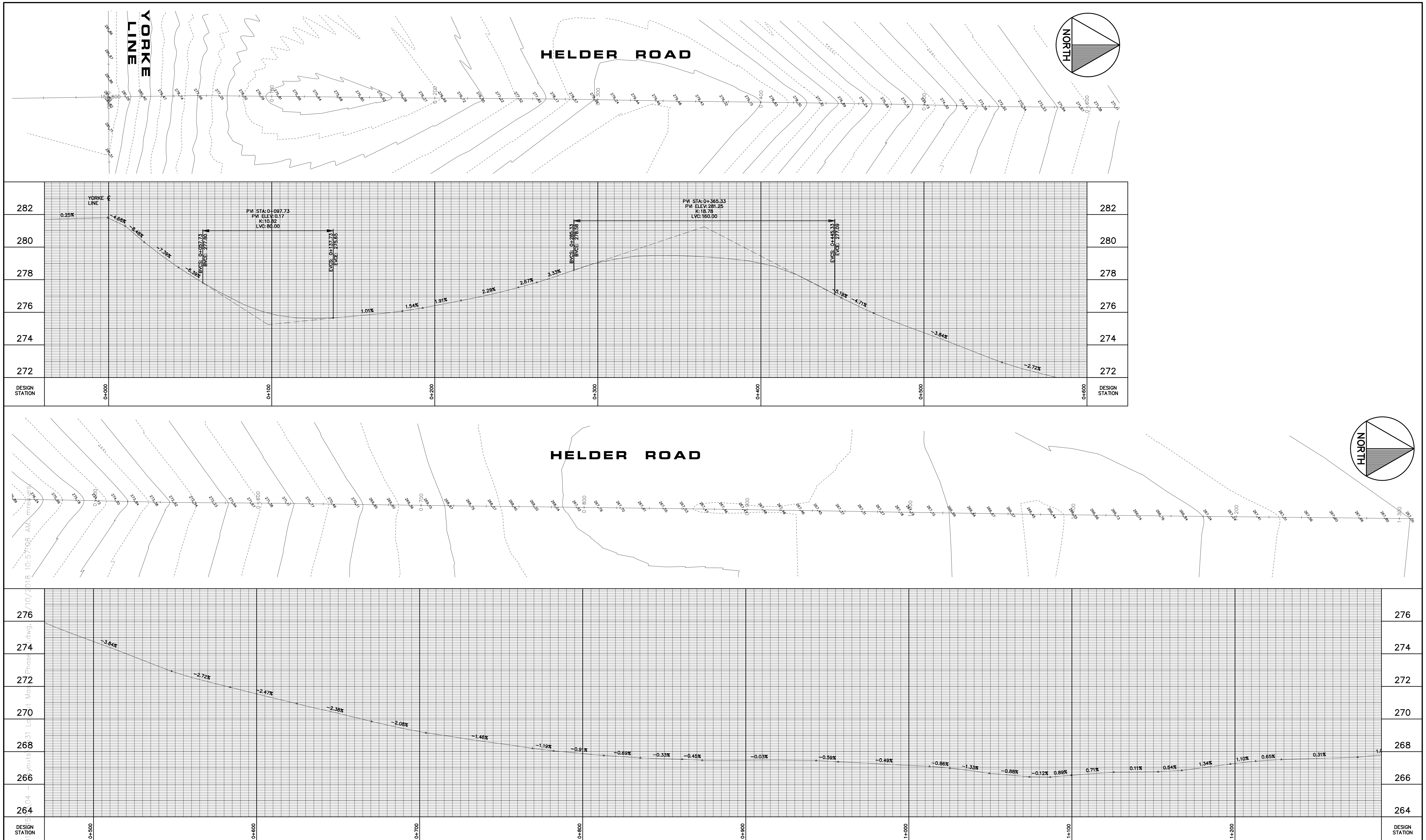
2.0 Criteria Review

Road Name: *Helder Road*	Study Section: *Yorke Line to Avon Drive*
Direction of Travel: South to North	Total Distance Analysed: 1.41 km
Posted Speed: ~~*N/A – Gravel Road; Assume 60km/h*~~ 50 km/h ; Gravel	AADT: *29* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	no shoulder road width inadequate (5.2m)	
	Surface Treatment	-Comment on surface treatment	loose gravel (re-evaluation of drainage + clear zones necessary if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Hedler Road Drain	swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	•	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	review passing sight distance due to vertical curve	
Intersections	List of intersections within project limits	Helder Road /Yorke Line -Through traffic -Intersection control: Stop Sign on Helder Rd -Stopping sight distance: 50m	-good sight lines -adequate SSD	
	List of intersections within project limits	Helder Road/Avon Drive -Through traffic -Intersection control: Stop Sign on Helder Rd -Stopping sight distance: 50m	-poor sight lines to west due to trees within Avon Dr. R.O.W.	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	Steep embankment on E side, S end of rd.	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	narrow bridge at Kettle Creek Drain crossing (advanced warning signage present). → no energy attenuators or end treatments on steel beam guardrail	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-speed limit signs only present on N end.	
Active Transportation		-Designation by the Master Plan?		

Helder Road – Poor visibility at Avon intersection (facing west) due to vertical alignment.

Helder Road – Ditch within clear zone, on east side, facing Yorke Line intersection.



LEGEND

280 — EXISTING CONTOURS (CJDL, 2017)

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No.	REVISION	DATE	BY

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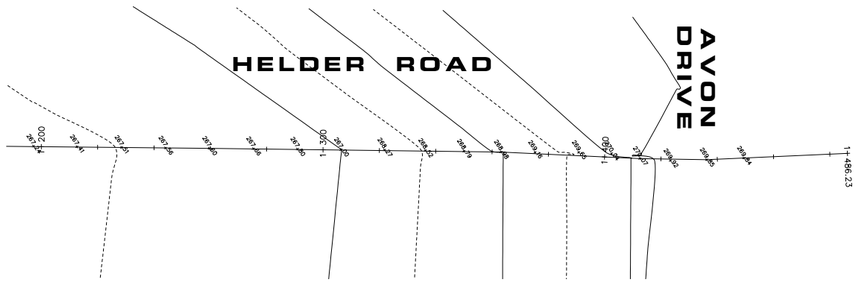
TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1

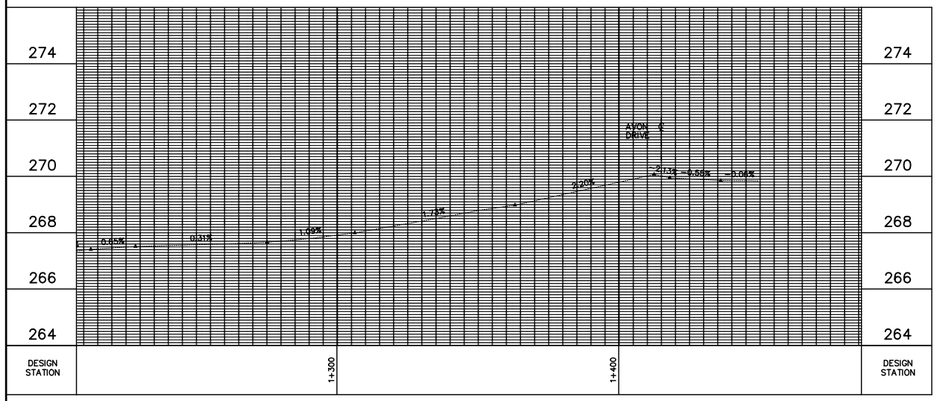
HELDER ROAD

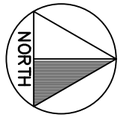
STA 0+000 TO STA 1+275

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

DRAWING No. 4







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LEGEND

280 EXISTING CONTOURS (CJDL, 2017)

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DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1

HELDER ROAD

STA 1+275 TO STA 1+450

DRAWING No. 5

Mapleton Line

Imperial Road to Belmont Road

- **Criteria Review Sheet**

2.0 Criteria Review

Road Name: *Mapleton Line*	Study Section: *Imperial Road to Belmont Road*
Direction of Travel: East to West	Total Distance Analysed: 7.62 km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *194-273* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.5m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -varies -Cross-Section CL alignment: Crown Centered	shoulder ≤ 0.5 m	
	Surface Treatment	-Comment on surface treatment	asphalt paving	
	Drainage	-Roadside swales? -Municipal Drains: Catfish Creek, Hoover Drain	Catfish creek ✓ (out of clear zone)	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)		
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	adequate passing sight distance	
Intersections	List of intersections within project limits	Mapleton Line/Imperial Road -~~Through traffic~~ -Intersection control: Stop Sign on Mapleton Ln -Stopping sight distance: 67m	-good sight lines -adequate SSD	
	List of intersections within project limits	Mapleton Line/Dorchester Road -Through traffic -Intersection control: Stop Sign on Dorchester rd -Stopping sight distance: 67m		
	List of intersections within project limits	Mapleton Line/Springwater Road -Through traffic -Intersection control: Stop Sign on Springwater rd -Stopping sight distance: 67m		
	List of intersections within project limits	Mapleton Line/Imperial Road -~~Through traffic~~ -Intersection control: Stop Sign on Mapleton -Stopping sight distance: 67m	-sharp curve at east end - warning sign for this may be needed -stop sign warning ahead ✓	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	

	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	outside of clear zone ✓	
Visual Aids		-Line painting: ~~yes~~ no -Signage?	-hidden driveway signs ✓ -speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

Newell Road

Ron McNeil Line to Lyons Line

- **Criteria Review Sheet**
- **Site Photographs**

2.0 Criteria Review

Road Name: *Newell Road*	Study Section: *Ron McNeil Line to Century Line*
Direction of Travel: South to North	Total Distance Analysed: 1.44 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *31* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 27 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	No Shoulder Road width = 6 m	
	Surface Treatment	-Comment on surface treatment	Loose gravel (if paving considered, re-evaluation of drainage & clear zones required)	
	Drainage	-Roadside swales? ✓ -Municipal Drains: Simpson Drain, Newell Drain	-Swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	✓	
Intersections	List of intersections within project limits	Newell Road /Ron McNeil Line -Through traffic -Intersection control: Stop Sign ✓ -Stopping sight distance: 50m	Good sight lines and stop distance	
	List of intersections within project limits	Newell Road/Century LIne -Through traffic -Intersection control: Stop Sign ✓ -Stopping sight distance: 50m	Good sight lines and stop distance	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	Hydro pole & ditch within clear zone (South of Mun. No. 12307)	
	Embankments	-Slope? -Height? -Protection required? Limits?	No embankment risks within clear zone.	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	CSP culvert at Simpson Drain	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-Speed limit signage absent	
Active Transportation		-Designation by the Master Plan?		

Newell Road – Hydro pole and ditch within clear zone (north of Ron McNeil Line)

2.0 Criteria Review

Road Name: *Newell Road*	Study Section: *Century Line to Lyons Line*
Direction of Travel: South to North	Total Distance Analysed: 1.34 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *23* per 2015 Municipal Rd Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 27 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	No shoulder Road width: 6 m	
	Surface Treatment	-Comment on surface treatment	Loose gravel (if paving is considered, a reevaluation of drainage & clear zones required)	
	Drainage	-Roadside swales? -Municipal Drains: Winder Drain (to west), Lamb Drain (to east)	Swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	✓	
Intersections	List of intersections within project limits	Newell Road /Century Line -Through traffic -Intersection control: Stop Sign ✓ -Stopping sight distance: 50m	Good sight lines & stop distance	
	List of intersections within project limits	Newell Road/Lyons Drive -Through traffic -Intersection control: Stop Sign ✓ -Stopping sight distance: 50m	Good sight lines & stop distance	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	No obstructions within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	No embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	Speed limit signage absent	

Active Transportation		-Designation by the Master Plan?		

Pigram Line

Avon Drive to Lyons Line

- **Criteria Review Sheet**
- **Site Photographs**
- **Centreline Profile Drawing**

2.0 Criteria Review

Road Name: *Pigram Line*	Study Section: *Lyons Line to Crossley Hunter Line*
Direction of Travel: North to South	Total Distance Analysed: 1.44 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *189* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m ✓ - Shoulder(s): 1.0m wide ✓ - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	Shoulder = 1 m road with = 7.1 m	
	Surface Treatment	-Comment on surface treatment	loose gravel (re-evaluation of drainage & clear zone necessary if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Brooks Drain, Procter Drain	Swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	•	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	Inadequate passing distance within 200m of vertical high points	
Intersections	List of intersections within project limits	Pigram Line/Lyons Line -Through traffic -Intersection control: Stop Sign on Lyons Ln -Stopping sight distance: 50m	-difficulty seeing intersection due to vertical displacement but still enough SSD.	
	List of intersections within project limits	Pigram Line/Keswick Road -Through traffic -Intersection control: Stop Sign on Keswick Rd -Stopping sight distance: 50m	-good visibility -adequate SSD	
	List of intersections within project limits	Pigram Line/Crossley Hunter Line -Through traffic -Intersection control: Stop Sign on Crossley Hunter -Stopping distance: 50m	-intersection ahead sign ✓ -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	steep slope at Proctor Drain Crossing	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-add intersection ahead sign to Lyons and Crossley -speed limit signs absent	

2.0 Criteria Review

Road Name: *Pigram Line*	Study Section: *Crossley Hunter Line to 0.1km S of Ostrander Road*
Direction of Travel: South to North	Total Distance Analysed: 0.96 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *180* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m ✓ - Shoulder(s): 1.0m wide ✓ - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	Shoulders = 1m Road width = 7.1 m	
	Surface Treatment	-Comment on surface treatment	Loose gravel (reevaluation of clear zone + drainage required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Teskey Drain, Clapton-Farrow Drain	- longitudinal swale - drain out of clear zone	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	Adequate passing sight distance	
Intersections	List of intersections within project limits	Pigram Line/Crossley Hunter Line -Through traffic -Intersection control: Stop Sign on Crossley Hunter Line -Stopping sight distance: 50m	-good visibility -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone.	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	drain out of clear zone	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Pigram Line*	Study Section: *0.1km S of Ostrander Road to 0.1km N of Wilson Line*
Direction of Travel: South to North	Total Distance Analysed: 0.52 km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *180* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m - Shoulder(s): 2.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -Cross-Section CL alignment: Crown Centered	shoulder ≤0.5 m road width = 7.0 m	
	Surface Treatment	-Comment on surface treatment	paved	
	Drainage	-Roadside swales? -Municipal Drains: Clear Creek Drain	swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	adequate passing sight distance	
Intersections	List of intersections within project limits	Pigram Line/Ostrander Road -Through traffic -Intersection control: Stop Sign on Ostrander Rd -Stopping sight distance: 67m	-good visibility -adequate SSD	
	List of intersections within project limits	Pigram Line/Wilson Line -Through traffic -Intersection control: Stop Sign on Wilson Ln. -Stopping sight distance: 67m	-good visibility -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	Severel hydro poles within clear zone ~~across from~~ Mun. No. 7175	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: No -Signage?	-speed limit signs absent -no paved road ends sign at S end.	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Pigram Line*	Study Section: *0.1km N of Wilson Line to Yorke Line*
Direction of Travel: South to North	Total Distance Analysed: 1.34 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *108* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m ✓ - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	shoulders ≤ 0.5m road width = 7.1 m	
	Surface Treatment	-Comment on surface treatment	Loose gravel (reevaluation of clear zones & drainage required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Clapton-Farrow Drain, Teskey Drain	swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	•	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	Adequate passing sight distance ~~except within 300 m of Mun. No 6961,~~ travelling southbound)	
Intersections	List of intersections within project limits	Pigram Line/Airport Road -Through traffic -Intersection control: Stop Sign on Airport Rd -Stopping sight distance: 50m	-good visibility -adequate SSD	
	List of intersections within project limits	Pigram Line/Yorke Line -Through traffic -Intersection control: Stop Sign on Yorke Ln -Stopping sight distance: 50m	-intersection ahead sign recommended	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-speed limit sign absent	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Pigram Line*	Study Section: *Yorke Line to Avon Drive*
Direction of Travel: South to North	Total Distance Analysed: 1.37 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *139* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

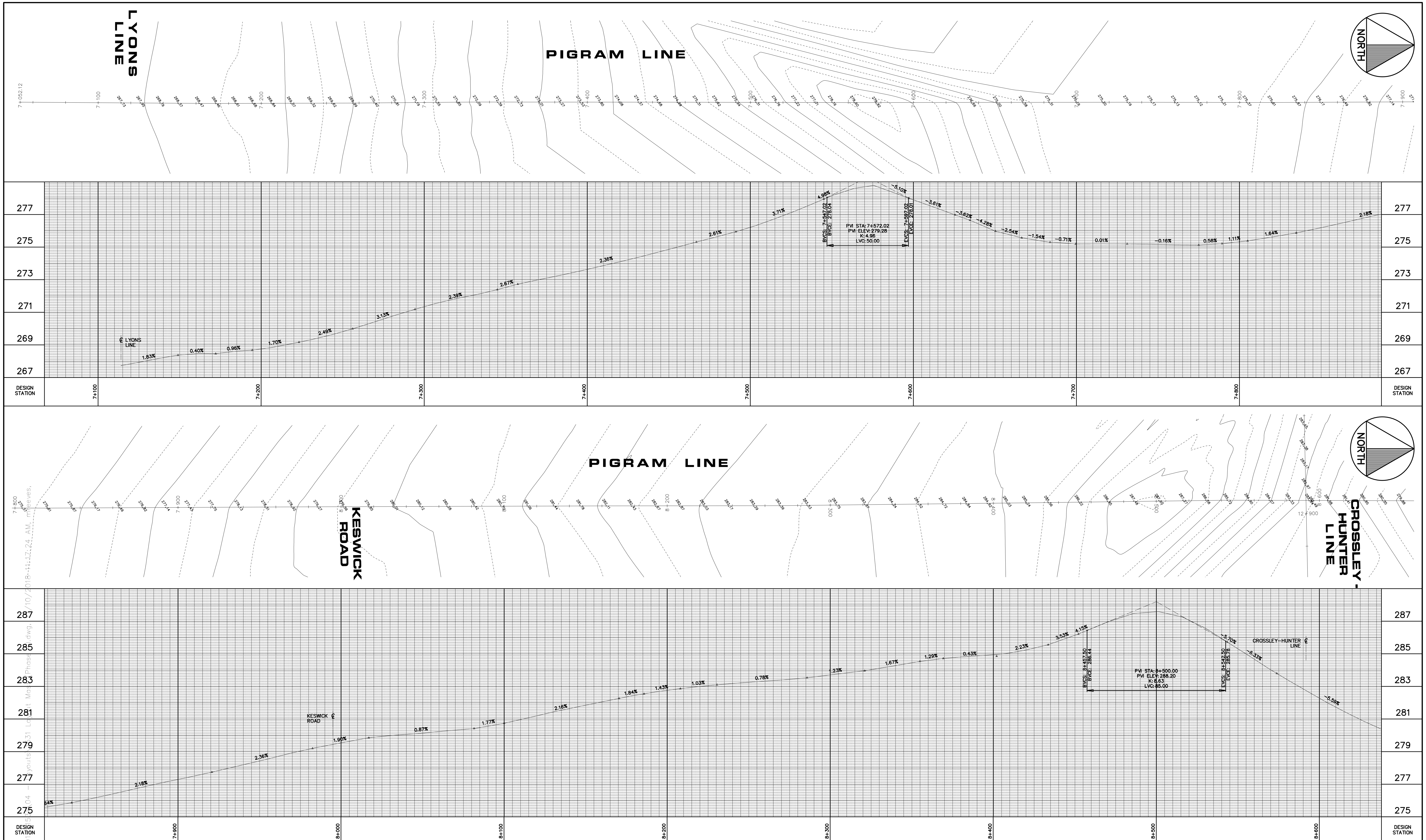
Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m ✓ - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	no shoulder road width = 7.1 m	
	Surface Treatment	-Comment on surface treatment	Loose gravel (reevaluation of clear zone + drainage required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Parsons Drain or Scoffin Award Drain	Swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	•	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	adequate passing sight distance (except within 300±m of Mun Rd 6241, travelling southbound)	
Intersections	List of intersections within project limits	Pigram Line/Yorke Line ~~Through traffic~~ -Intersection control: Stop Sign on Pigram Ln -Stopping sight distance: 50m		
	List of intersections within project limits	Pigram Line/Avon Drive/Prouse -Through traffic -Intersection control: Stop Sign on Prouse Rd -Stopping sight distance: 50m	-limited sight line to W due to curve	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-Speed limit signs absent -no passing signs recommended	
Active Transportation		-Designation by the Master Plan?		

Pigram Line – Poor visibility between Crossley-Hunter Line and Lyons Line (facing south)

Pigram Line – Hydro poles within clear zone north of Lyons Line intersection, on east side.

Pigram Line – Poor visibility approaching Wilson Line intersection from north.

Pigram Line – Poor visibility facing east at Avon intersection due to horizontal alignment.



LEGEND

280 — EXISTING CONTOURS (CJDL, 2017)

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PROVINCE OF ONTARIO

METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

No.	REVISION	DATE	BY

TOWNSHIP OF MALAHIDE

CJDL Consulting Engineers

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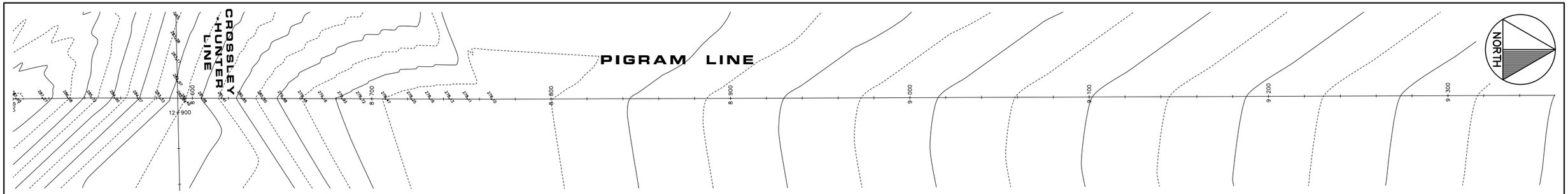
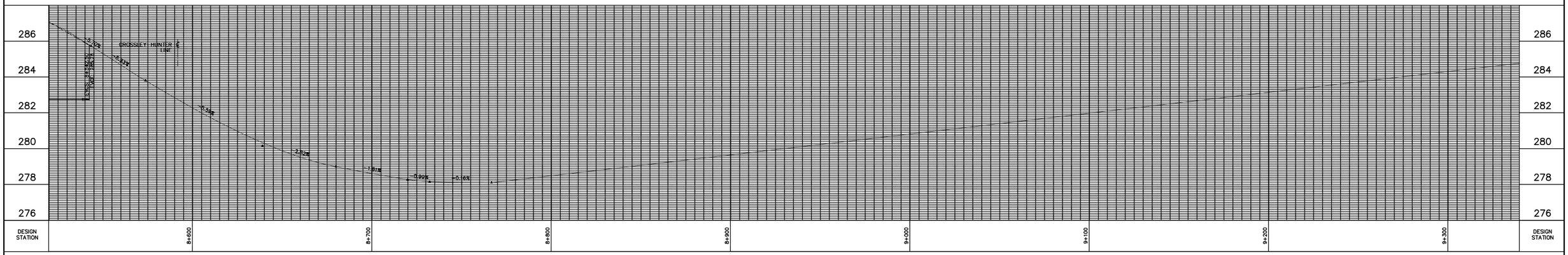
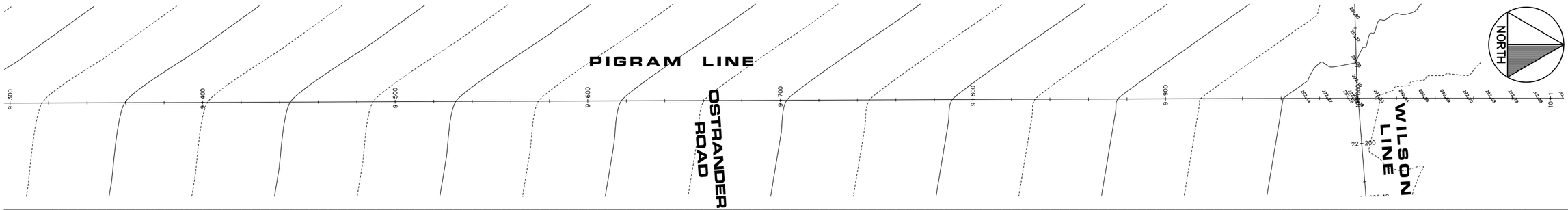
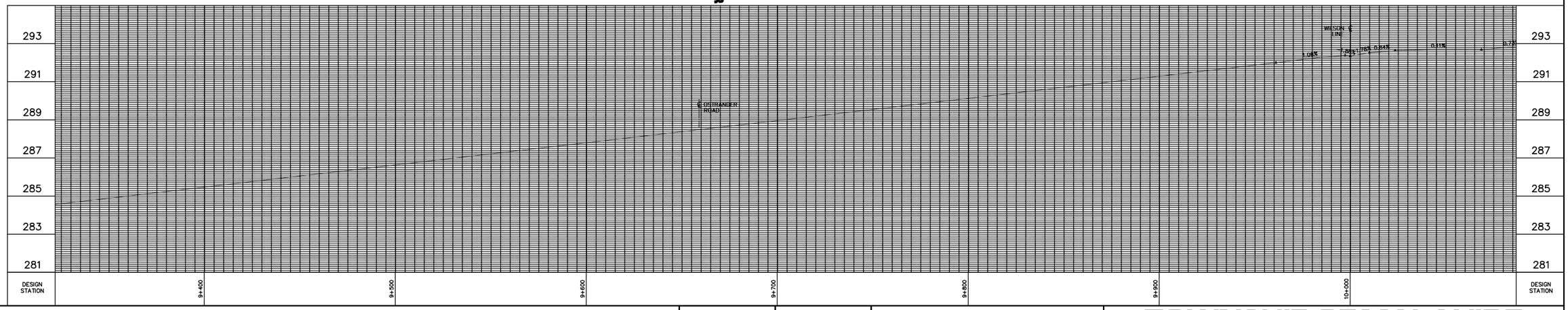
TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
PIGRAM LINE
STA 7+100 TO STA 8+600

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL	
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018	DRAWING No. 6









LEGEND

280 EXISTING CONTOURS (CJDL, 2017)

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LICENSED PROFESSIONAL ENGINEER
M.D.R. SWEETLAND
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LICENSED PROFESSIONAL ENGINEER
D.J. LYLE
100174772
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METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

No.	REVISION	DATE	BY

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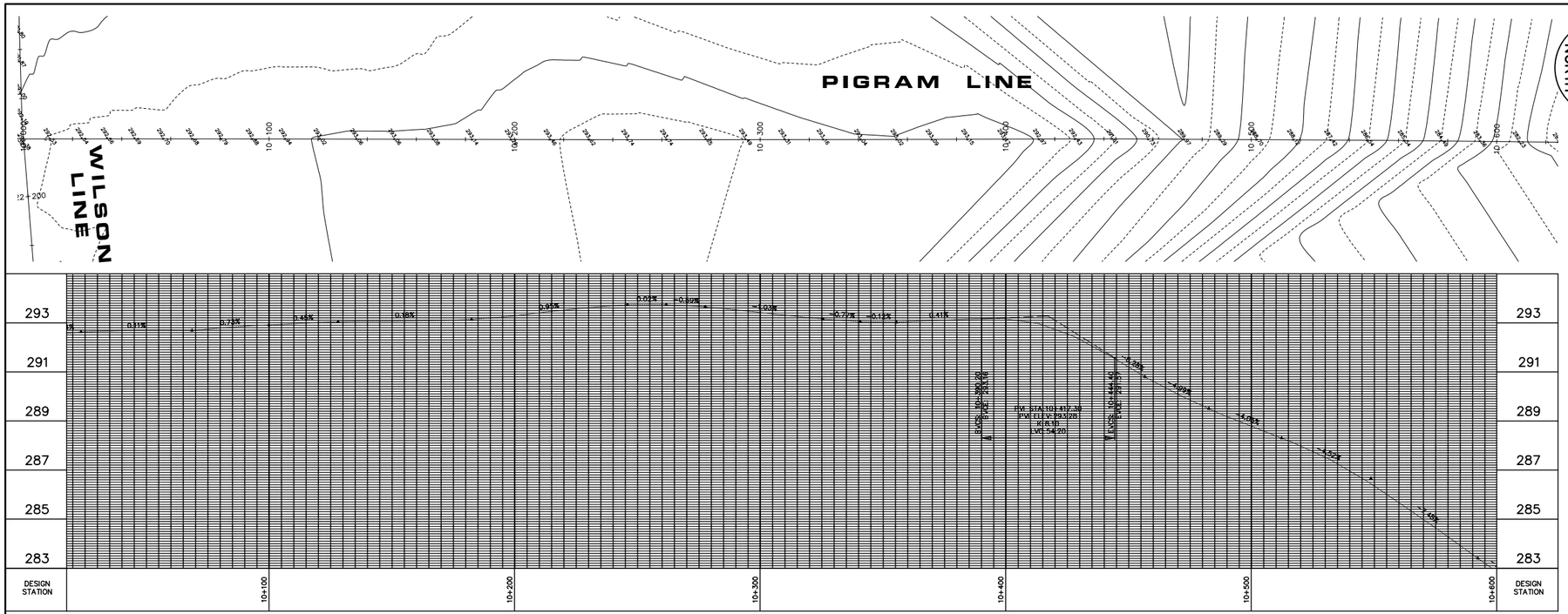
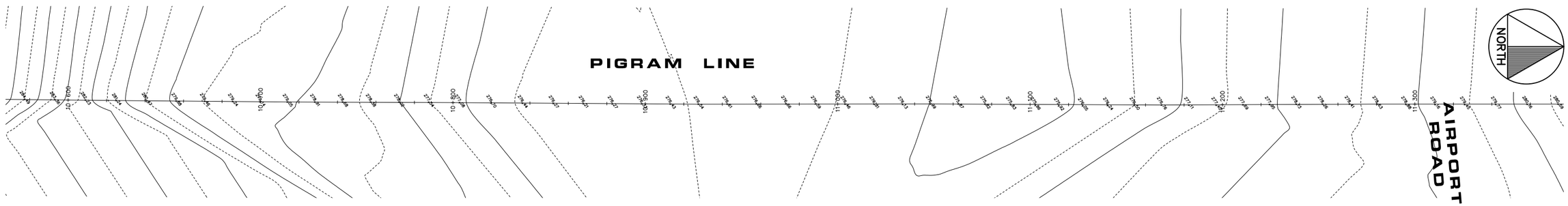
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
PIGRAM LINE
STA 8+600 TO STA 10+050

DRAWING No. 7





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LEGEND

280 EXISTING CONTOURS (CJDL, 2017)

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D.J. LYLE 100174772 LICENCED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO

METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

No.	REVISION	DATE	BY

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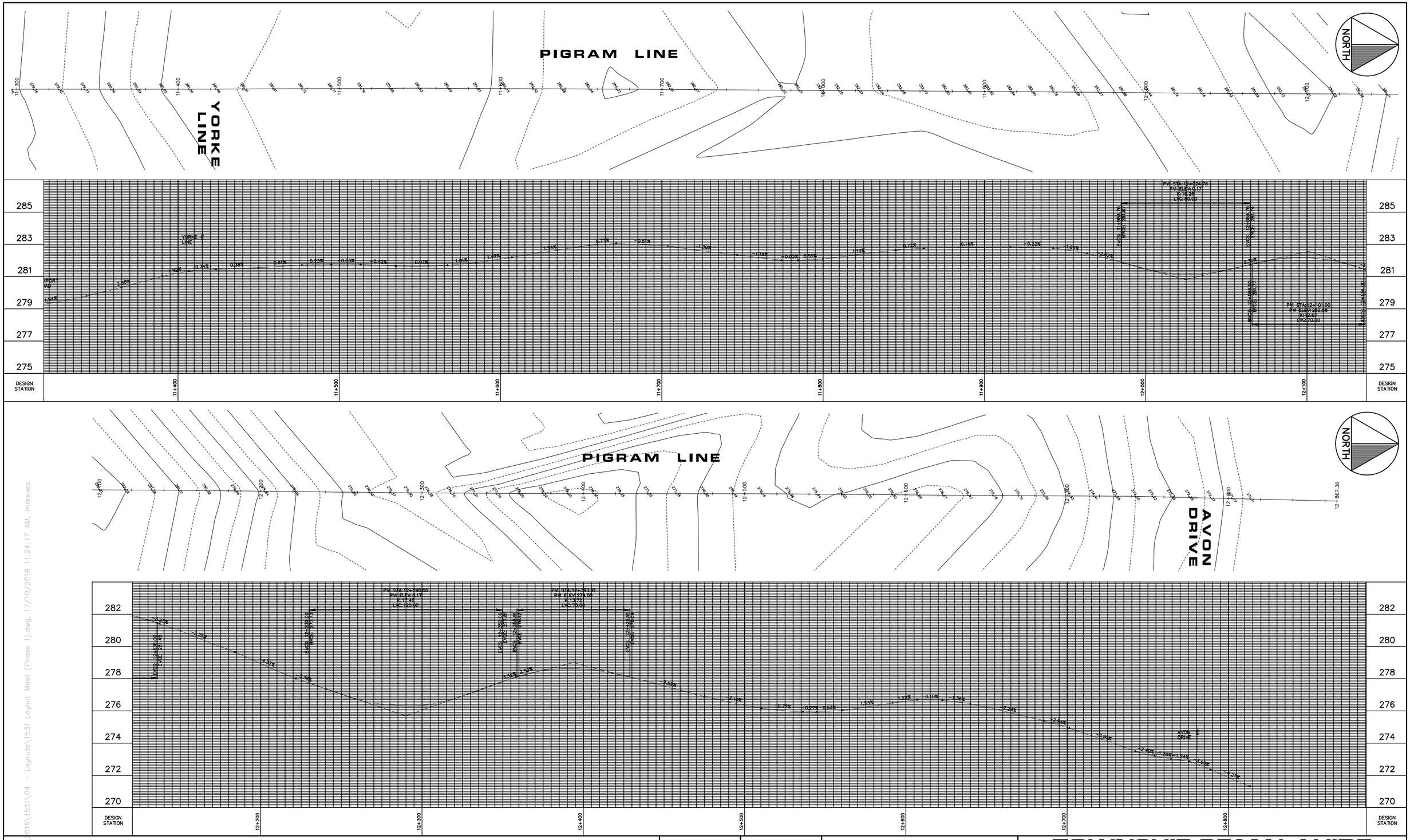
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
PIGRAM LINE
STA 10+000 TO STA 11+350

DRAWING No. 8



LEGEND

280 — EXISTING CONTOURS (CJDL, 2017)

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METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

No.	REVISION	DATE	BY

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TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1

PIGRAM LINE

STA 11+300 TO STA 12+800

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

DRAWING No. 9

Springwater Road

Ron McNeil Line to Mapleton Line

- **Criteria Review Sheet**

2.0 Criteria Review

Road Name: SPRINGWATER RD	Study Section: RUN MCNEIL TO MAPLETON LINE
Direction of Travel: NORTH / SOUTH	Total Distance Analysed: _____ km
Posted Speed: ~~80~~ NOT POSTED	AADT:
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 SEPT 2018

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -Cross-Section CL alignment: Crown Centered	ROAD WIDTH 7.5m NO SHOULDERS	
	Surface Treatment	-Comment on surface treatment	TAR + CHIP - GOOD CONDITION	
	Drainage	-Roadside swales? -Municipal Drains:	LONGITUDINAL SWALES DRAIN CROSSINGS ARE ADEQUATE FOR ROAD TRAVEL	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)		
Intersections	List of intersections within project limits	RUN MCNEIL -Intersection control: Stop Sign -Stopping sight distance: 50m	NO STOP AHEAD SIGN	
	List of intersections within project limits	MAPLETON LINE -Intersection control: -Stopping sight distance:	NO STOP AHEAD SIGN CHECKERBOARD SIGN	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m		
	Embankments	-Slope? -Height? -Protection required? Limits?		
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?		
Visual Aids		-Line painting: N/A – ~~Gravel Road~~ -Signage?		
Active Transportation		-Designation by the Master Plan?		

Whittaker Road

Avon Drive to Lyons Line

- **Criteria Review Sheet**
- **Site Photographs**
- **Centreline Profile Drawing**

2.0 Criteria Review

Road Name: *Whittaker Road*	Study Section: *Yorke Line to Avon Drive*
Direction of Travel: North to South	Total Distance Analysed: 1.42 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *53* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -varies -Cross-Section CL alignment: Crown Centered	No shoulder Road width inadequate: 5.8m	
	Surface Treatment	-Comment on surface treatment	Loose gravel (re-evaluation of drainage + clear zones required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Jolliffe Drain	Drain ✓ (outside clear zone)	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value		
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	Adequate passing sight distance (except within 500m of Mun. No 15161)	
Intersections	List of intersections within project limits	Whittaker Road /Yorke Line -Through traffic -Intersection control: Stop Sign -Stopping sight distance: 50m	-good sight lines travelling southbound) -adequate SSD	
	List of intersections within project limits	Whittaker Road/Avon Drive -Through traffic -Intersection control: Stop Sign -Stopping sight distance: 50m	-good sight lines -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	No obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	No embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	Drain, outside of clear zone + culvert	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-speed limit signs absent -no passing sign recommended	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Whittaker Road*	Study Section: *Crossley Hunter Line to Wilson Line*
Direction of Travel: North to South	Total Distance Analysed: 1.43 km
Posted Speed: *N/A* – Paved Rd; *Assume* 80km/h	AADT: *87* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – Varies -Cross-Section CL alignment: Crown Centered	-shoulder <0.5m	
	Surface Treatment	-Comment on surface treatment	asphalt pavement	
	Drainage	-Roadside swales? -Municipal Drains: Catfish Creek Drain, Grinstead Drain	Catfish Creek ✓ Curbside of clear zone	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is ~~200-410m~~ 275-550m (TAC, 1999)	~~Adequate~~ SSD	
Intersections	List of intersections within project limits	Whittaker Road / Wilson Line -~~Through traffic~~ -Intersection control: Stop Sign on Whittaker rd. -Stopping sight distance: 67m	-good sight lines -adequate SSD	
	List of intersections within project limits	Whittaker Road/Crossley Hunter Line -Through traffic -Intersection control: Stop Sign on Crossley Hunter Line -Stopping sight distance: 67m	-good sight lines -intersection ahead sign ✓ -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	No obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	No embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	Bridge over Catfish Creek – guardrail on E side only 1m from road	
Visual Aids		-Line painting: NO -Signage?	-speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

Whittaker Road – Guardrail over Catfish Creek on east side within 1m of roadway.

Whittaker Road – Poor visibility at Avon intersection (facing east) due to vertical alignment.

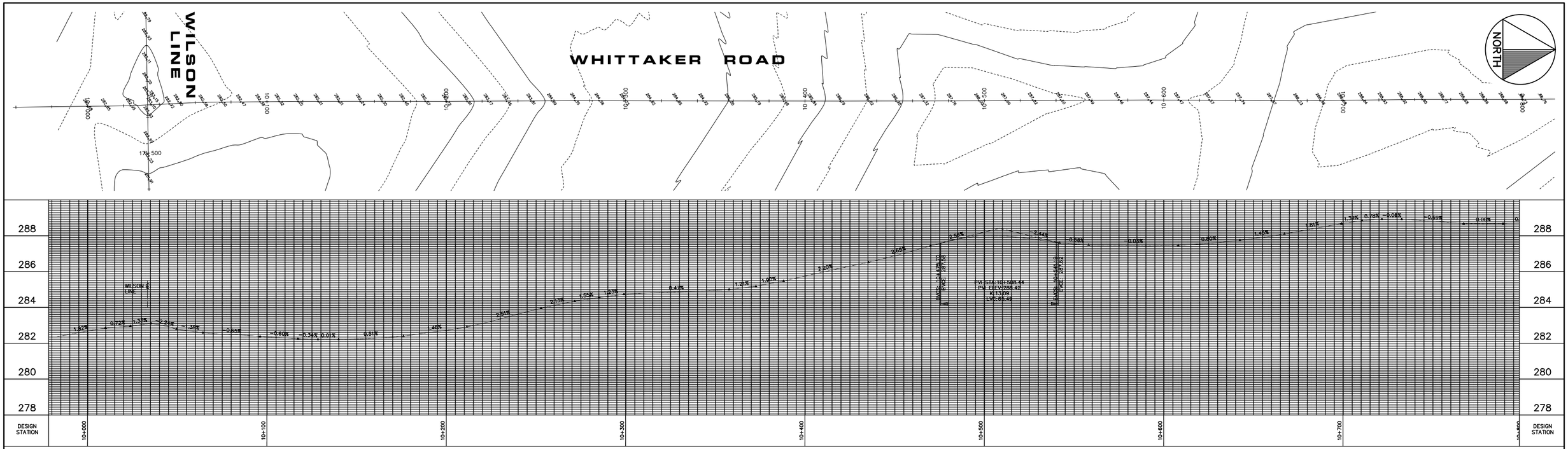
Whittaker Road – Poor visibility at Avon intersection (facing west) due to vertical alignment.

Whittaker Road – Poor visibility due to vertical alignment.

2.0 Criteria Review

Road Name: *Whittaker Road*	Study Section: *Lyons Line to Crossley Hunter Line*
Direction of Travel: South to North	Total Distance Analysed: 1.43 km
Posted Speed: *N/A* – Paved Rd; *Assume* 80km/h	AADT: *90* per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = ~~7.2~~m - Shoulder(s): ~~1~~.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	-shoulders ≤ 0.5 m -road width = 7.1 m	
	Surface Treatment	-Comment on surface treatment	Asphalt paving	
	Drainage	-Roadside swales? -Municipal Drains: Brooks Drain	-Brooks drain – outside of clear zone	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is ~~200-410m~~ 275-550m (TAC, 1999)	Adequate sight distance	
Intersections	List of intersections within project limits	Whittaker Road /Lyons Line ~~-Through traffic~~ -Intersection control: Stop Sign on Whittaker Rd -Stopping sight distance: 67m	-stop sign ahead signage recommended; hill makes it difficult to see intersection.	
	List of intersections within project limits	Whittaker Road/Crossley Hunter Line -Through traffic -Intersection control: Stop Sign on Crossley -Stopping sight distance: 67m Hunter Ln	-intersection ahead sign ✓ -good sight lines -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	No obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	3:1 slope down from roadway within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	Outside of clear zone (Brooks Drain culvert)	
Visual Aids		-Line painting: NO -Signage?	-speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		



LEGEND

280 — EXISTING CONTOURS (CJDL, 2017)

M.D.R. SWEETLAND 100171341 — LICENCED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

D.J. LYLE 100174772 — LICENCED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

No.	REVISION	DATE	BY

TOWNSHIP OF MALAHIDE

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DESIGN BY: MDS DJL | DRAWN BY: TJW AER | CHECKED BY: MDS DJL

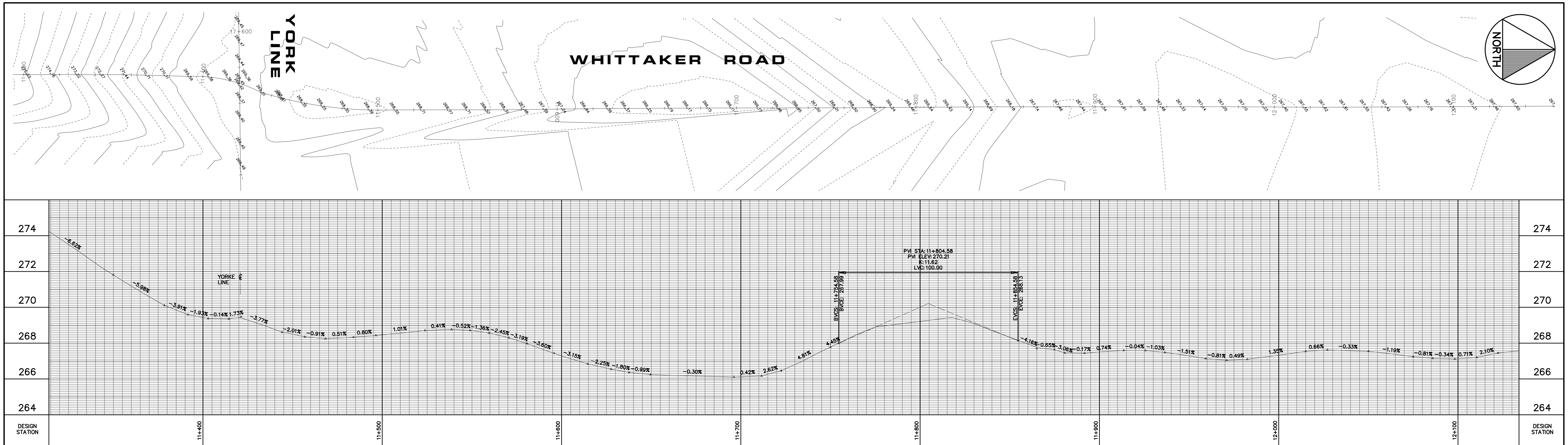
PROJECT NO. 1531 | SURVEY BY: TPM | DATE: OCT 2018

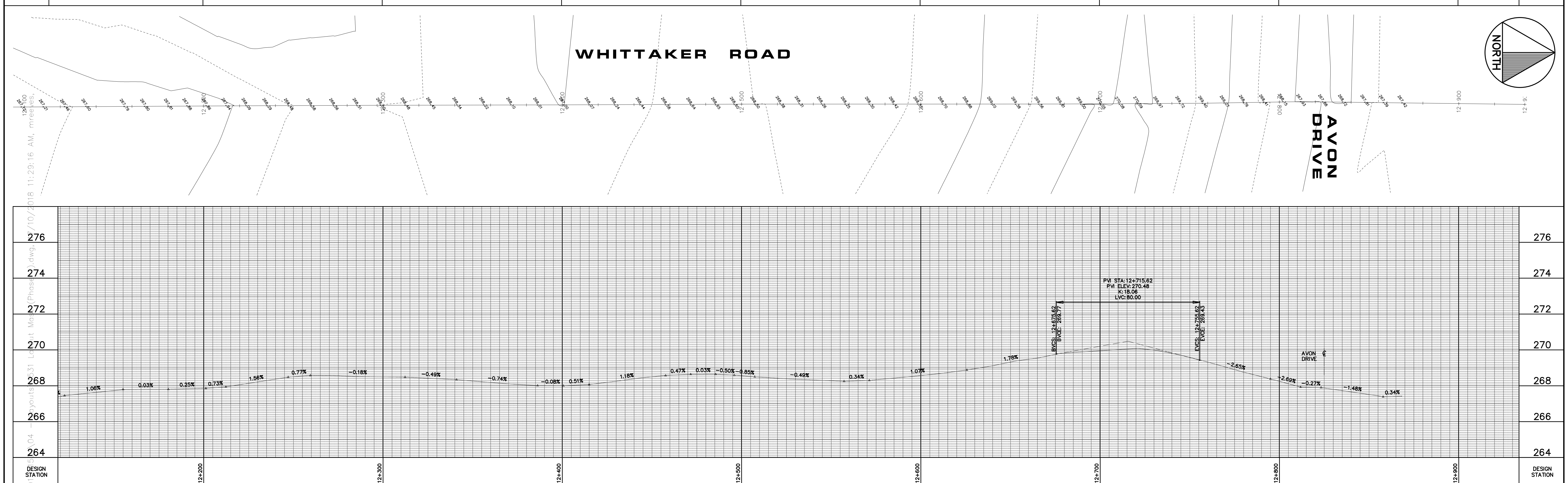
TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1

WHITTAKER ROAD

STA 10+000 TO STA 11+300

DRAWING No. 10





LEGEND

280 — EXISTING CONTOURS (CJDL, 2017)

LICENSED PROFESSIONAL ENGINEER M.D.R. SWEETLAND 100171341 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER D.J. LYLE 100174772 PROVINCE OF ONTARIO

METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

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TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
WHITTAKER ROAD
STA 11+300 TO STA 12+900

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL	
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018	DRAWING No. 11

Wilson Line

Belmont Road to Pigram Line

- **Criteria Review Sheet**
- **Site Photographs**
- **Centreline Profile Drawing**

2.0 Criteria Review

Road Name: *Wilson Line*	Study Section: Belmont Rd. to Dorchester Rd.
Direction of Travel: West to East	Total Distance Analysed: 3.71 km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *103* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	shoulders ≤ 0.5 m	
	Surface Treatment	-Comment on surface treatment	asphalt paving	
	Drainage	-Roadside swales? -Municipal Drains: Poortinga Drain, Charlton Drain	Longitudinal swale	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	adequate passing sight distance	
Intersections	List of intersections within project limits	Wilson Line /~~Imperial Road~~ Dorchester -Through traffic -Intersection control: Stop Sign -Stopping sight distance: 67m	-good sight lines -adequate SSD	
	List of intersections within project limits	Wilson Line/ ~~Whittaker Road~~ Belmont -Through traffic -Intersection control: Stop Sign -Stopping sight distance: 67m	-good sight lines -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risk within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: None -Signage?	-speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Wilson Line*	Study Section: Dorchester to Imperial
Direction of Travel: West to East	Total Distance Analysed: ~~3.70~~ km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *118* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -varies -Cross-Section CL alignment: Crown Centered	shoulders ≤0.5 m	
	Surface Treatment	-Comment on surface treatment	asphalt paving	
	Drainage	-Roadside swales? -Municipal Drains: Clapton-Farrow Drain	Longitudinal swale	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value		
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	not always good passing sight distance	
Intersections	List of intersections within project limits	Wilson Line /~~Gorless Road~~ Dorchester Rd. -~~through traffic~~ -Intersection control: Stop Sign on Dorchester Rd -Stopping sight distance: 67m	-good sight lines -adequate stopping distance	
	List of intersections within project limits	Wilson Line/ ~~Pigram Line~~ Imperial -~~Through traffic~~ -Intersection control: Stop Sign on Wilson Line -Stopping sight distance: 67m	-good sight lines -adequate stopping distance	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks exist within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: None -Signage?	-speed limit signs absent -no passing signs recommended	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Wilson Line*	Study Section: *Imperial Road to Whittaker Road*
Direction of Travel: West to East	Total Distance Analysed: 3.69 km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *180* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	no shoulder	
	Surface Treatment	-Comment on surface treatment	paved	
	Drainage	-Roadside swales? -Municipal Drains: Babcock Drain, Booy Drain, J.L. Ferguson Drain, Upper Catfish	swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value		
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	not always safe passing distance	
Intersections	List of intersections within project limits	Wilson Line /Imperial Road -Through traffic -Intersection control: Stop Sign -Stopping sight distance: 67m	-good sight lines -adequate SSD	
	List of intersections within project limits	Wilson Line/ Whittaker Road -Through traffic -Intersection control: Stop Sign -Stopping sight distance: 67m	-good sight lines -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks exist within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: None -Signage?	-speed limit signs absent -no passing sign recommended	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Wilson Line*	Study Section: *Whittaker Road to Putnam Road*
Direction of Travel: West to East	Total Distance Analysed: 1.85 km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *180* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -varies -Cross-Section CL alignment: Crown Centered	no shoulder	
	Surface Treatment	-Comment on surface treatment	paved	
	Drainage	-Roadside swales? -Municipal Drains: Giret Wilson Drain	swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value		
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	not always safe passing distance	
Intersections	List of intersections within project limits	Wilson Line /Whittaker Road -Through traffic -Intersection control: Stop Sign On Whittaker Rd -Stopping sight distance: 67m	-good sight lines -adequate SSD	
	List of intersections within project limits	Wilson Line/ Putnam Road -~~Through traffic~~ -Intersection control: Stop Sign On Wilson Ln -Stopping sight distance: 67m	-stop sign ahead signage recommended	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: None -Signage?	-Speed limit signs absent -no passing sign recommended	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Wilson Line*	Study Section: *Putnam Road to Corless Road*
Direction of Travel: West to East	Total Distance Analysed: 1.8k km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *218* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

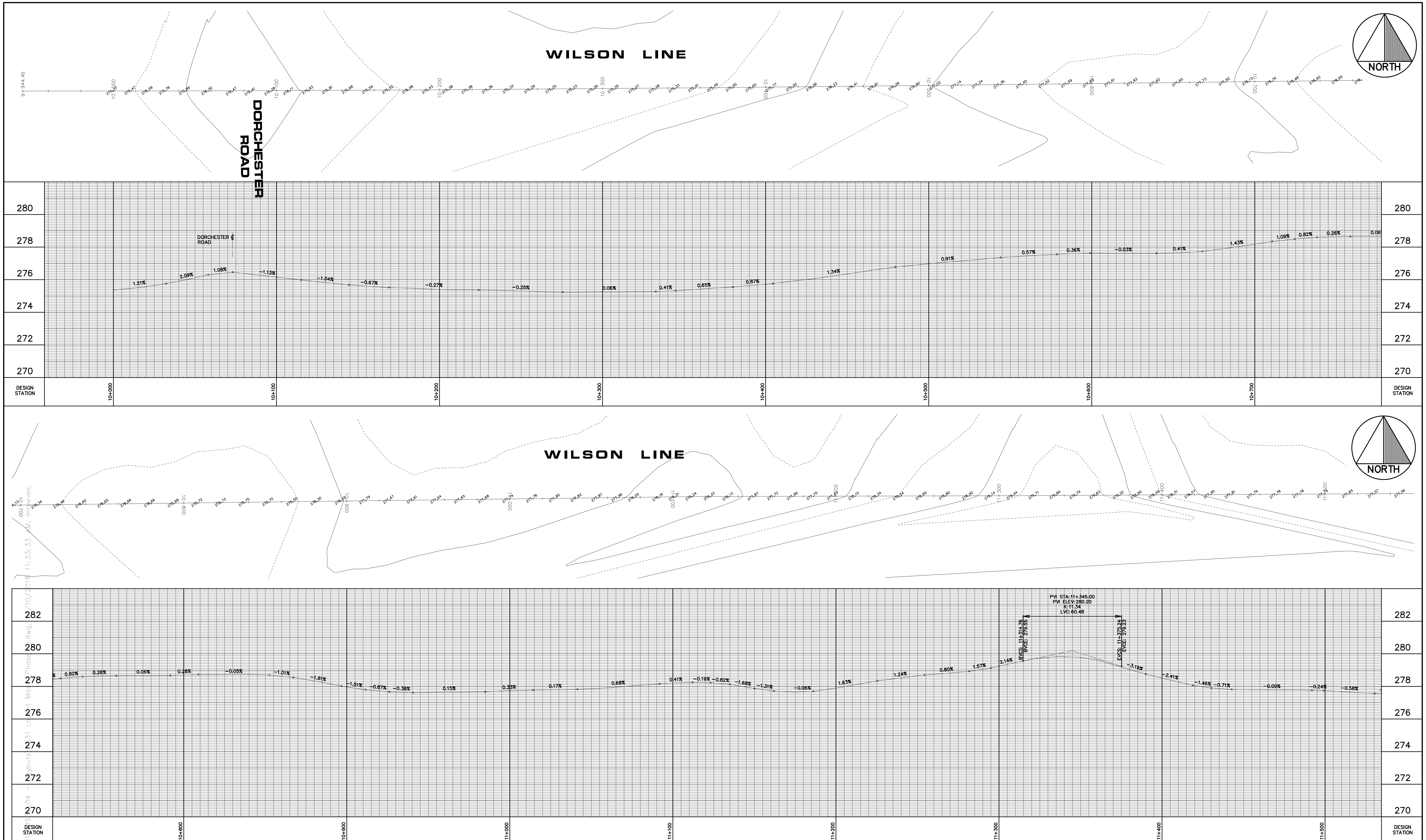
Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	shoulders ≈0.5 m	
	Surface Treatment	-Comment on surface treatment	paved	
	Drainage	-Roadside swales? -Municipal Drains: Pearson Drain	swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value		
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	not always adequate passing distance	
Intersections	List of intersections within project limits	Wilson Line /Putnam Road ~~-Through traffic~~ -Intersection control: Stop Sign on Wilson Ln -Stopping sight distance: 67m	-stop sign ahead signage recommended due to vertical alignment	
	List of intersections within project limits	Wilson Line/ Corless Road -Through traffic -Intersection control: Stop Sign on Corless Rd. -Stopping sight distance: 67m	- intersection ahead sign recommended	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: None -Signage?	-speed limit signs absent -no passing sign recommended	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Wilson Line*	Study Section: *Corless Road to Pigram Line*
Direction of Travel: West to East	Total Distance Analysed: 0.98 km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *217* Per 2015 Municipal Rd Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	shoulders ≤0.5 m	
	Surface Treatment	-Comment on surface treatment	asphalt paving	
	Drainage	-Roadside swales? -Municipal Drains: Clapton-Farrow Drain	swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value		
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	adequate passing sight distance (except within 300m of Mun. No. 52407)	
Intersections	List of intersections within project limits	Wilson Line /Corless Road -Through traffic -Intersection control: Stop Sign on Corless -Stopping sight distance: 67m	-intersection ahead sign required due to vertical alignment	
	List of intersections within project limits	Wilson Line/ Pigram Line -~~Through traffic~~ -Intersection control: Stop Sign on Wilson Ln -Stopping sight distance: 67m	-good sight lines -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	3:1 slope on S side, E of Mun. No 52407 within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: None -Signage?	-Speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

Wilson Line – Poor visibility due to vertical alignment.



LEGEND

280 — EXISTING CONTOURS (CJDL, 2017)

M.D.R. SWEETLAND 100171341 LICENSED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO

D.J. LYLE 100174772 LICENSED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO

METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

No.	REVISION	DATE	BY

TOWNSHIP OF MALAHIDE

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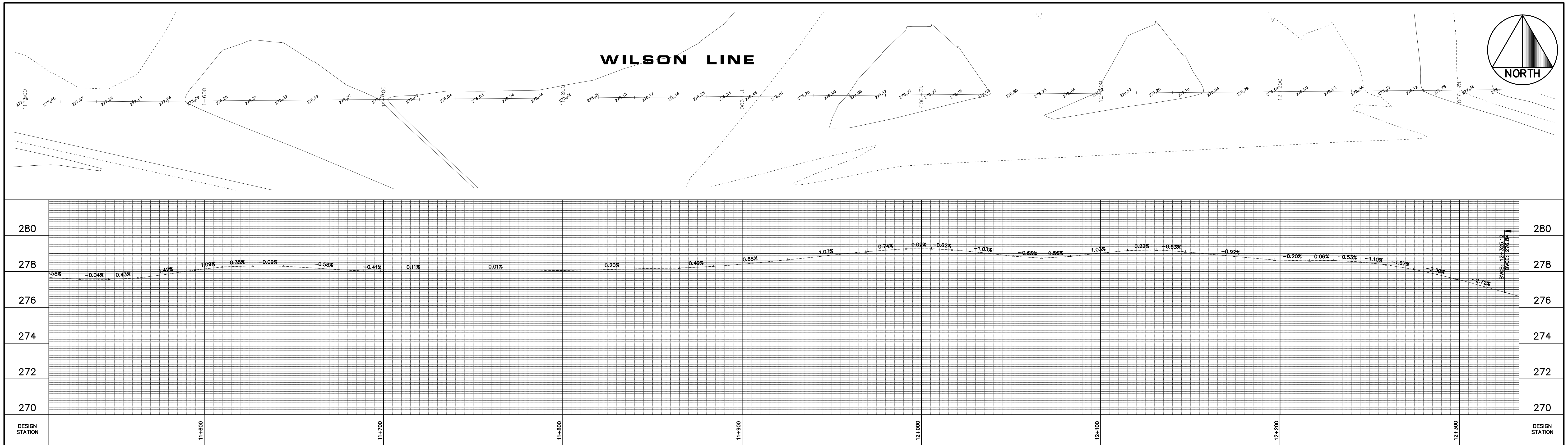
cjdl@cjdleng.com

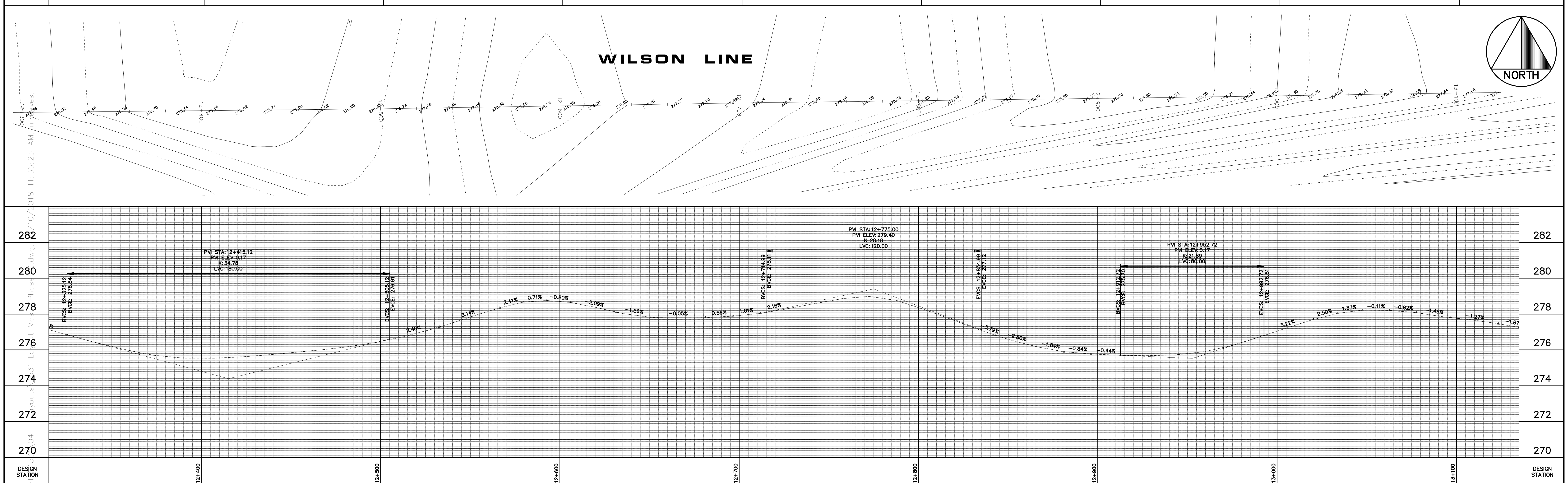
TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
WILSON LINE
STA 10+000 TO STA 11+500

DESIGN BY: MDS DJL | DRAWN BY: TJW AER | CHECKED BY: MDS DJL

PROJECT NO. 1531 | SURVEY BY: TPM | DATE: OCT 2018

DRAWING No. 12





LEGEND

280 EXISTING CONTOURS (CJDL, 2017)

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LICENSED PROFESSIONAL ENGINEER
D.J. LYLE
100174772
PROVINCE OF ONTARIO

METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

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TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
WILSON LINE
STA 11+500 TO STA 13+100

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

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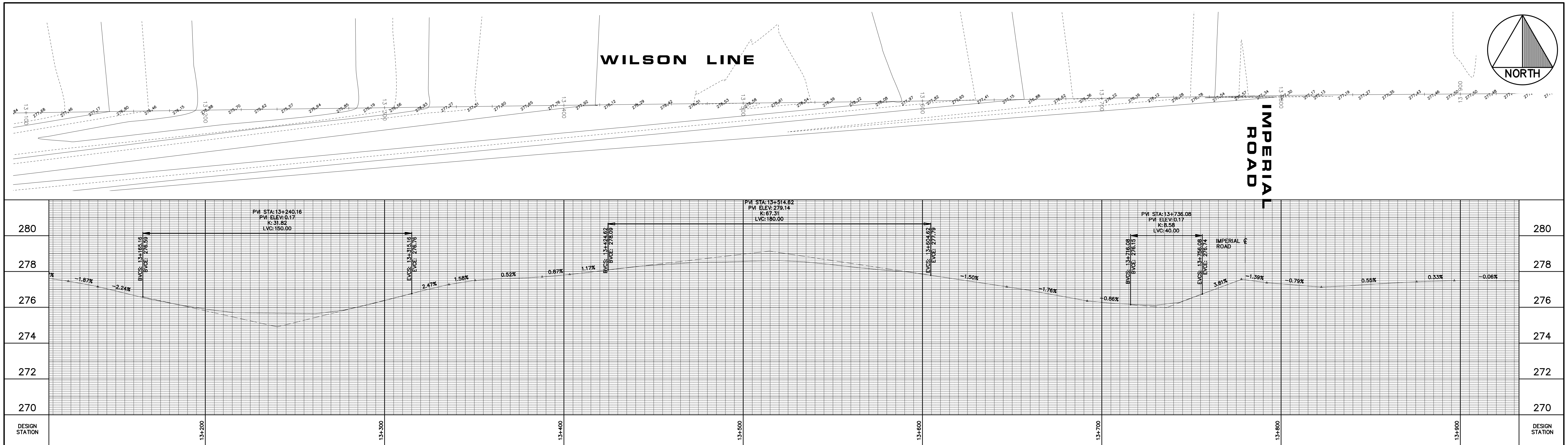

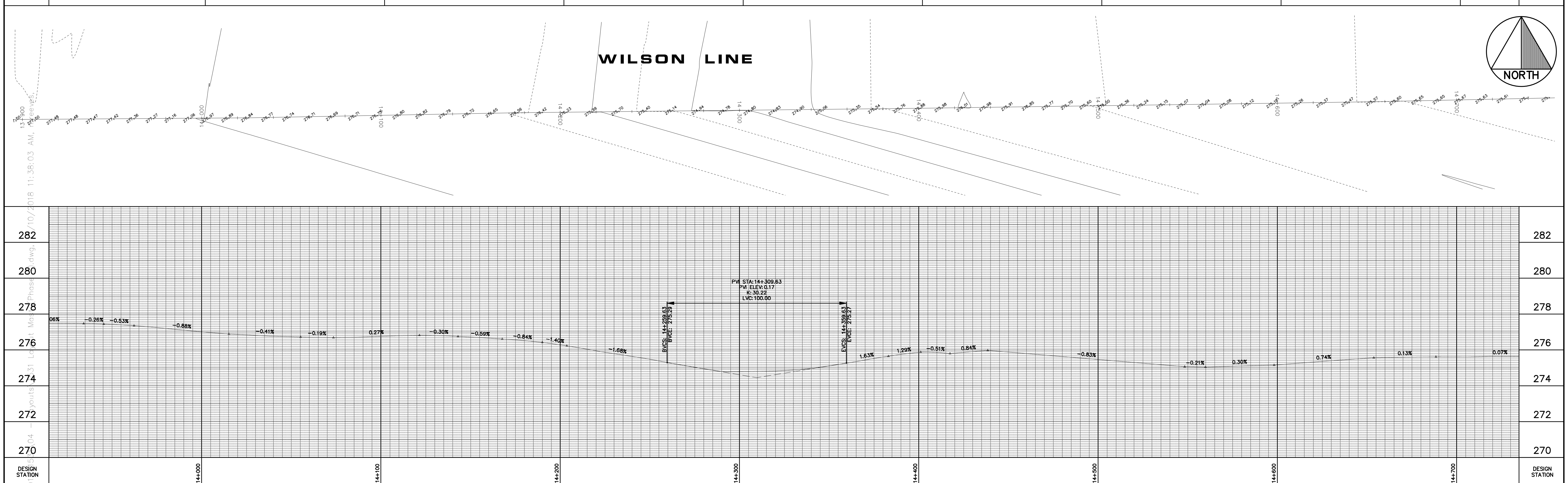

LEGEND

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METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

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TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
WILSON LINE
STA 13+100 TO STA 14+700

DESIGN BY: MDS DJL | DRAWN BY: TJW AER | CHECKED BY: MDS DJL

PROJECT NO. 1531 | SURVEY BY: TPM | DATE: OCT 2018

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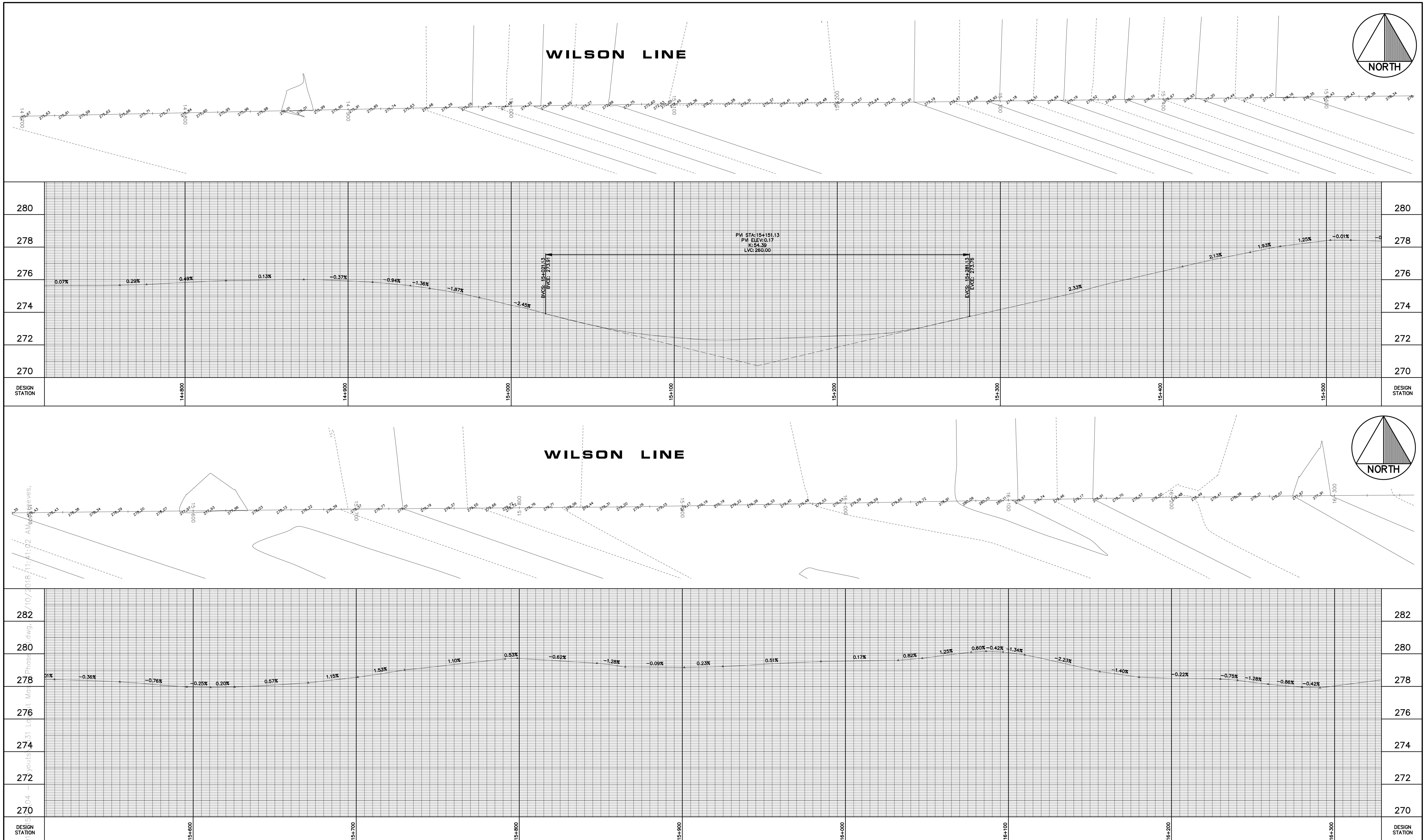

LEGEND

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TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
WILSON LINE
STA 14+700 TO STA 16+300

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

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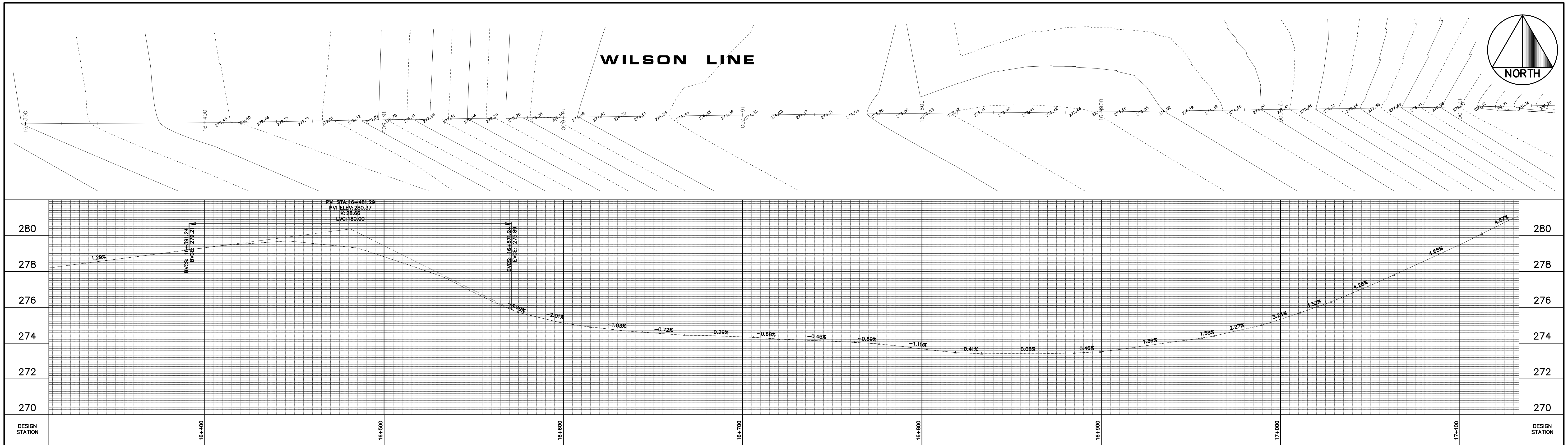

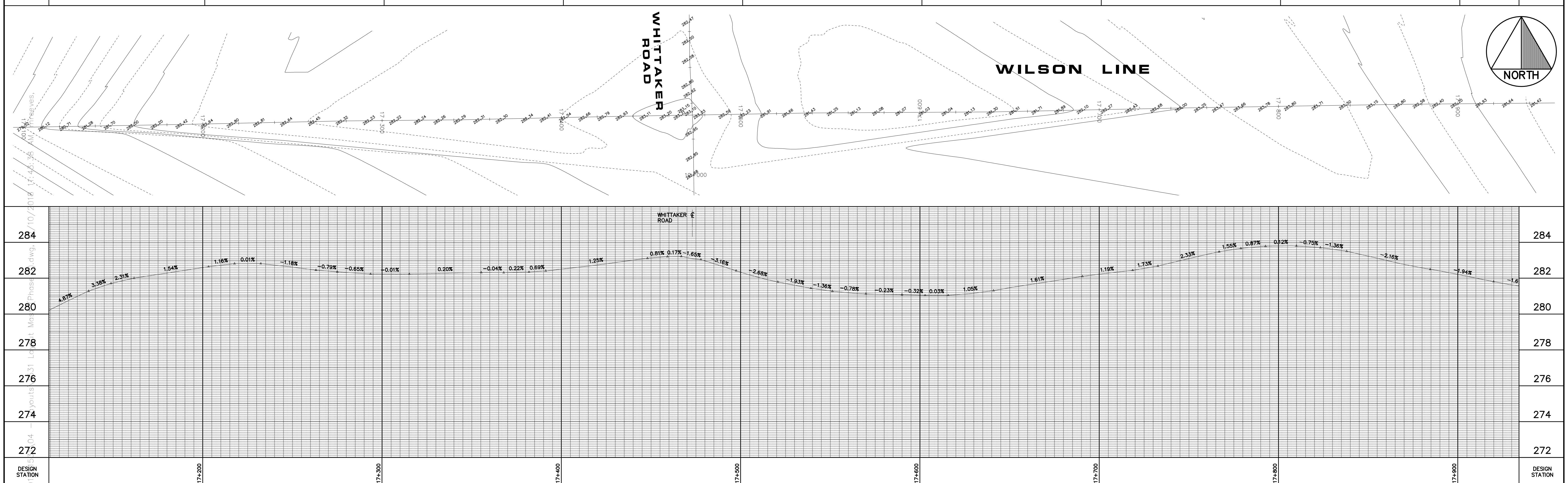

LEGEND

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METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

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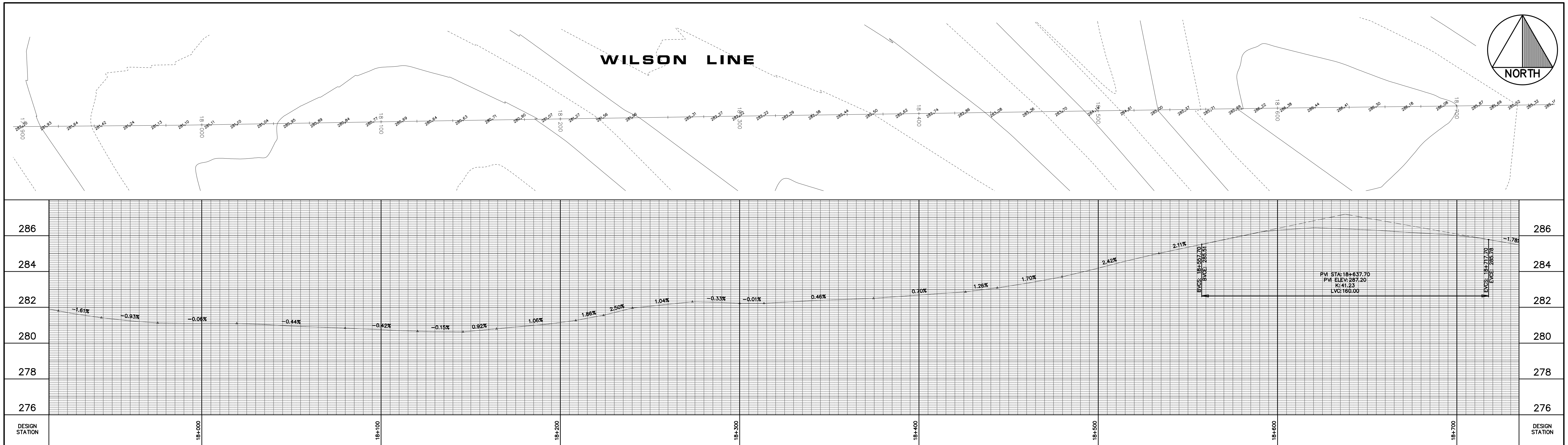
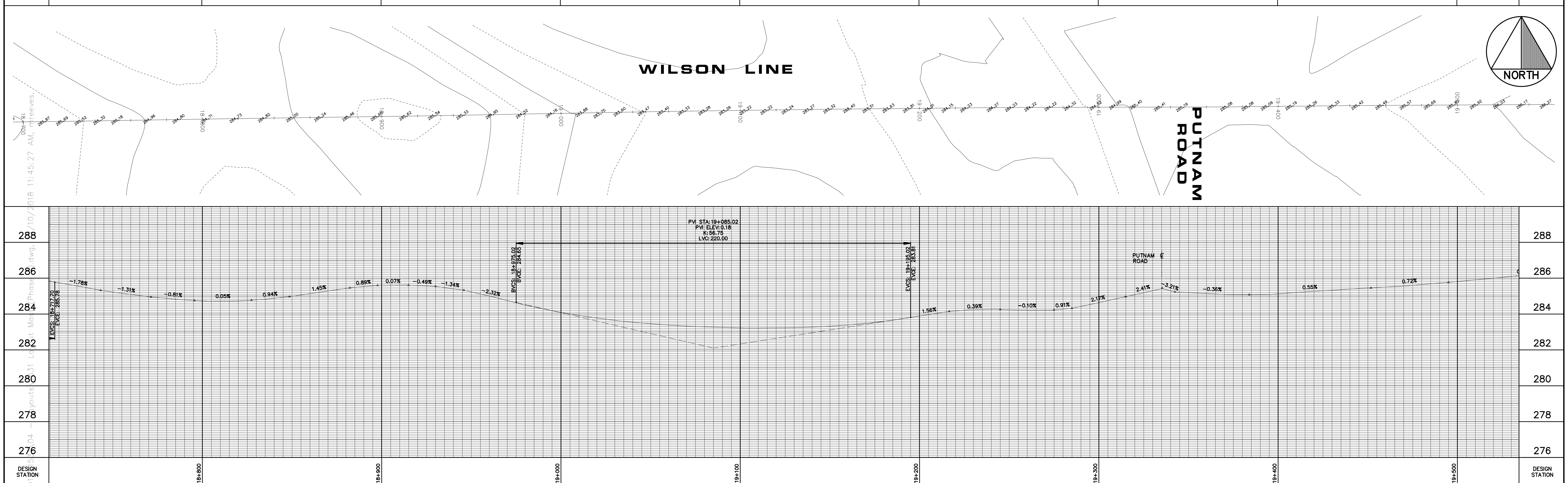
TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
WILSON LINE
STA 16+300 TO STA 17+900

DESIGN BY: MDS DJL | DRAWN BY: TJW AER | CHECKED BY: MDS DJL

PROJECT NO. 1531 | SURVEY BY: TPM | DATE: OCT 2018 | DRAWING No. 16





LEGEND

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TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
WILSON LINE
STA 17+900 TO STA 19+500

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

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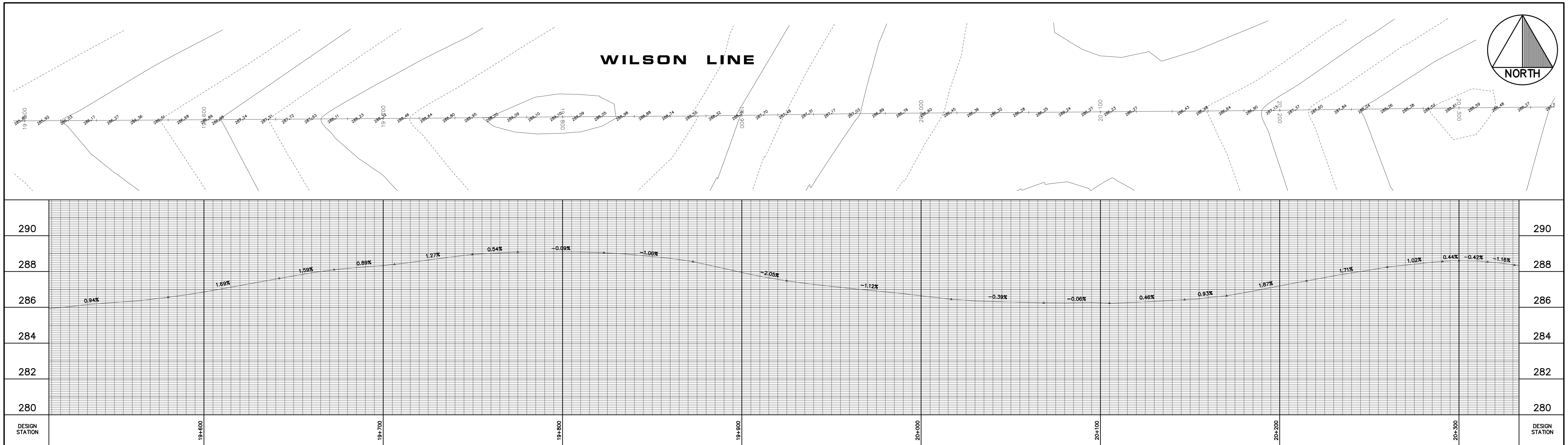

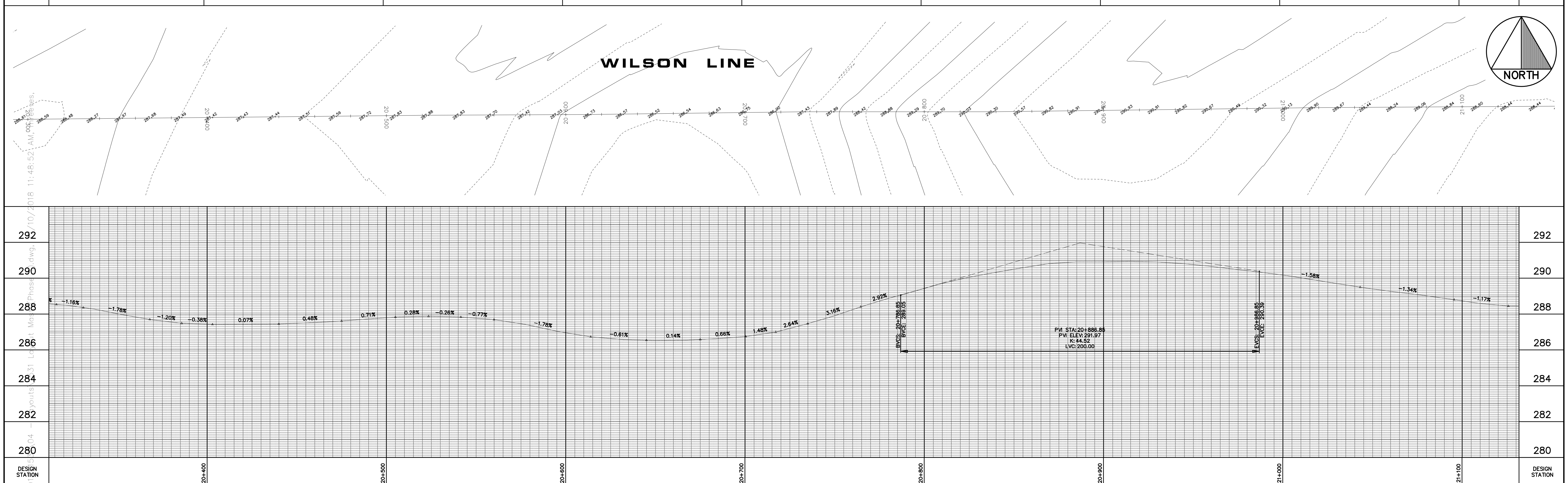

LEGEND

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No.	REVISION	DATE	BY

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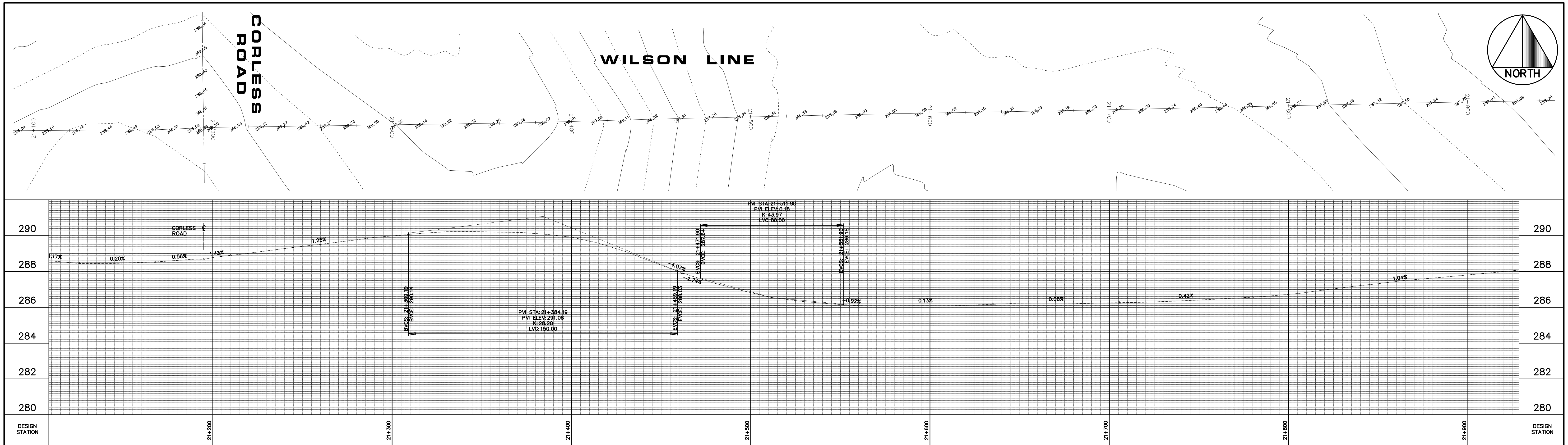
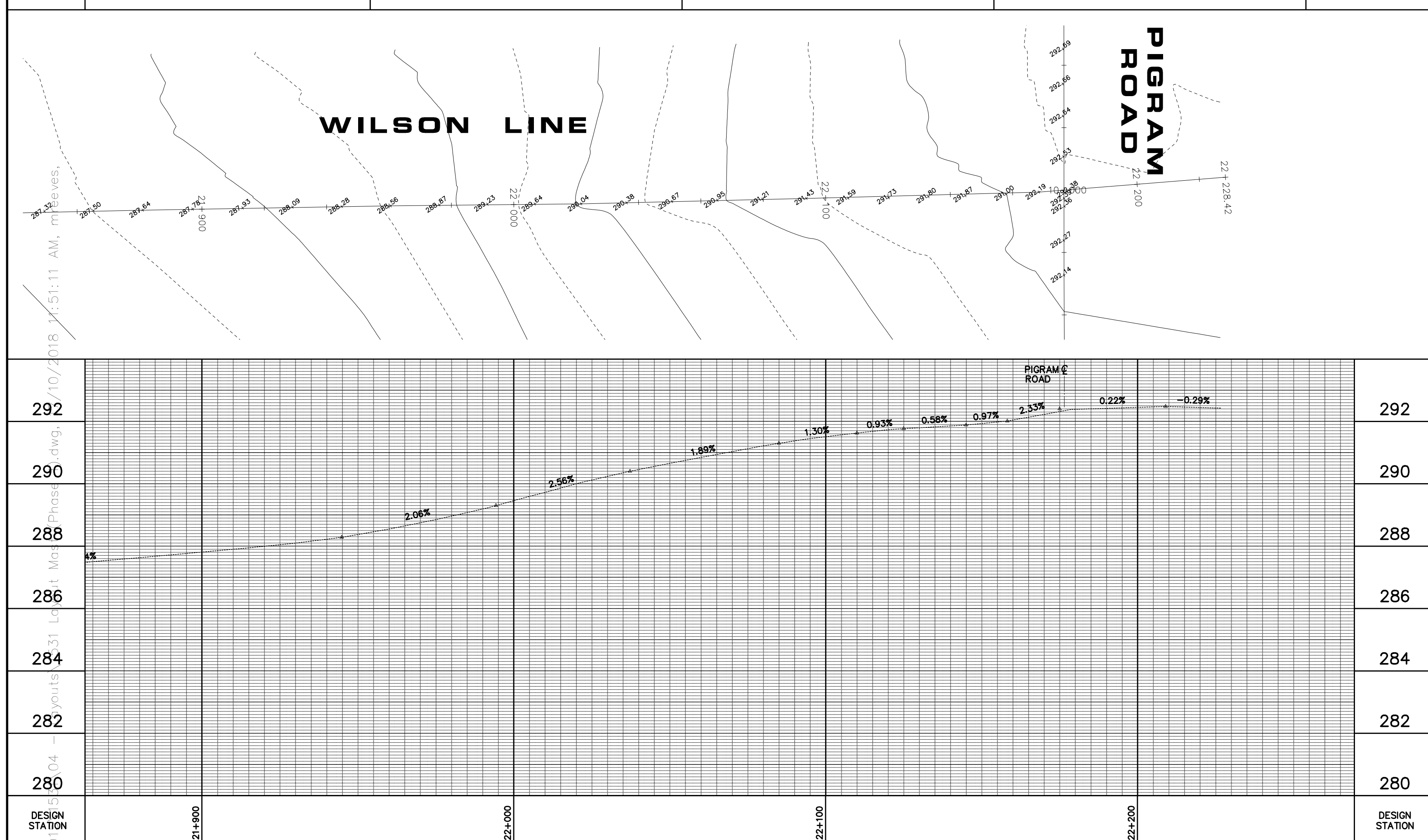
TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
WILSON LINE
STA 19+500 TO STA 21+100

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL	
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018	DRAWING No. 18





LEGEND

280 — EXISTING CONTOURS (CJDL, 2017)

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No.	REVISION	DATE	BY

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TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1

WILSON LINE

STA 21+100 TO STA 22+200

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL	
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018	DRAWING No. 19

Yorke Line

Belmont Road to Pigram Line

- **Criteria Review Sheet**
- **Embankment Protection Warrant**
- **Site Photographs**
- **Centreline Profile Drawing**

2.0 Criteria Review

Road Name: *Yorke Line*	Study Section: *Dorchester Road to Belmont Road*
Direction of Travel: West to East	Total Distance Analysed: _____ km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *296*
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m - Shoulder(s): 2.5m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -varies -Cross-Section CL alignment: Crown Centered	shoulder ≈0.5 m road width = 7.1 m	
	Surface Treatment	-Comment on surface treatment	asphalt paving	
	Drainage	-Roadside swales? -Municipal Drains: Pettit Drain, Prohl Drain	longitudinal swale	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	adequate passing sight distance	
Intersections	List of intersections within project limits	Yorke Line/Dorchester Road -Through traffic -Intersection control: Stop Sign on Dorchester Rd. -Stopping sight distance: 67m	-good sight lines -adequate SSD	
	List of intersections within project limits	Yorke Line/Belmont Road ~~-Through traffic~~ -Intersection control: Stop Sign on Yorke Ln -Stopping sight distance: 67m	↓	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions exist within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?		
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: None -Signage?	-speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Yorke Line*	Study Section: *Dorchester Road to Imperial Road*
Direction of Travel: West to East	Total Distance Analysed: 3.68 km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *257* per 2015 Municipal Road Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.5m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	shoulder <0.5 m	
	Surface Treatment	-Comment on surface treatment	asphalt paving	
	Drainage	-Roadside swales? -Municipal Drains: Livingston Drain, Shackleton Drain, Yorke Drain	swale runs longitudinal	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	~~N/A~~ Many vertical curves	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	adequate passing sight distance	
Intersections	List of intersections within project limits	Yorke Line /Dorchester Road -Through traffic -Intersection control: Stop Sign on Dorchester Rd -Stopping sight distance: 67m	-good sight lines -adequate SSD	
	List of intersections within project limits	Yorke Line/ Imperial Road -~~Through traffic~~ -Intersection control: Stop Sign on Yorke Line -Stopping sight distance: 67m	↓	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	ditch within clear zone, W of Dorchester. (~2m)	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: None -Signage?	-speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Yorke Line*	Study Section: *Imperial Road to Helder Road*
Direction of Travel: West to East	Total Distance Analysed: 1.86 km
Posted Speed: *N/A – Paved Road; Assume 80km/h*	AADT: *128* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

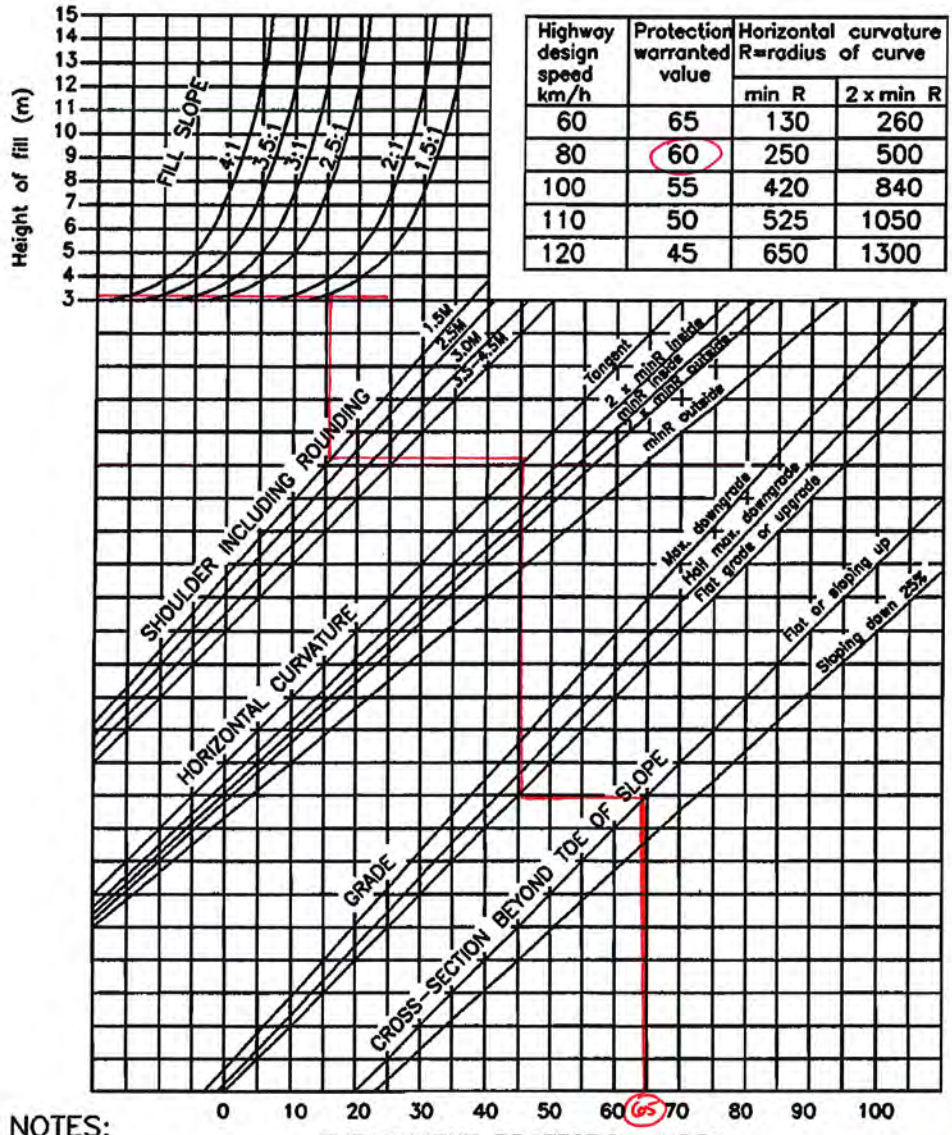
Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.6m x 2 = 7.2m ✓ - Shoulder(s): 2.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% -varies -Cross-Section CL alignment: Crown Centered	no shoulder	
	Surface Treatment	-Comment on surface treatment	asphalt paving	
	Drainage	-Roadside swales? -Municipal Drains: Bentley Drain, T.N. Dunn Award Drain	Longitudinal swale	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value		
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 275-550m (TAC, 1999)	passing sight distance inadequate on W half of road.	
Intersections	List of intersections within project limits	Yorke Line /Imperial Road ~~-Through traffic~~ -Intersection control: Stop Sign ~~on~~ Yorke Line -Stopping sight distance: 67m	-vertical alignment decreases visibility; ~~intersection ahead sign~~ recommended Stop sign ahead signage	
	List of intersections within project limits	Yorke Line/Helder Road -Through traffic -Intersection control: Stop Sign on Helder Rd. -Stopping sight distance: 67m	-intersection ahead sign recommended	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 4m	no obstructions within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: None -Signage?	-speed limit signs absent -no passing sign recommended	
Active Transportation		-Designation by the Master Plan?		

2.0 Criteria Review

Road Name: *Yorke Line*	Study Section: *Putnam Road to Corless Road*
Direction of Travel: East to West	Total Distance Analysed: 1.86 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *65* per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m ✓ - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	-no shoulder	
	Surface Treatment	-Comment on surface treatment	Loose gravel (re-evaluation of drainage & clear zone required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Teskey Drain	Longitudinal swale	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	adequate passing sight distance	
Intersections	List of intersections within project limits	Yorke Line/Putnam Road ~~-Through traffic-~~ -Intersection control: Stop Sign on Putnam Rd. -Stopping sight distance: 50m	-good visibility -adequate SSD ↓	
	List of intersections within project limits	Yorke Line/Corless Road -Through traffic -Intersection control: Stop Sign on Corless Rd -Stopping sight distance: 50m		
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	hydro poles on N side	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-Speed limit signs absent	
Active Transportation		-Designation by the Master Plan?		

York Line @ Kettle Creek
Municipal Drain - North Side



Highway design speed km/h	Protection warranted value	Horizontal curvature R=radius of curve	
		min R	2 x min R
60	65	130	260
80	60	250	500
100	55	420	840
110	50	525	1050
120	45	650	1300

EMBANKMENT PROTECTION WARRANT GUIDE

> Protection Warrant Value
∴ Provide protection

NOTES:

1 Guide rail is not required for:

Undivided Hwys
- On fill heights less than 3 metres.
- Slopes 3:1 or flatter.

Divided Hwys
- On fill heights less than 2 metres.
- Slopes 4:1 or flatter.

2 When the embankment protection index is greater than the protection warranted value guide rail or slope flattening is required.

FIGURE 2.5.1 Embankment Warrant Guide

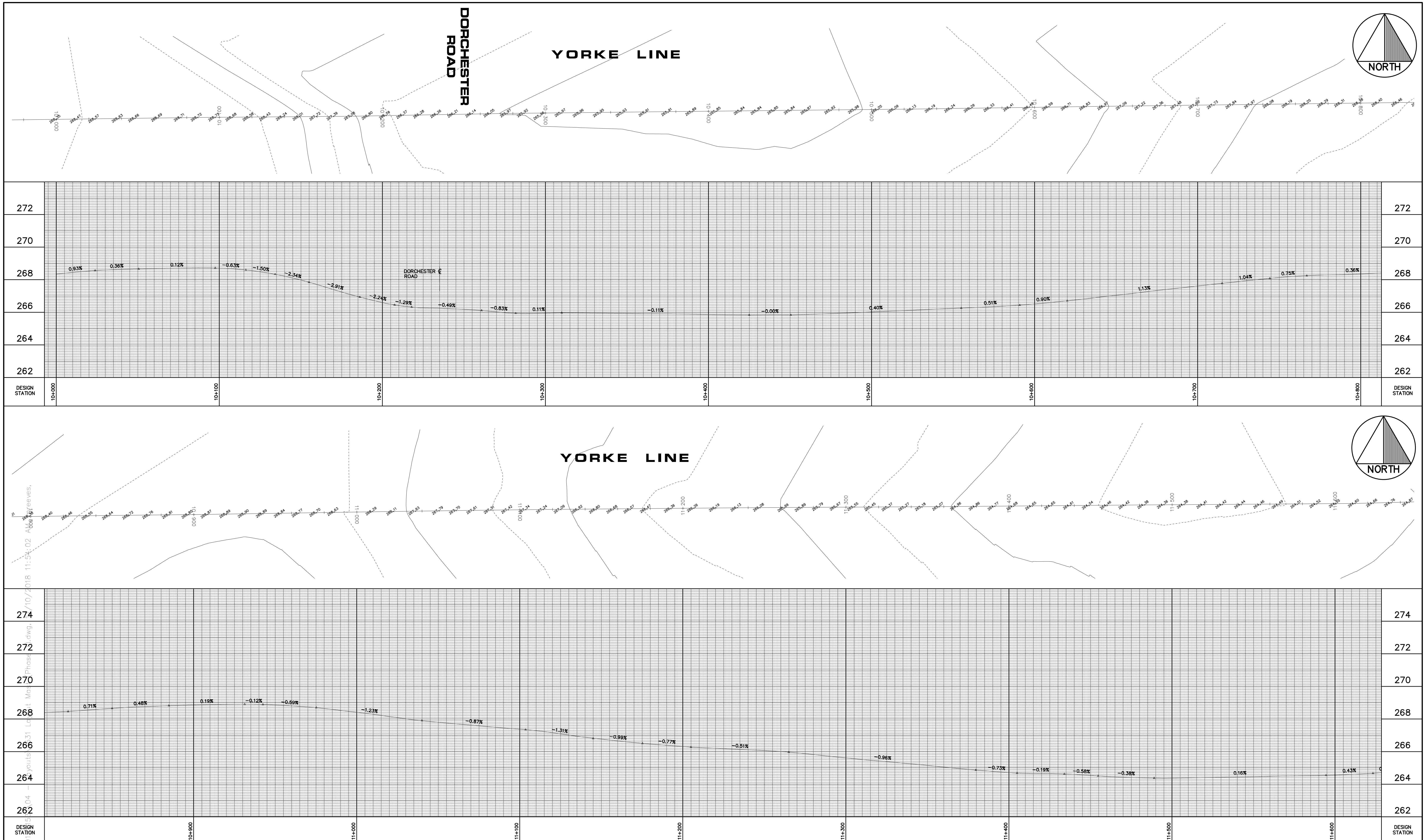
Yorke Line · @ Kettle Creek X-ing - North Side

Yorke Line – Hydro poles within clear zone between Corless Road and Putnam Road.

2.0 Criteria Review

Road Name: *Yorke Line*	Study Section: *Corless Road to Pigram Road*
Direction of Travel: East to West	Total Distance Analysed: 0.99 km
Posted Speed: *N/A – Gravel Road; Assume 60km/h*	AADT: *41* Per 2015 Municipal Rd. Inventory Condition Assessment
Right-of-Way Width: *20m (66')*	Date of Site Inspection: 28 June 2017

Criteria		Design Recommendations	On-Site Observations	Deficiencies
Cross-Section	Geometry	-Cross-section lane widths: 3.5m x 2 = 7.0m ✓ - Shoulder(s): 1.0m wide - Boulevard(s): N/A -Typ. cross-fall: 2% – varies -Cross-Section CL alignment: Crown Centered	no shoulder	
	Surface Treatment	-Comment on surface treatment	loose gravel (reevaluation of clear zones + drainage required if paving)	
	Drainage	-Roadside swales? -Municipal Drains: Teskey Drain	Longitudinal swale	
Alignment	Vertical Alignment	-Maximum road segment grades -Vertical curve 'K' value	N/A	
	Horizontal Alignment	-Minimum design radius is ___m and the maximum super elevation is ____m/m (TAC, 1999)	N/A	
	Passing Sight Distance	-The minimum passing sight distance is 200-410m (TAC, 1999)	adequate passing sight distance	
Intersections	List of intersections within project limits	Yorke Line/~~Putnam Road~~ Pigram Rd. ~~-Through traffic~~ -Intersection control: Stop Sign on Yorke Line -Stopping sight distance: 50m	-good visibility -adequate SSD	
	List of intersections within project limits	Yorke Line/Corless Road -Through traffic -Intersection control: Stop Sign on Corless -Stopping sight distance: 50m	-good visibility -adequate SSD	
Physical Objects	Clear Zone (Poles, Trees, etc.)	-Recommended clear zone based on a design speed and a low AADT: 3m	no obstructions within clear zone	
	Embankments	-Slope? -Height? -Protection required? Limits?	no embankment risks within clear zone	
	Structures (Bridges, Culverts, etc.)	-Culverts? -Bridges?	N/A	
Visual Aids		-Line painting: N/A – Gravel Road -Signage?	-speed limit signs absent.	
Active Transportation		-Designation by the Master Plan?		



LEGEND

— 280 — EXISTING CONTOURS (CJDL, 2017)

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LICENSED PROFESSIONAL ENGINEER
D.J. LYLE
100174772
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METRIC SCALE HORIZ. 1:2000 , VERT. 1:200

No.	REVISION	DATE	BY

TOWNSHIP OF MALAHIDE

CJDL Consulting Engineers

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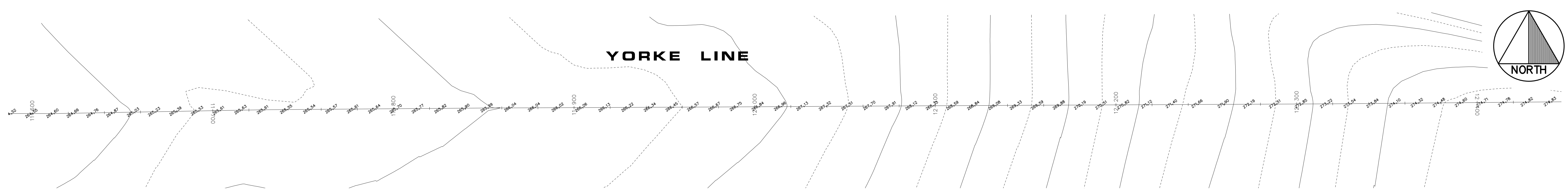
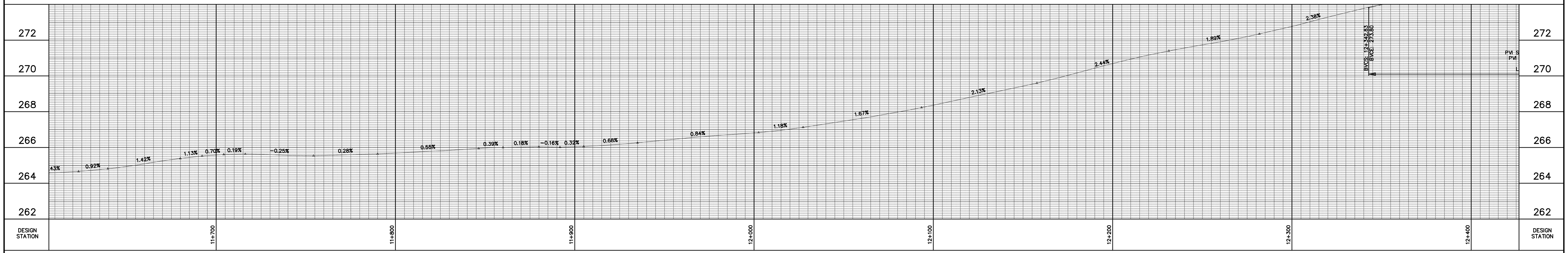
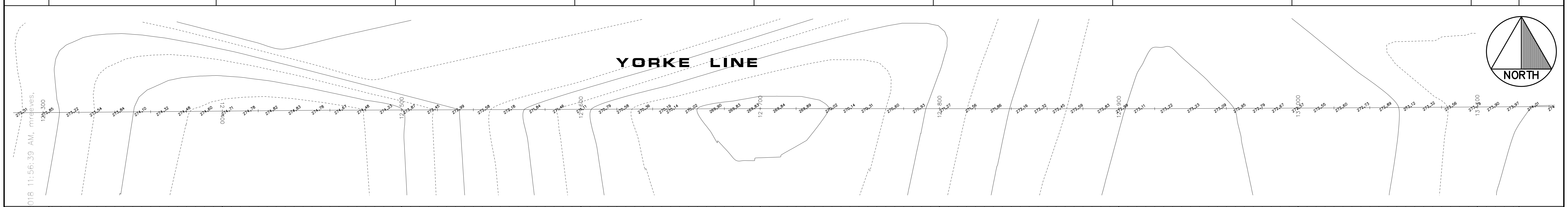
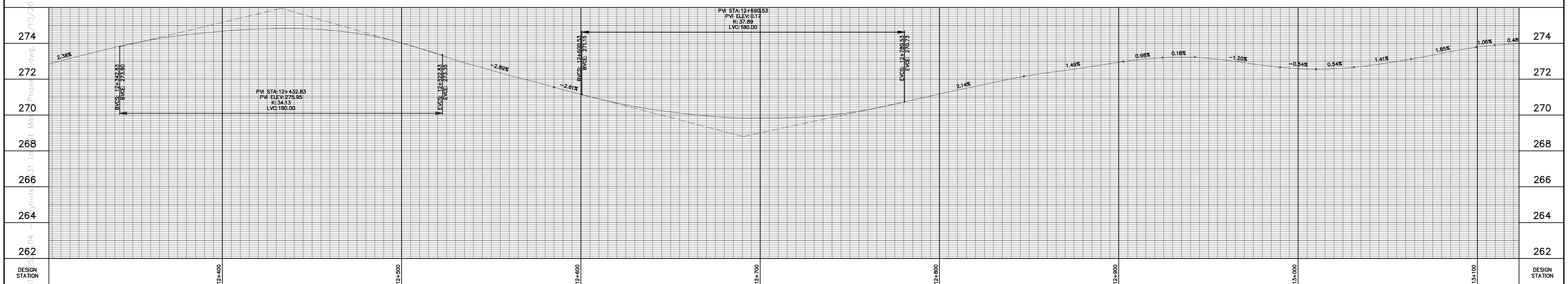
TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
YORKE LINE
STA 10+000 TO STA 11+600

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL	
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018	DRAWING No. 20









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TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
YORKE LINE
STA 11+600 TO STA 13+100

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018

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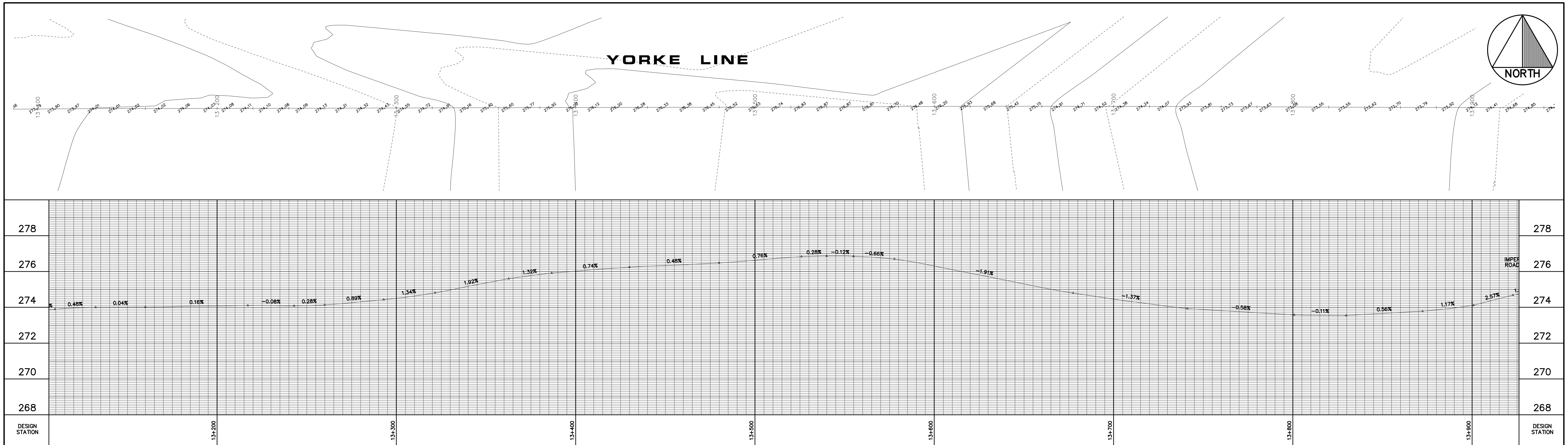

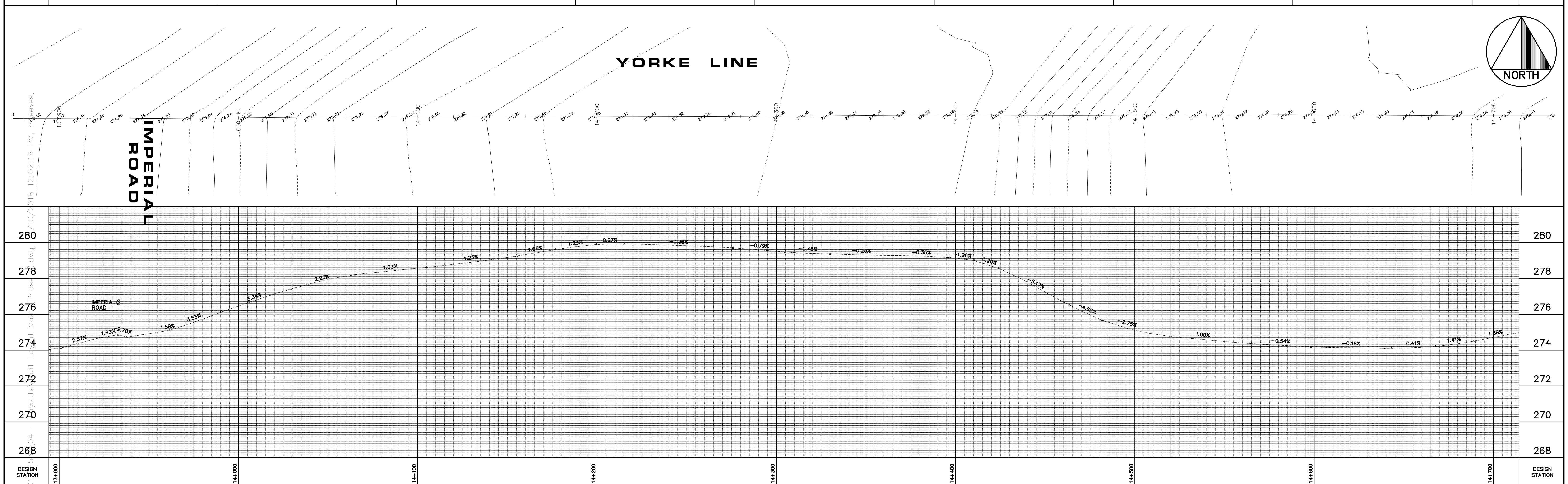

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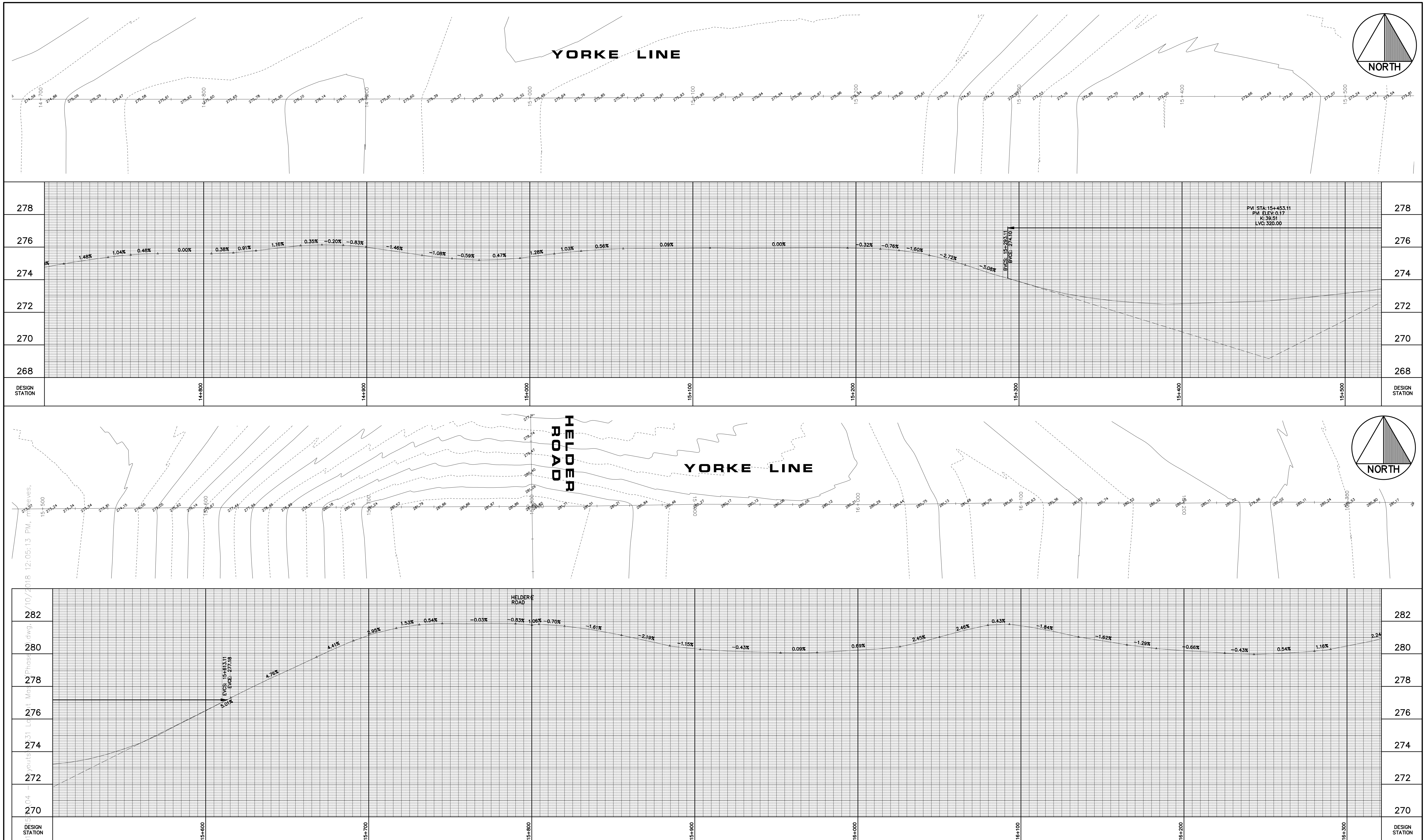
TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
YORKE LINE
STA 13+100 TO STA 14+700

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL	
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018	DRAWING No. 22



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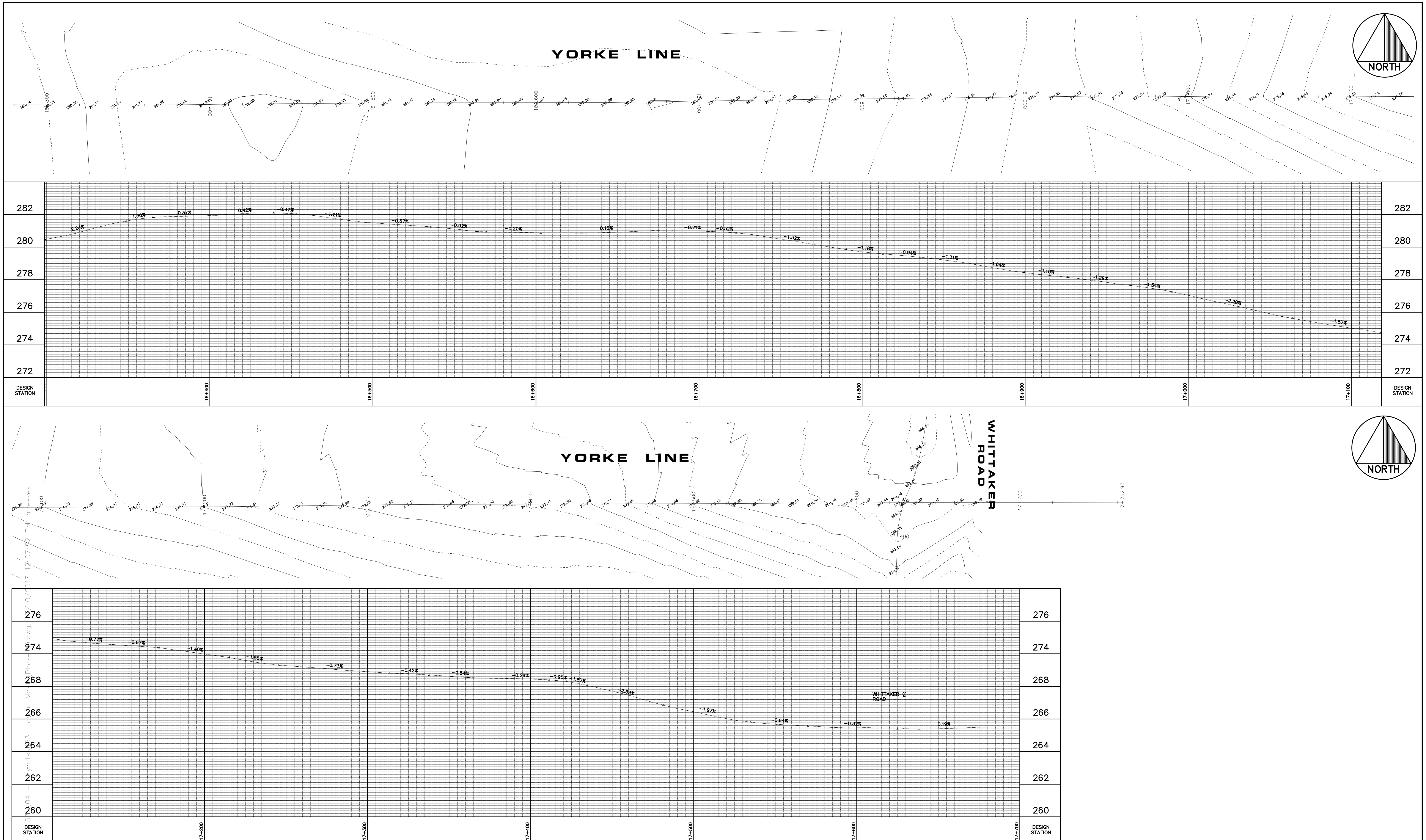
TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
YORKE LINE
STA 14+700 TO STA 16+300

DESIGN BY: MDS DJL	DRAWN BY: TJW AER	CHECKED BY: MDS DJL	
PROJECT NO. 1531	SURVEY BY: TPM	DATE: OCT 2018	DRAWING No. 23



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TOWNSHIP OF MALAHIDE
ROAD SAFETY AUDIT – PHASE 1
YORKE LINE
STA 16+300 TO STA 17+700

DESIGN BY: MDS DJL | DRAWN BY: TJW AER | CHECKED BY: MDS DJL

PROJECT NO. 1531 | SURVEY BY: TPM | DATE: OCT 2018 | DRAWING No. 24