Guidelines for the Detailed Assessment of Existing Rural Road Sections

D19#888441
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Contents

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Amendments

Revision Number	Revision Date	Description of Key Changes	Section / Page No.
0	14/11/2019	Issue for use.	All
1	27/11/2019	Sight distance commentary and worked example report updated.	3.4.1 A 1

1 INTRODUCTION AND PURPOSE

Main Roads has a number of resources, for example ROSMA Risk Mapping and Network Management route strategies, which have the ability to rank rural road sections of the network by a number of criteria (e.g., KSI crash rating, geometric deficiencies and overtaking opportunity). The results of these reports can lead to sections of the rural network requiring detailed investigation to assess the scale of deficiencies and identify or confirm prescribed treatments and risk mitigation measures to improve the safety of the road. This guide is intended for use by Main Roads and design consultants, and provides processes and information for the detailed assessment of existing sections of rural road with multiple geometric elements.

For the assessment of isolated geometric features, refer to Main Roads Extended Design Domain (EDD) Guideline.

This guide is not to be used as an EDD guide for new or realignment sections of rural road.

2 BACKGROUND

Main Roads' Network Management Branch produce route strategy reports, which highlights deficiencies in the rural road network. These high-level reports utilise coarse data to prioritise sections of the network for treatment. The data used has the following limitations:

- Horizontal sight distance is not considered in the assessment.
- The assessment does not combine horizontal, vertical and superelevation to get an accurate measure of available sight distance.
- Vegetation and features off the road are not considered in the sight distance assessment.
- Operating speed models do not form part of the assessment.

The route strategy reports are an important resource for identifying and prioritising deficient sections of rural road out of the entire rural network. However they are not suited to the detailed assessment of sections of rural road, hence this process has been developed to allow for further analysis with the intention of identifying specific locations requiring treatment and risk mitigation measures to improve safety.

3 EXISTING RURAL ROAD ASSESSMENT

3.1 Rationalisation of EDD Case Types for Rural Road Assessment

For this process, a rationalised list of EDD case types for sight distances has been established based on comparing K values for the different case types. The K value comparison approach is adopted as this value combines the effects of object height, eye height and stopping sight distance into a single comparable value. For this rationalisation exercise an arbitrary operating speed of 100 km/h and normal braking conditions (0.46 for cars) are adopted for both cars and trucks. Refer to Table 1 below for the outcome of this comparison and note that shaded cases are the critical ones adopted for the rural road assessment process.

Table 1: Rationalisation of EDD Case Types for Sight Distance

Case Type	Case Code	Design Speed (km/h)	Eye Height (m)	Object Height	CoD	Reaction Time	SSD	Crest K Value
NDD (Car)		100	1.1	0.2	0.36	2.5	179	71
NDD (Truck)		100	2.4	0.2	0.29	2.5	205	53(3)
EDD Base Case (0.4 m)	Norm-Day	100	1.1	0.4	0.46	2	141	35
EDD Base Case (0.8 m)	Norm-Day	100	1.1	0.8	0.46	2	141	26
EDD Base Case (1.25 m)(2)	Norm-Day	100	1.1	1.25	0.46	2	141	21
EDD Base Case	Truck-Day	100	2.4	0.8	0.29	2	191	31
EDD Base Case	Truck-Day	100	2.4	1.25	0.29	2	191	26
EDD Check Case	Norm-Night	100	0.65	0.4	0.46	2	141	48
EDD Check Case	Truck-Night	100	1.05	0.8	0.29	2	191	50(1)
EDD Check Case	Mean-Day	85	1.1	0.4	0.41	2	117	24
EDD Check Case	Mean-Night	85	0.65	0.4	0.41	2	117	33
EDD Check Case	Skilled-Day	85	1.1	0.4	0.56	1.5	86	13
EDD Check Case	Skilled-Night	85	0.65	0.4	0.56	1.5	86	18
EDD MSD		100	1.1	0.2	N/A	3.5	97	21

Notes:

1. The Truck Night K value is higher than the Norm Night K value, however as a minimum eye height of 2.4 m can be adopted for Truck Night, and the fact that the values are very close, Truck Night has been removed from the rationalised list. This has the advantage of simplifying the operating speed model requirements.
2. Additional Base Case included to demonstrate degree of deficiency.
3. On dual carriageways in the right hand lane on a right hand bend, sight distance over a median barrier may be more critical for a truck than for a car, because the eye position for a truck driver is assumed to be offset to the right of the centre of the lane (refer Austroads GRD Part 3, Figure 5.4).

3.2 NDD, EDD and DE Case Types and Design Criteria

Table 2 below summarises all the Case Types from Table 1 that must be adopted when undertaking a sight distance assessment for existing rural road sections. The eye and object heights are applicable when determining the design software modelling sight distances.

Table 2: NDD, EDD and DE Case Types and Sight Distance Design Criteria

Case Type	Case Code	Design Speed	Eye Height	Object Height	Reaction time	CoD (Dry)[1]	CoD	Minimum Shoulder Width
NDD		Refer Main Roads Supplement to Austroad GRD Part 3, Section 3	1.1	0.2	2.5	N/A	0.36	Refer Main Road Supplement to Austroads GRD Part 3

Main Roads desirable minimum EDD Base Case with requirement for Risk Assessment and Mitigation Strategy								
EDD Case Type	**Case Code**	**Design Speed**	**Eye Height**	**Object Height**	**Reaction time**	**CoD (Dry)[1]**	**CoD**	**Minimum Shoulder/Traversable Width based on 3.5 m lane width**
Base Case	Norm-Day	Operating Speed	1.1	0.4	2	0.61	0.46	1.5
MSD		Operating Speed	1.1	0.2	2 + 1.5	N/A	N/A	
Main Roads absolute minimum EDD Base Case with requirement for Risk Assessment and Mitigation Strategy.								
Base Case	Norm-Day	Operating Speed	1.1	0.8	2	0.61	0.46	2.5
MSD		Operating Speed	1.1	0.2	2 + 1.5	N/A	N/A	
Main Roads minimum DE Case if absolute minimum EDD Base Case Cannot be Achieved, with requirement for Risk Assessment and Mitigation Strategy								
Base Case	Norm-Day	Operating Speed	1.1	1.25	2	0.61	0.46	2.5
MSD		Operating Speed	1.1	0.2	2 + 1.5	N/A	N/A	
Main Roads Minimum Reportable Check Case								
Check Case	Norm Night	Operating Speed	0.65	0.4	2	0.61	0.46	N/A

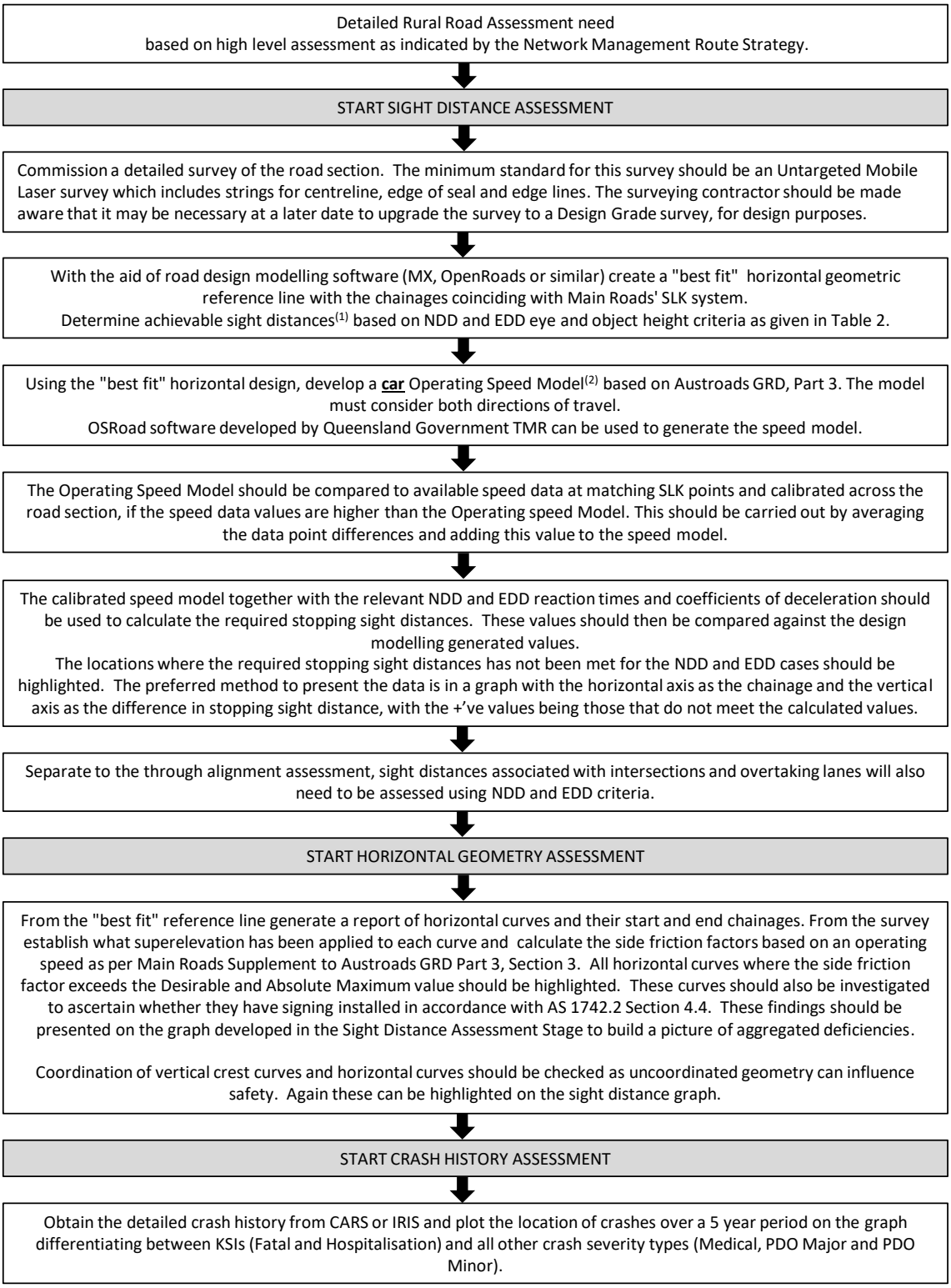
Notes:

1. CoD (Dry) is only used if AADT <4000 vpd and the average no. of days per year with rainfall >5 mm is less than 40. Refer to Main Roads Guideline Drawing 201831-0070.

3.3 NDD and EDD Assessment Process

Figure 1 describes the process to be followed when assessing existing sections of rural road.

Figure 1: Detailed Rural Road Assessment Process Chart



Notes:

1. When determining sight distances using design modelling software, sight lines should not extend beyond the invert of drains in cut situations, or beyond the hinge point in fill situations, unless the roadside environment is unobstructed by vegetation, or other features that would restrict visibility.
2. From the K value comparison of all NDD and EDD criteria it is evident that cars and not trucks govern the sight distance assessment, therefore it is only necessary to develop an operating speed model for cars.
3. Refer to section 4 for useful links to guidance, assessment tools and software.

3.4 Methodology and Guidance Notes

The sections below provide a detailed methodology of that described in Figure 1.

3.4.1 Design Modelling Sight Distance Assessment

The first stage of this process is to generate a geometric best-fit horizontal reference line using the existing surveyed centreline. This reference line is then draped onto the triangulated survey model surface.

From a mapping street view or on-site observations, the assessor should estimate the ability of a driver to sight an object in the middle of a lane through the roadside environment. From this estimation, walls (visual screens) will need to be created in the design modelling software to emulate the actual roadside environment. Generally, in cuts these walls are located at the invert of the drain and in fill situations at the hinge point as outside of these locations vegetation has the ability to become established. Any other existing visual obstructions should also be considered when modelling the visual screens e.g. road safety barriers.

Based on the above steps, it is now possible to generate visibility reports using the design modelling software. Note the following:

- The parameters adopted for this process must match those in Table 2.
- The designer must use distances (SSD and MSD) that include the requirements for horizontal curves that exceed the desirable side friction factor i.e.,(Manoeuvre time increased by 0.5 s and Coefficient of Deceleration decreased by 0.05). This will produce the correct results if the road section includes any horizontal deficiencies.
- The designer should also ensure that if using MX or OpenRoads that the “Move Target to Achieve Visibility” is activated to ensure accurate deficiencies are reported.
- The reports should be undertaken in both directions of travel.
- The text files generated by these reports then need to be converted to Excel format and the results copied into the EDD rural road assessment tool spreadsheet (EDD RRA Tool), relevant columns, in the “A-B Direction” and “B-A Direction” tabs.

Note the following when using the spreadsheet tool

- When using the spreadsheet it is necessary to first input the posted speed. Also the operating speed model adjustments which include Road Surface Condition, Lane Width and the Calibration Speed Model Adjustment (Refer to Section 3.4.3).
- The graph “select data” ranges will need to be altered to match the road section length to produce the graphing information. It is suggested graphs are broken into a maximum of 20 km long sections to enable the reader to decipher the information i.e.,(100 km long road section results in five graphs in either direction).
- A-B and B-A labels used in the spreadsheet indicate the direction of travel. The data in the tables is arranged in ascending chainage even for the reverse direction, hence it will be necessary to sort the data in ascending chainage order.
- Only unshaded areas should be populated with data.

3.4.2 Establishing the Operating Speed Model

The geometric report of the best-fit horizontal alignment and the assessed typical superelevation should be manually input into the OSRoad – Operating Speed Modeller software provide by Queensland Government TMR. The software should be used to generate an excel output of the 85th Percentile speed.

This data should be copied into the EDD RRA Tool, into tabs labelled “A-B OSRoad” and “B-A Osroad”.

3.4.3 Calibrating the Operating Speed Model

Traffic speed counts should be checked against the operating speed model outputs based on the Monday to Friday 85th percentile data. Main Roads Traffic Map online data is where traffic speed counts can be sourced. Due to the limited number of locations of traffic counts on rural roads the operating speed model in its entirety should only be adjusted if the Monday to Friday 85th percentile traffic count speed data at the equivalent SLKs is higher than the operating speed model.

3.4.4 Intersection and Overtaking Lane Sight Distance Requirements

For the EDD assessment of intersections, refer to Austroads GRD Part 4A, Appendix A. For SISD (SSD + Observation time travel distance) note that Main Roads uses the observation times in Table A.8.
This assessment should include the intersection crash history as obtained from Main Roads - Crash Analysis Reporting System (CARS).

For the assessment of overtaking lanes, there is no allowance for the application of EDD to merge or diverge tapers. EDD can be applied to the minimum merge sight distance by using an eye height of 1.1m to a zero object height, with an EDD coefficient of deceleration (normal or dry) and a reaction time of 2.0 seconds.

The results of the intersection and overtaking sight distance are not included in the EDD RRA Tool, however they are required to be included in the EDD report, and considered in combination with the results of the EDD RRA Tool.

3.4.5 Horizontal Geometric Assessment

Having copied the OSRoad output data into the EDD RRA Tool, the spreadsheet will automatically generate a report in the graph for deficient horizontal curves. The graph shows:

- Instances where curve side friction demand is higher than Main Roads desirable, but less than the absolute maximum, which is considered acceptable for existing rural road assessment since it falls within the NDD category. The reason for presenting this NDD data is because it falls below NDD requirements for new road design and it may be useful to represent this data when deciding on realignment extents.
- Instances where the friction demand is greater than the absolute maximum, which falls in the Design Exception category.

By generating a profile along the reference line it is possible to manually identify locations where vertical crest curves are not coordinated with the horizontal geometry. These locations should be manually added to the EDD RRA Tool in the last column of the A-B and B-A Direction tabs. The deficiencies will appear in the bottom of the graph and can be used to influence the extent of realignment works.

3.4.6 Crash History Assessment

For Main Roads internal users, crash data is obtained by using IRIS Reporting Centre. The report to select is “Detailed Crash History Extract (1 line per crash)”, this avoids the need to filter out target vehicles where more than one vehicle is involved in a crash.

For external consultants crash data for the last five years is obtained by logging into Main Roads - Crash Analysis Reporting System (CARS). Access to this location does require an application to Main Roads.

The crash data and associated SLKs should be sorted by Killed or Seriously Injured (KSI), and Property Damage Only (PDO) combined with Medical. This data is then manually input into the EDD RRA Tool, in the Crash Data tab, which will then automatically generate a colour-coded graphical representation of crashes in the chart.

3.5 Conclusion

From the example, it is evident that combining data sets and investigation outcomes is the key to establishing a priority list of necessary treatments to improve road safety and ensuring consistent rural road sections for users.

Note that once the realignments and widening has been modelled, it is possible to reassess sight distances and repopulate the EDD RRA Tool spreadsheet, which will allow the designer to confirm the treatments have met the project objectives.

4 WORKED EXAMPLE

An example report including approval signing sheet is included in Appendix 1.

4.1.1 Treatment and Risk Mitigation Strategies

Treatment options are often governed by available funding. For the example it is assumed that funding would be sufficient to allow for partial realignment and widening. To address the identified deficiencies, treatments and risk mitigation measures are proposed.

4.1.2 Restricted Funding Treatment and Risk Mitigation Strategies

If the example had very limited funding and realignments were not possible then the minimum treatment would need to be shoulder widening, and warning signage. The sections failing the absolute minimum EDD Base Case criteria would need to be treated as Design Exceptions and that process should be followed. The road section would also need to be monitored for crashes and the identified realignment sections earmarked for upgrade when funding becomes available.

5 REFERENCES

5.1 References

Austroads. (2016). *Guide to Road Design Part 3 - Geometric Design.* Sydney, NSW.

Austroads. (2017). *Guide to Road Design Part 4: Intersections and Crossings - General.* Sydney, NSW.

Austroads. (2017). *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections.* Sydney, NSW.

6 APPENDICES

Appendix	Title
Appendix 1	Worked Example

Appendix 1: Worked Example

EDD / DE Report

H099 Lynton Highway, Western Central SLK 9.84 – 27.91

Assessment of Rural Road Section

Consultant / Designer (Logo if required)
Contact Details

TRIM No. (if applicable)
Month Year

Contents

Amendments

Revision Number	Revision Date	Description	Prepared	Reviewed	Approved
A	14/11/2019	Final Issue	ABC	DEF	XYZ

1 INTRODUCTION

This report applies to Lynton Highway M099 SLK 9.84 to 27.91and summarises the rationale behind the intention to deviate from standard design practice in the application of Normal Design Domain (NDD) design values and to use design values considered to fall within the Extended Design Domain (EDD) range. The report explains the reason for the proposed departure, the justification for the departure, the expected impacts and mitigation measures to address the impacts. A risk assessment is documented to show residual risk.

1.1 Project Purpose

The purpose of this project is to assess the deficiencies and risk associated with this section of Lynton Highway and provide cost effective solutions to improve the overall safety.

2 EXISTING ROAD INFORMATION

Lynton Highway connects Wattletville to various regional centres in the north and provides a vital link for grain cartage during the harvesting season. Much of the road has been upgraded as funding has become available with this section being one of the remaining less critical sections, hence the investigation to consider retaining as much of the existing alignment as possible.

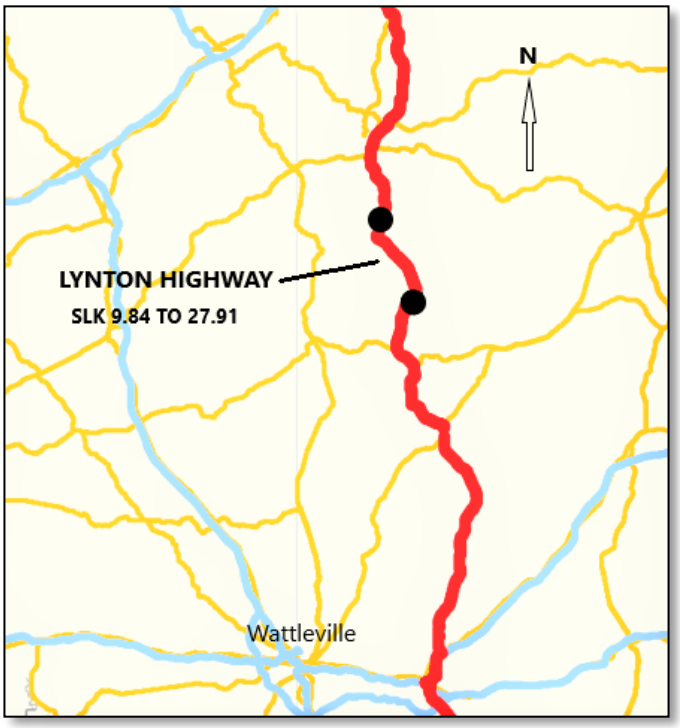


Figure 1 Location Map

2.1 Existing Road Section Details

Table 1 below provides details of the existing section of road relevant to this project study.

Table 1 – Existing Road Section Details

Description	Details
Road Type	Two lane single carriageway rural highway
Road Number	H099
SLK	9.84 to 27.91 (18.07 km)
Intersection List	None.
Overtaking Lanes (including tapers)	Northbound SLK 15.45 to 16.72 (1.27 km) Southbound SK 16.55 to 15.32 (1.23 km)
Posted Speed	100km/h
Speed Counts	Two available both 85th percentile speed counts indicating lower values than operating speed model calculations
Existing AADT	5,500 (12% Heavies)
Traffic Growth Rate	2%
AADT (20 Year Projection)	8,173 (12% Heavies)
RAV Network	4 (B-Doubles)
Other Road User Details	No specific demand for tourists or vehicles towing caravans.
Lane Width	3.5 m
Shoulders	0.5 m Sealed and 0.5 m Unsealed
Pavement Batters	Typically 1:4 (irregular and consist of loose material)
Road Running Surface Condition	Good and unbroken
Road Safety Barriers	Installed at two significant culvert locations
Vegetation	Advised as degraded. Mainly low height grasses and weeds.
Total Crashes	34 (4 KSIs, 30 PDO and Medical)

2.2 Crash History

For crash locations and severity refer to the EDD RRA Tool spreadsheet charts in Appendix 1

The CARS crash pattern reported in Table 2 indicates that Head On crashes are over-represented with 5 of the total 34 being of that type. These could be attributed to a lack of overtaking opportunity and poor sight distance, as well as a number of other factors.

Table 2 – CARS Crash Pattern Report

Crash Grouping		RUM Codes	This Study Area (%)	Network Average	Flag
Crash Nature	Rear End	30,31,32,33,53,55,61,62	17	32	Under-represented
	Head On	21,51	15	2	Over-represented
	Sideswipe Opposite Dirn	23,24,25,26,34,43,50,54	0	0	
	Sideswipe Same Dirn	35,36,37,38,39,42,56,64	2	11	
	Right Angle	10,11,12,13,14,15,16,17,18,19,47,48,49	7	2	
	Right Turn Thru	22,27	5	1	
	Hit Pedestrian	01,02,03,04,05,06,07,08,09,98	0	0	
	Hit Animal	69,95	15	9	
	Hit Object	46,60,63,65,66,67,70,72,74,80,82,84,93,94	20	25	
	Non Collision	52,71,73,75,76,77,81,83,85	17	11	
	Not Known		2	7	
Lighting	Daylight		61	63	
	Dawn Or Dusk		10	9	
	Dark - Street Lights On		0	10	Under-represented
	Dark - Street Lights Off		2	1	
	Dark - Street Lights Not Provided		27	14	Over-represented
	Not Known		0	3	
Grade	Level		51	74	Significantly under-represented
	Crest Of Hill		5	17	Under-represented
	Slope		20	2	Over-represented
	Not Known		24	7	Over-represented
Road Condition	Wet		20	18	
	Dry		56	79	Significantly under-represented
	Not Known		24	3	Significantly over-represented
Crash Severity	Fatal		0	2	
	Hospital		15	10	
	Medical		17	16	
	PDO Major		41	57	Under-represented
	PDO Minor		27	15	Over-represented
Alignment	Curve		15	21	
	Straight		71	74	
	Not Known		15	5	Over-represented

3 ASSESSMENT METHODOLOGY

The assessment methodology documented in this report is based on the methodology given in the "*Guidelines for the Detailed Assessment of Existing Rural Road Sections*". A rationalised list of EDD case types for sight distances was established based on comparing K values for the different case types. Table 3 below summarises all the Case Types that must be adopted when undertaking a sight distance assessment for existing rural road sections. The eye and object heights are applicable when determining the design software modelling sight distances.

Table 3: NDD, EDD and DE Case Types and Sight Distance Design Criteria

Case Type	Case Code	Design Speed	Eye Height	Object Height	Reaction time	CoD (Dry)[1]	CoD	Minimum Shoulder Width
NDD		Refer Main Roads Supplement to Austroad GRD Part 3, Section 3	1.1	0.2	2.5	N/A	0.36	Refer Main Road Supplement to Austroads GRD Part 3

Main Roads desirable minimum EDD Base Case with requirement for Risk Assessment and Mitigation Strategy								
EDD Case Type	**Case Code**	**Design Speed**	**Eye Height**	**Object Height**	**Reaction time**	**CoD (Dry)[1]**	**CoD**	**Minimum Shoulder/Traversable Width based on 3.5 m lane width**
Base Case	Norm-Day	Operating Speed	1.1	0.4	2	0.61	0.46	1.5
MSD		Operating Speed	1.1	0.2	2 + 1.5	N/A	N/A	
Main Roads absolute minimum EDD Base Case with requirement for Risk Assessment and Mitigation Strategy.								
Base Case	Norm-Day	Operating Speed	1.1	0.8	2	0.61	0.46	2.5
MSD		Operating Speed	1.1	0.2	2 + 1.5	N/A	N/A	
Main Roads minimum DE Case if absolute minimum EDD Base Case Cannot be Achieved, with requirement for Risk Assessment and Mitigation Strategy								
Base Case	Norm-Day	Operating Speed	1.1	1.25	2	0.61	0.46	2.5
MSD		Operating Speed	1.1	0.2	2 + 1.5	N/A	N/A	
Main Roads Minimum Reportable Check Case								
Check Case	Norm Night	Operating Speed	0.65	0.4	2	0.61	0.46	N/A

Notes:

1. CoD (Dry) is only used if AADT <4000 vpd and the average no. of days per year with rainfall >5 mm is less than 40. Refer to Main Roads Guideline Drawing 201831-0070..

An Extended Design Domain Rural Road Assessment (EDD RRA) spreadsheet tool has been developed which compares available sight distance from survey models with required sight distance for the various cases above.

4 FINDINGS

The graphical representation of the outputs generated using the EDD RRA Tool spreadsheet are located in Appendix 1. The findings based on these outputs and the input data are as follows:

- In general, the section of road has a multitude of locations that do not conform to NDD sight distance requirements.
- The section of road also has a number of locations that do not meet the desirable minimum Base Case or the absolute minimum Base Case.
- The road section has two clusters (Cha 10,000 to Cha 14100 and Cha 19,000 to Cha 20,100) where EDD Manoeuvre SD has not been achieved.
- No intersections are present therefore no SISD or ASD is required to be assessed.
- For the overtaking lanes Continuation Sight Distance was not achieved, however the minimum criteria of Merge Sight Distance was found to be adequate for NDD criteria.
- The section has a total 10 horizontal curves with two (Cha 11,060 and Cha 11,740) not having acceptable combinations of radius and superelevation, therefore exceeding the allowable absolute maximum side friction factor. There are also two KSIs at this location, which are run off road and sight distance related, which could be attributed to the poor geometry.
    - Also one curve at Cha 26,800 has a resulting side friction demand that falls between desirable and absolute maximum, This curve does not follow Main Roads standard design practice, however is still considered as complying with NDD.
    - Nine out of 10 curves do not have desirable arc lengths however, this is an aesthetic criteria so not considered to be an issue.
- The section includes one section where a horizontal curve and vertical crest curve are uncoordinated.

5 EXPLANATION

5.1 Why are EDD or DE values being proposed?

This section of rural road was identified for shoulder widening and had a budget that allow for this treatment. Prior to going ahead with the treatment, it was considered appropriate to assess the deficiencies along the section. Due to high frequency of NDD deficiencies and the lack of funding to provide a design solution, which addressed these deficiencies, it is considered suitable to rather adopt an EDD design philosophy across this section. The resulting road section will also be of an equivalent geometric standard with other existing upgraded sections along Lynton Highway.

It would only be appropriate to adopt DEs along the section if the individual elements had no attributed crash history.

5.2 Alternative solutions

Lowering of the posted speed was considered, however this was not found to be acceptable to the region and is unlikely to be accepted by the local community.

5.3 Potential Impacts

By adopting EDD principles it is accepted that elements within this section of Lynton Highway will be of a lower standard as they do not comply with NDD. However these elements will instead comply with Austroads EDD values, which have been developed through research and/or operating experience and proved to provide an acceptable solution from a safety point of view. The proposed treatments only adopts one EDD parameter in any application and not combinations with other minimums or EDD values, therefore the treatments should be defendable.

6 RISK ASSESSMENT

The full risk assessment based on Main Roads risk matrix (D18#363243) is provided in Appendix 2.

7 REVIEW AND APPROVAL

This EDD / DE Report has been recommended, reviewed and approved in terms of Main Roads' Delegation of Authority Manual.

1. To be completed by RM, DMO, DSWO,BM or PD

The use of EDD and/or DE design values are recommended to be used on this project:

……...	……..	……	…….
Name	Signature	Position	Date

Comments:

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2. To be completed by MRTE, SES or MME

The use of EDD and/or DE design values have been reviewed by me and are recommended / not recommend (delete not applicable) for approval to be used on this project:

……...	……..	……	…….
Name	Signature	Position	Date

Comments:

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3. To be completed by EDPTS

The use of EDD and/or DE design values are approved / not approved (delete not applicable) be used on this project:

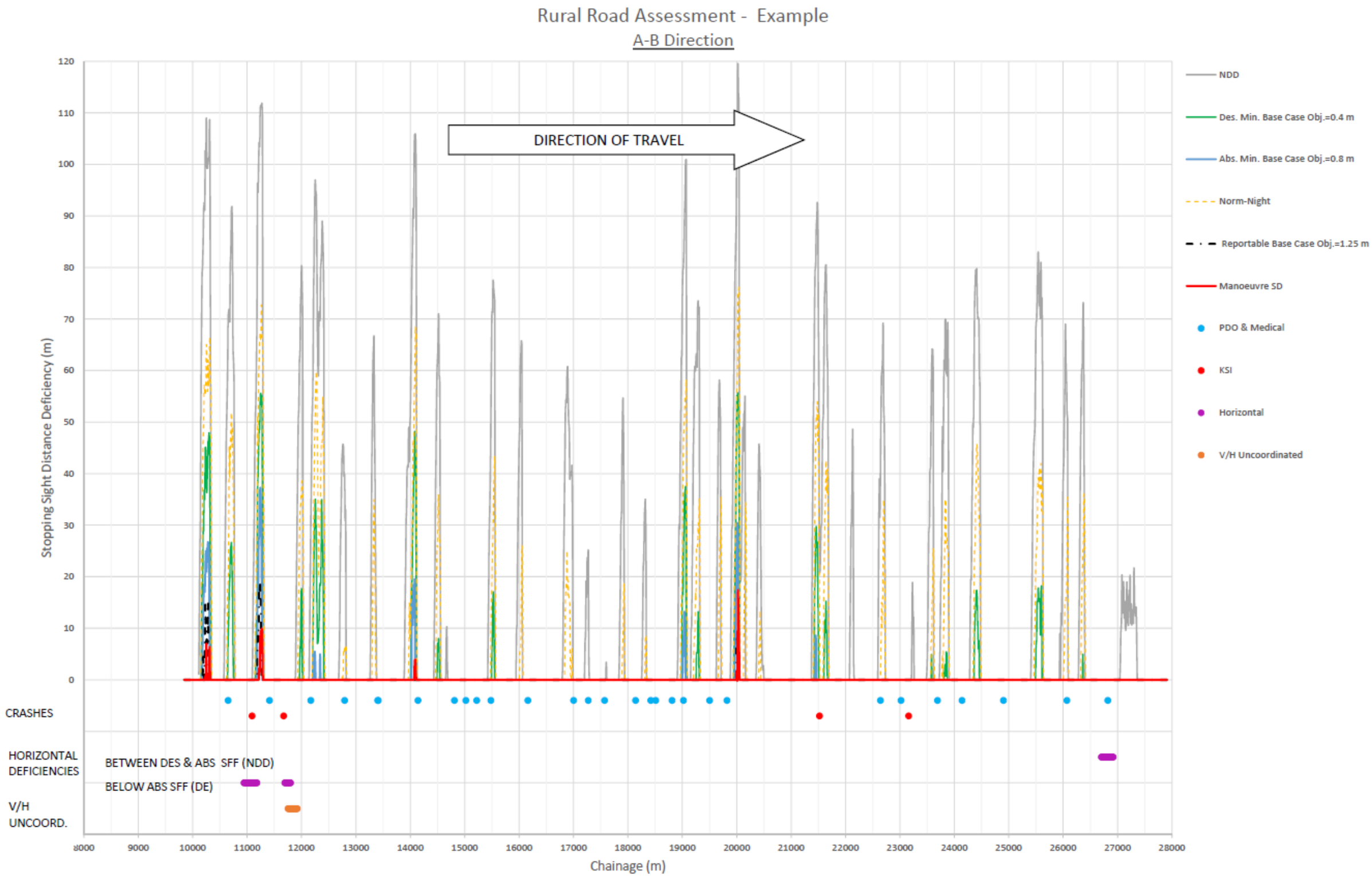
……...	……..	……	…….
Name	Signature	Position	Date

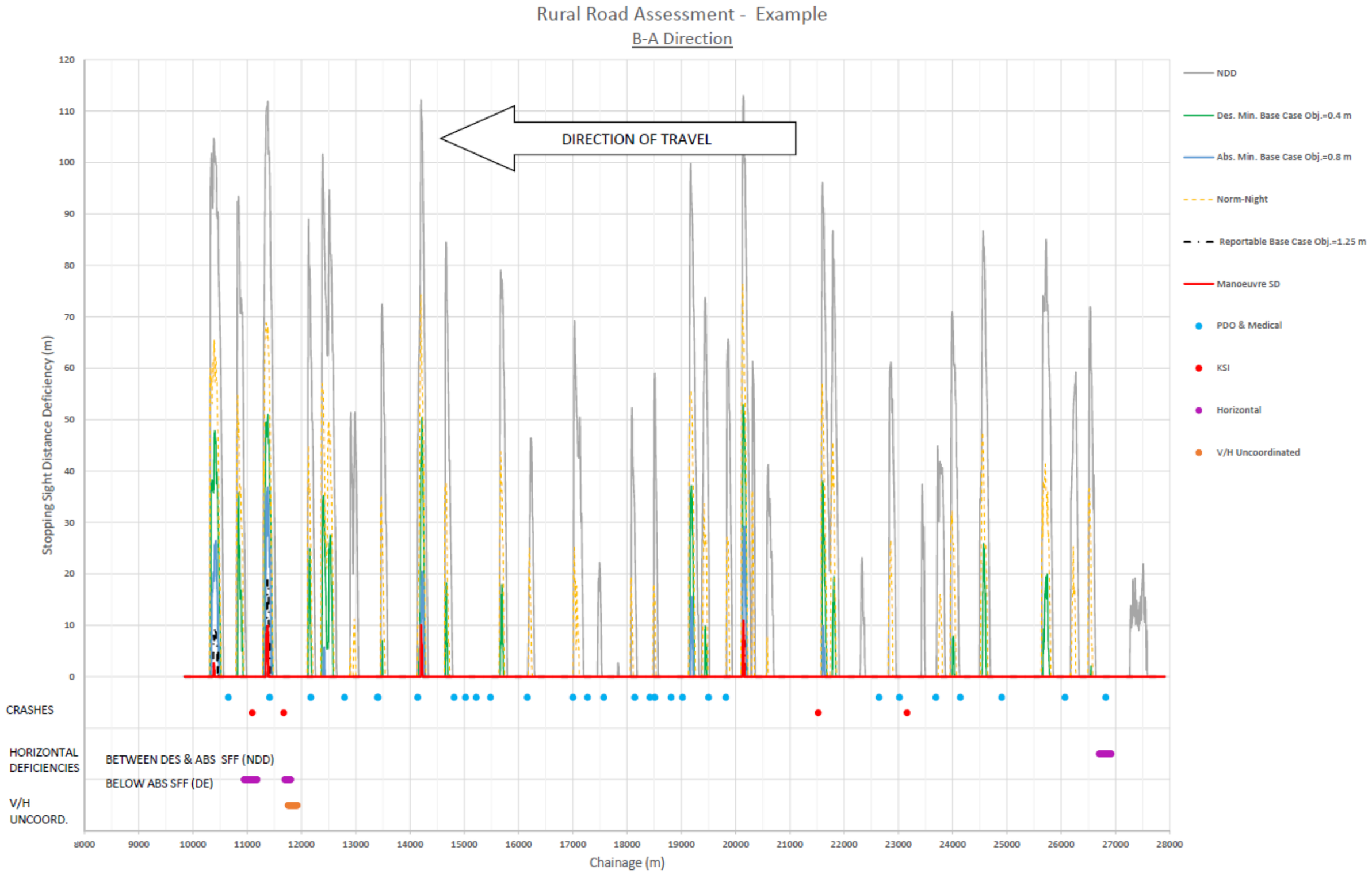
Comments:

8 APPENDICES

Appendix	Title
Appendix A	EDD RRA Tool Spreadsheet Charts
Appendix B	Risk Assessment

Appendix A: EDD RRA Tool Spreadsheet Charts


Rural Road Assessment - Example
A-B Direction
DIRECTION OF TRAVEL
Stopping Sight Distance Deficiency (m)
Chainage (m)
CRASHES
HORIZONTAL DEFICIENCIES
BETWEEN DES & ABS SFF (NDD)
BELOW ABS SFF (DE)
V/H UNCOORD.
NDD
Des. Min. Base Case Obj.=0.4 m
Abs. Min. Base Case Obj.=0.8 m
Norm-Night
Reportable Base Case Obj.=1.25 m
Manoeuvre SD
PDO & Medical
KSI
Horizontal
V/H Uncoordinated


Rural Road Assessment - Example
B-A Direction
DIRECTION OF TRAVEL
Stopping Sight Distance Deficiency (m)
120
110
100
90
80
70
60
50
40
30
20
10
0
CRASHES
HORIZONTAL DEFICIENCIES
BETWEEN DES & ABS SFF (NDD)
BELOW ABS SFF (DE)
V/H UNCOORD.
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
20000
21000
22000
23000
24000
25000
26000
27000
28000
Chainage (m)
NDD
Des. Min. Base Case Obj.=0.4 m
Abs. Min. Base Case Obj.=0.8 m
Norm-Night
Reportable Base Case Obj.=1.25 m
Manoeuvre SD
PDO & Medical
KSI
Horizontal
V/H Uncoordinated

Appendix B: Risk Assessment

Main Roads Region and Project Location	Date	Revision
Western Central, WattlevilleXXX	15 October 2019	00
Road Name	**Road Number**	**SLK**
Lynton Highway	H099	9.84 – 27.91
Posted Speed	**AADT**	**20 Year Projected AADT**
100 km/h	5,500	11,700
RAV Route Designation	**Percentage Heavies**	**Other Route Vehicle Details (Caravans, HWL. etc.)**
Network 4	8%	N/A
Existing Lane Width	**Existing Sealed Shoulder Width**	**Existing Sealed Shoulder Width**
3.5 m	0.5 m	0.5 m

Item Number	Chainage	Element	Deficiencies	Existing Risk	Considerations	Treatment	Outcome	Residual Risk
1.	9,840 to 27,910 Excluding realignment sections	Shoulders	Hi frequency of locations not achieving NDD, or desirable EDD Base Case.	High 12	Agreed regional cross sectional requirements as per Main Roads Integrated Mapping System (IMS) (11 m on 11 m) (2 m sealed shoulders) Agreed regional low cost cross sectional requirements as per Main Roads IMS (10 m on 10 m) (1.5 m sealed shoulders) EDD desirable Base Case object height of 0.4 m results in minimum shoulder / traversable width of 1.5 m. Although existing pavement batters are mostly traversable as far as slope goes, they are loose and therefore deemed not to comply with the criteria for being traversable. Note that if shoulder widening is undertaken the new pavements batters at 1:6 can be considered traversable. Vegetation clearing acceptable due to degraded nature.	Desirable Base Case required 1.5 m traversable shoulders however adopt 2.0m sealed shoulders (11 m on 11 m) to comply with regional cross sectional requirements. Extend culverts as required. Offset and reassess Length of Need for existing road safety barriers.	Minimum traversable shoulder width achieved for both Desirable minimum EDD Base Case (1.5 m) and Absolute minimum EDD Base Case (2.5 m).	Medium 9

2.	10,000 to 14,200	Realignment	A number of locations do not achieve absolute minimum EDD Base Case. Two locations fail DE Case Two horizontal curves, which are non-conforming. The section includes an uncoordinated vertical crest curve and horizontal curve	High 12	Two KSIs occur in this section, which can be attributed to poor geometry.	Realign based on NDD principles and adopt 2 m sealed shoulders.	NDD	Medium 9
3.	14,490 to 14,530	Crest Curve	Crest curve does not achieve desirable EDD Base Case	High 12	Section fails desirable EDD Base Case in both directions for 40 m. Sight distance fails by up to 8 m in A-B Direction and 18 m in B-A Direction. No crashes are located within the section Section does not fail absolute minimum EDD Base Case. With shoulder widening and new pavement batters minimum traversable shoulder width of 2.5 m is achieved.	Install crest warning signs in both directions 2.0m sealed shoulders (11 m on 11 m) as per Item 1.	Absolute minimum EDD Base Case with risk mitigation measures.	Medium 9
4.	15,500 to 15,540	Crest Curve	Crest curve does not achieve desirable EDD Base Case	High 12	Section fails desirable EDD Base Case in both directions for 40 m. Sight distance fails by up to 17 m in A-B Direction and 17 m in B-A Direction. One crash is located within the section. Section does not fail absolute minimum EDD Base Case. With shoulder widening and new pavement batters minimum traversable shoulder width of 2.5 m is achieved.	Install crest warning signs in both directions 2.0m sealed shoulders (11 m on 11 m) as per Item 1.	Absolute minimum EDD Base Case with risk mitigation measures.	Medium 9

5.	18,910 to 20,040	Realignment	A number of locations do not achieve absolute minimum EDD Base Case. One location fails DE Case by up to 8 m.	High 12	No specific crash clustering occur at this section.	Realign based on NDD principles and adopt 2 m sealed shoulders.	NDD	Medium 9
6.	21,420 to 21,660	Realignment	This location does not achieve absolute minimum EDD Base Case. Fails by up to 8 m.over 10 m.	High 12	At this location there is an R530 horizontal curve, which reduces the operating speed (107 km/h). A KSI, which can be attributes to sight distance, is located within the section. The combination of issues and events at this location suggest that it should be realigned instead of being treated as a Design Exception.	Realign based on NDD principles and adopt 2 m sealed shoulders. Possibly linked to realignment section above.	NDD	Medium 9
7.	23,580 to 23,860	Two Crest Curves	Crest curves do not achieve desirable EDD Base Case.	High 12	Fails by up to 5 m over two short sections. Due to the failure being marginal (<10 m) and the fact that shoulder widening will be applied to the full length of the section, no further action will be taken.	2.0m sealed shoulders (11 m on 11 m) as per Item 1.	Absolute minimum EDD Base Case with risk mitigation measures.	Medium 9
8.	24,370 to 24,440	Crest Curve	Crest curve does not achieve desirable EDD Base Case	High 12	Section fails desirable EDD Base Case in both directions for 70 m. Sight distance fails by up to 17 m in A-B Direction and 26 m in B-A Direction. Section does not fail absolute minimum EDD Base Case. With shoulder widening and new pavement batters minimum traversable shoulder width of 2.5 m is achieved.	Install crest warning signs in both directions 2.0m sealed shoulders (11 m on 11 m) as per Item 1.	Absolute minimum EDD Base Case with risk mitigation measures.	Medium 9
9.	25,500 to 25,600	Crest Curve	Crest curve does not achieve desirable EDD Base Case	High 12	Section fails desirable EDD Base Case in both directions for 110 m. Sight distance fails by up to 18 m in A-B Direction and 20 m in B-A Direction. Section does not fail absolute minimum EDD Base Case. With shoulder widening and new pavement batters minimum traversable shoulder width of 2.5 m is achieved.	Install crest warning signs in both directions. 2.0m sealed shoulders (11 m on 11 m) as per Item 1.	Absolute minimum EDD Base Case with risk mitigation measures.	Medium 9

10.	26,360	Crest Curve	Crest curve does not achieve desirable EDD Base Case.	High 12	Fails by up to 5 m over two short section. Due to the failure being marginal (<10 m) and the fact that shoulder widening will be applied to the full length of the section, no further action will be taken.	2.0m sealed shoulders (11 m on 11 m) as per Item 1.	Absolute minimum EDD Base Case with risk mitigation measures.	Medium 9