



# **Ōtaki to North Levin Road Realignment Productive Land Values**

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# 1 CONCLUSIONS

In evaluating the options on productive land values, the following points are:

- Elite land/soils comprise of LUC classes I, II and III land. Protecting these resources is considered important as they are our most versatile and productive soils. Effectively they are a finite resource and if they are used for anything other than agricultural or horticultural production their versatility and productive values are lost for ever. Consequently the best MCA score for productive land is a 3 as the land is lost from production forever. The greater the area of class 1 and 2 land the higher the MCA score.
- In undertaking the analysis, the NZLRI database was used. This database was derived from 1:50,000 scale surveying which is sufficient at the district level and for this exercise. When extrapolated to the paddock scale there will be discrepancies. This is particularly so at the northern end of the study area where there are flat terraces dissected by small steep wet gully systems and in the sand country to the west where there is poor differentiation of the sand dunes and sand plains.
- There is not much difference between the different alignments within a zone with the exception of zones C and D. For the C zone, the white option is less impactful on productive land compared with purple and green. For the D zone, the blue option is less impactful compared with cyan.
- For the interchanges the roundabouts are less impactful on productive land compared with the interchanges. In saying this, the areas affected are significantly less than the areas for the alignments.

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### **3 LANDUSE CAPABILITY AND LAND RESOURCE INVENTORY**

The land resources in the region have been obtained from the NZLRI (New Zealand Land Resource Inventory). This survey was published at 1:50,000. The 1:50,000 scale information is adequate for this level of analysis but caution is advised if small individual property owners try to extrapolate this information to the paddock scale.

The land resource inventory (LRI) system involves mapping landscape units according to five inventory factors. These include rock type, soil unit, slope class, erosion type and severity, and vegetation.

From the LRI assessment, the area is then classified into land use capability (LUC) classes according to the level of limitations present for productive use. LUC classes range from class I land (elite land) through to class VIII land. LUC classes I to IV is considered suitable for arable and vegetable cropping, horticulture, intensive pastoral farming or production forestry. Class I land is the elite land with very little limitation to productive use. As you go from class I to class IV the level of limitations increase whilst the versatility decreases. Classes V, VI and VII have greater physical limitations and the level of land use intensity decreases significantly. Class VIII land has no productive value and is generally catchment protection land.

The LUC classes are then further broken down according to the most dominant limitation to production. These limitations include erosion, wetness, soil or climate.

Finally the LUC unit is derived from a combination of the LUC class and subclass along with the five land resource inventory factors. Hence it groups land with similar productive capability, levels of limitations, and land resource inventory factors.

### **4 THE IMPORTANCE OF PRODUCTIVE LAND VALUES**

Our most productive land that is suitable for vegetable growing, is relatively scarce in New Zealand. The very best land (LUC Class 1) makes up less than 1% of New Zealand. LUC classes 1 and 2 together comprise of less than 5%. These units contain the most valuable soils. LUC Class 3 land comprises of about 9% of New Zealand and is also important for vegetable production. Overall there are about 5% of New Zealand that is considered vital for productive use and should be protected from land uses other than vegetable production or horticultural use. The land use on a further 9% should be considered carefully.

The proposed national policy statement for highly productive land was released in mid-2019 by MPI for the purpose of preserving LUC classes 1-3 land for productive use rather than expansion into urban or lifestyle blocks. This land is needed for vegetable and horticultural production. Intensive vegetable production cannot be shifted from our highly productive land classes to classes of land with greater limitations.

An efficient and effective roading network is vital for the growth of New Zealand. The construction of roads however on LUC classes 1 to 3 land effectively eliminates the productive potential of this land forever.

### **5 THE PROCESS USED**

In undertaking the analysis the areas of the different LUC classes for each option were determined from the NZLRI (NZ land resource inventory). The information contained in the NZLRI database was generated at 1:50,000 scale. The areas of classes 1 to 3 were then converted into a percentage area for each class for the different options. This was then multiplied

by a weighting factor for each LUC class to give an overall weighting for the option. The higher the overall weighting the higher the MCA score as shown in the next section.

## 6 OPTION SCORING

The scoring system used to assess the options is shown in the following table.

Score	Description
1	The option presents few difficulties on the basis of the criterion being evaluated and may provide significant benefits in terms of the attribute.
2	The option presents only minor aspects of difficulty on the basis of the criterion being evaluated, and may provide some benefits in terms of the criterion.
3	The option presents some aspects of reasonable difficulty in terms of the criterion being evaluated and problems cannot be completely avoided. There are few apparent benefits in terms of the criterion.
4	The option includes clear aspects of difficulty in terms of the criterion being evaluated, and very limited perceived benefits.
5	The option includes significant difficulties or problems in terms of the criterion being evaluated and no apparent benefits.

The reality of using the above MCA scoring system to assess the impact on productive land for any of the options is that if the land is used for a road then the productive potential is lost forever. Consequently the only MCA scores in the table above that can be considered for productive land is 3, 4 or 5 and the actual MCA score is dependent on the amount of classes 1 to 3 land that is lost.

## 7 IMPACT ON PRODUCTIVE LAND FROM THE ROAD ALIGNMENTS

The table below shows the breakdown of LUC class for each of the road alignments options and these are shown on the Road Alignments Maps in Appendix 1. Also shown on Table 1 below is the MCA scoring for productive land. A description of the LUC units shown on the maps in Appendix 1 are described in Appendix 3.

Zone	Option	LUC Class					Total Area (ha)	Total area for LUC classes 1-3 (ha)	Total area for LUC classes 1-2 (ha)	MCA Scoring
		1	2	3	4	6				
Zone A	Green	-	-	17.2	-	-	17.2	17.2	0	3
	White	-	-	17.8	-	-	17.8	17.8	0	3
Zone B	Cyan	4.1	-	23.5	-	0.3	27.9	27.6	4.1	3
	Green	4.3	-	24.4	-	-	28.7	28.7	4.3	3

	<b>White</b>	4.8	-	23.7	-	-	28.5	28.5	4.8	3
<b>Zone C</b>	<b>Green</b>	7.3	-	12.7	-	-	20.0	20	7.3	4
	<b>Purple</b>	5.5	-	14.6	-	-	20.1	20.1	5.5	4
	<b>White</b>	4.2	-	16.0	-	-	20.3	20.2	4.2	3
<b>Zone D</b>	<b>Blue</b>	6.4	8.2	16.3	5.3	1.1	37.3	30.9	14.6	3
	<b>Cyan</b>	12.9	10.0	9.6	4.6	-	37.1	32.5	22.9	4
<b>Zone E</b>	<b>Cyan</b>	-	5.4	11.2	2.7	-	19.3	16.6	5.4	3
	<b>Green</b>	-	6.6	9.9	2.4	-	19.0	16.5	6.6	3
<b>Zone F</b>	<b>Purple</b>	8.4	2.4	9.1	-	-	19.9	19.9	10.8	4
	<b>White</b>	7.9	2.7	9.3	-	-	19.9	19.9	10.6	4
<b>Zone G</b>	<b>Cyan</b>	-	-	18.4	-	-	18.4	18.4	0	3
	<b>Purple</b>	-	-	18.5	-	-	18.5	18.5	0	3
	<b>White</b>	-	-	18.5	-	-	18.5	18.5	0	3
<b>Zone H</b>	<b>Cyan</b>	11.7	-	0.6	-	-	12.2	12.3	11.7	5
	<b>Purple</b>	11.9	-	0.3	-	-	12.2	12.2	11.9	5
<b>Zone K</b>	<b>Blue</b>	20.4	0.1	-	-	-	20.5	20.5	20.5	5
	<b>Cyan</b>	20.4	0.4	-	-	-	20.8	20.8	20.8	5
	<b>Yellow</b>	19.7	0.1	-	-	-	19.8	19.8	19.8	5
<b>Zone L</b>	<b>Purple</b>	5.0	15.3	-	-	-	20.3	20.3	20.3	5
	<b>Green</b>	5.3	15.1	-	-	-	20.4	20.4	20.4	5
	<b>Orange</b>	5.7	15.5	-	-	-	21.1	21.2	21.2	5
	<b>Black</b>	8.9	12.5	-	-	-	21.3	21.4	21.4	5

The above table shows the following:

- Generally within the different zones there is very little difference between the various options in terms of MCA with the exception of zones C and D where one option has less impact on productive land compared with the other options.
- The greater the amount of class 1 and 2 land the higher the MCA score.
- The MCA score at the very best is a 3 by definition as any land lost to the proposed road loses its productive potential for food production forever.

## 8 IMPACT ON PRODUCTIVE LAND FROM THE INTERCHANGERS

Zone	Option	LUC Class					Total Area (ha)	Total area for LUC classes 1-3 (ha)	Total area for LUC classes 1-2 (ha)	MCA Scoring
		1	2	3	4	6				
South Manakau	Roundabout	-	-	4.7	-	-	4.7	4.7	-	4
	Grade separation	1.1		6.7	-	-	7.9	7.9	1.1	5
North Manakau	Roundabout	3.5	1.0		-	-	4.5	4.5	4.5	4
	Grade separation	3.0	1.7	0.1	-	-	4.8	4.8	4.7	4
	No connection	-	-	-	-	-	-	-	-	1
Kimberley	Roundabout	4.0	0.2	-	-	-	4.2	4.2	4.2	4
	Grade separation	9.0	0.5	1.7	-	-	11.2	11.2	9.5	5
Tararua	Roundabout	-	-	2.4	-	-	2.4	2.4	0	3
	Grade separation	-	-	10.4	-	-	10.4	10.4	0	3
SH57	Bifurcation	7.8	-	-	-	-	7.8	7.8	7.8	5
	Roundabout	4.9	0.2	-	-	-	5.1	5.1	5.1	4
	Grade separation	13.4					13.4	13.4	13.4	5
North Levin	Roundabout	1.6	-	-	-	-	1.6	1.6	1.6	3
	Grade separation	3.4	1.1	-	-	-	4.5	4.5	4.5	4

Each of these areas are shown on the Interchangers Maps in Appendix 2.

The above table shows the following:

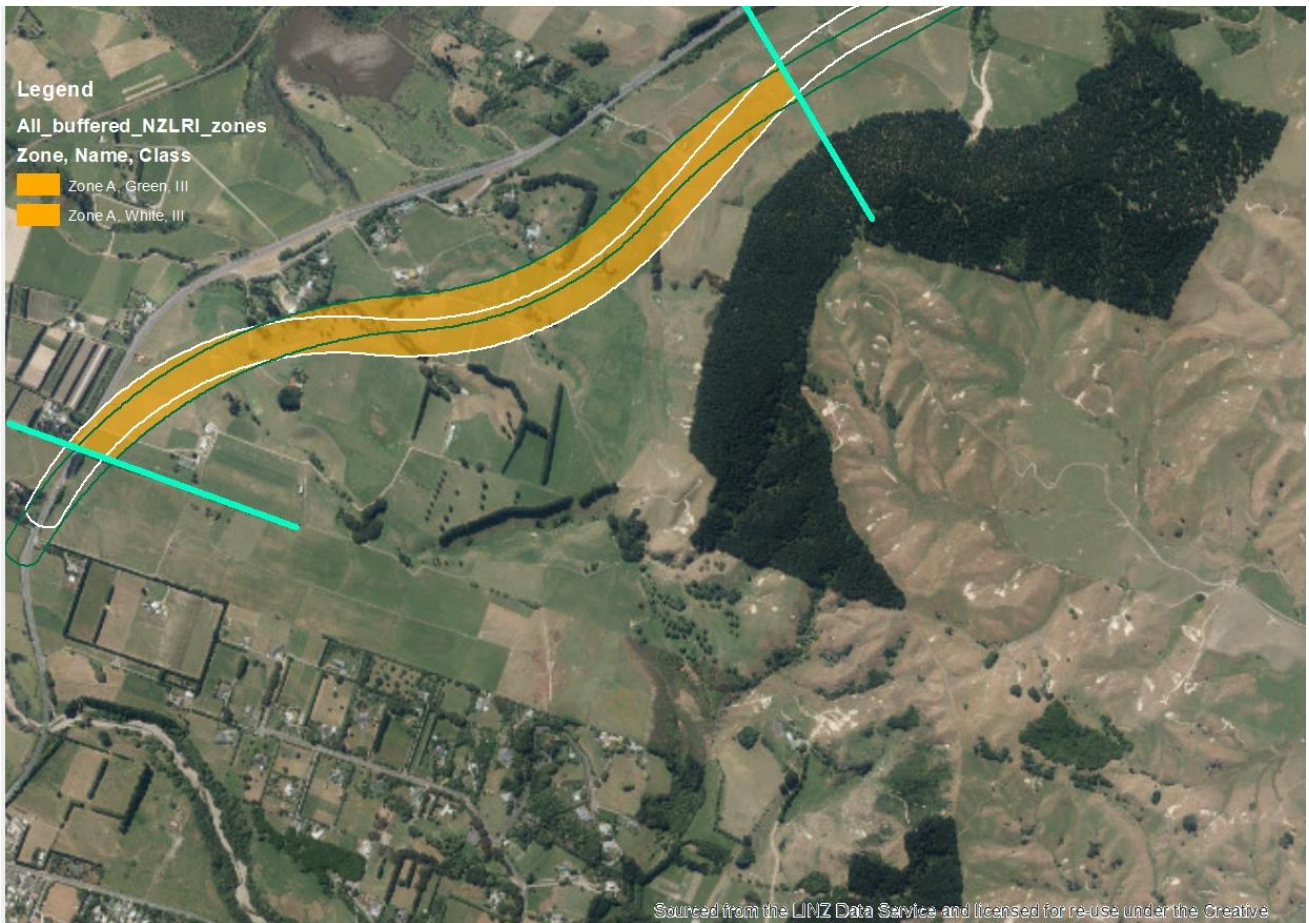
- Generally the footprints from the roundabouts are smaller than the service interchanges.
- Mostly located on class I land or I and III land (highly productive).
- None of the options add value to productive land for food production.

A description of the LUC units shown on the maps in Appendix 2 is described in Appendix 3.

## 9 APPENDIX 1: LAND RESOURCES MAPS FOR THE DIFFERENT ALIGNMENTS

### 9.1 Zone A

#### 9.1.1 Zone A - LUC



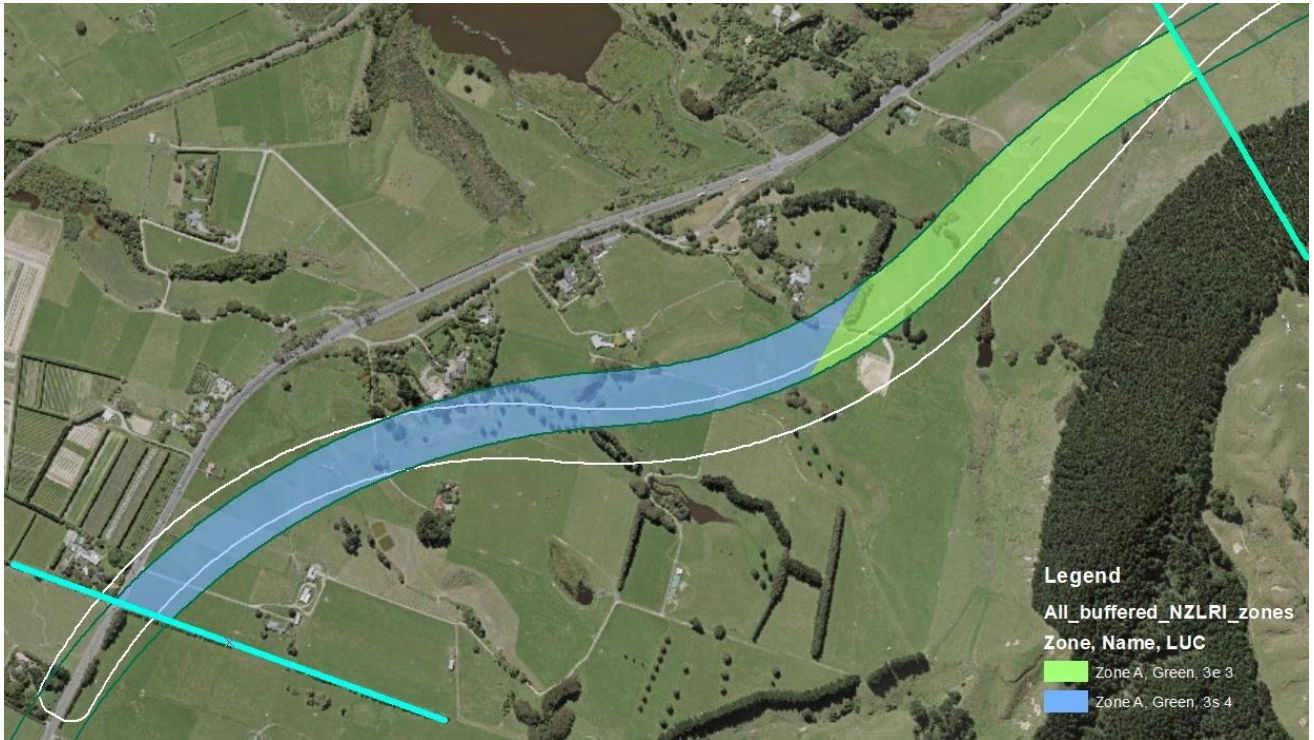
Row Labels	Sum of AREAH
Zone A	35.0
Green	17.2
III	17.2
3e 3	6.4
3s 4	10.9
White	17.8
III	17.8
3e 3	7.5
3s 4	10.3
<b>Grand Total</b>	<b>35.0</b>

**Summary:**

- No real difference between options
- All class 3 land
- MCA – 3 for all options



### 9.1.2 Zone A - Green

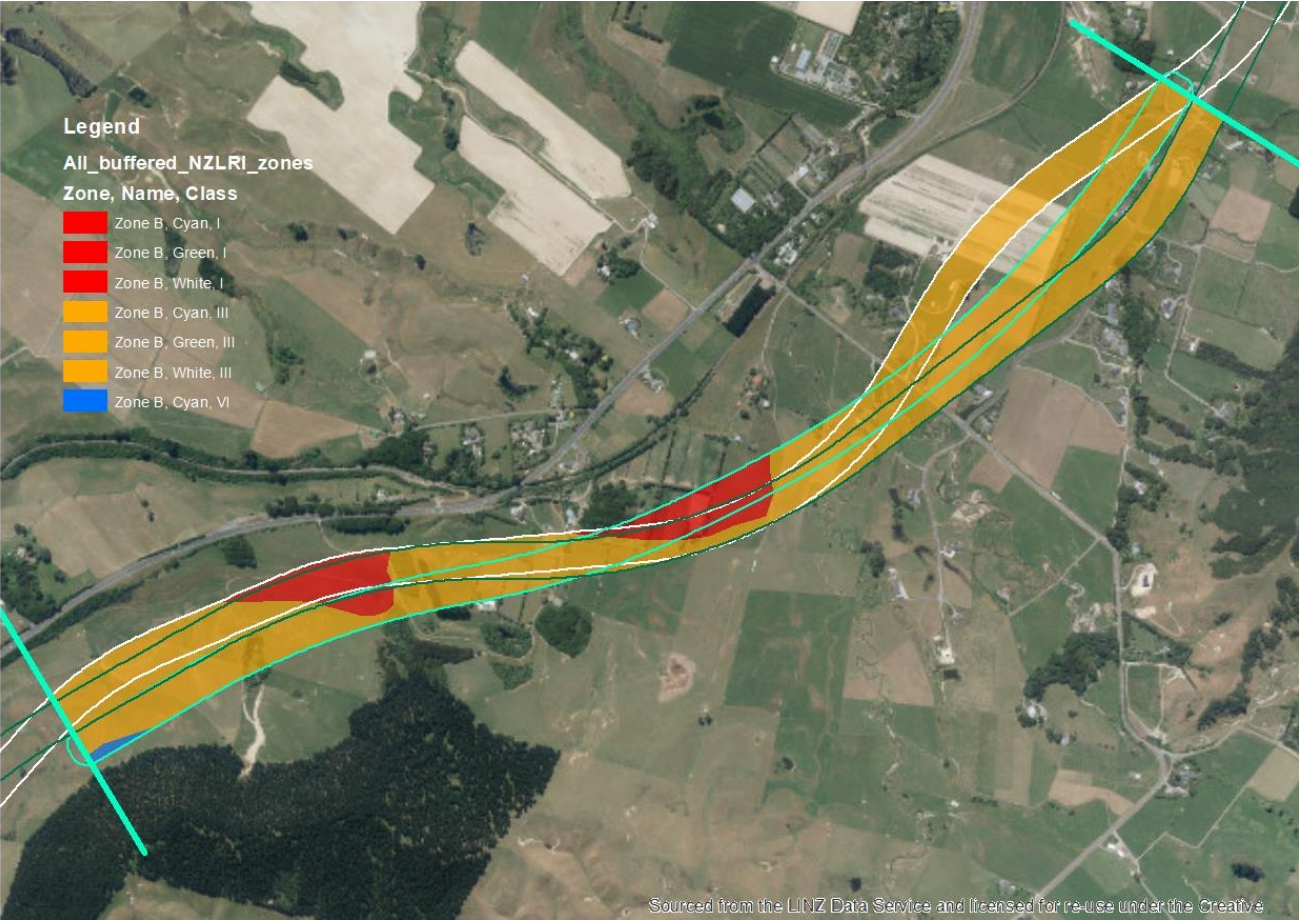


### 9.1.3 Zone A - White



9.2 Zone B

9.2.1 Zone B - LUC

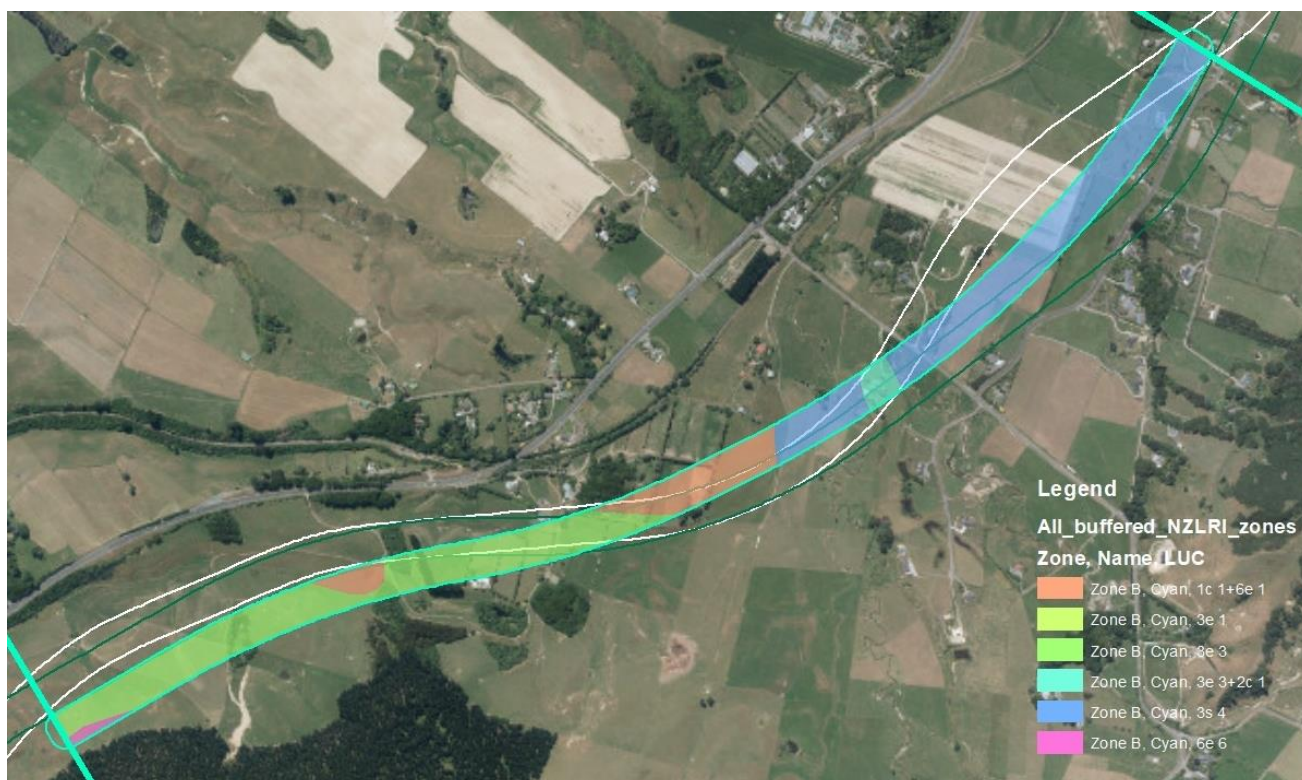


<b>Zone B</b>	<b>85.1</b>
<b>Cyan</b>	<b>27.9</b>
I	4.1
1c 1+6e 1	4.1
III	23.5
3e 1	0.0
3e 3	11.5
3e 3+2c 1	0.7
3s 4	11.3
VI	0.3
6e 6	0.3
<b>Green</b>	<b>28.7</b>
I	4.3
1c 1+6e 1	4.3
III	24.4
3e 3	11.7
3e 3+2c 1	0.8
3s 4	11.9
<b>White</b>	<b>28.5</b>
I	4.8
1c 1+6e 1	4.8
III	23.7
3e 1	0.1
3e 3	11.2
3e 3+2c 1	0.8
3s 4	11.7

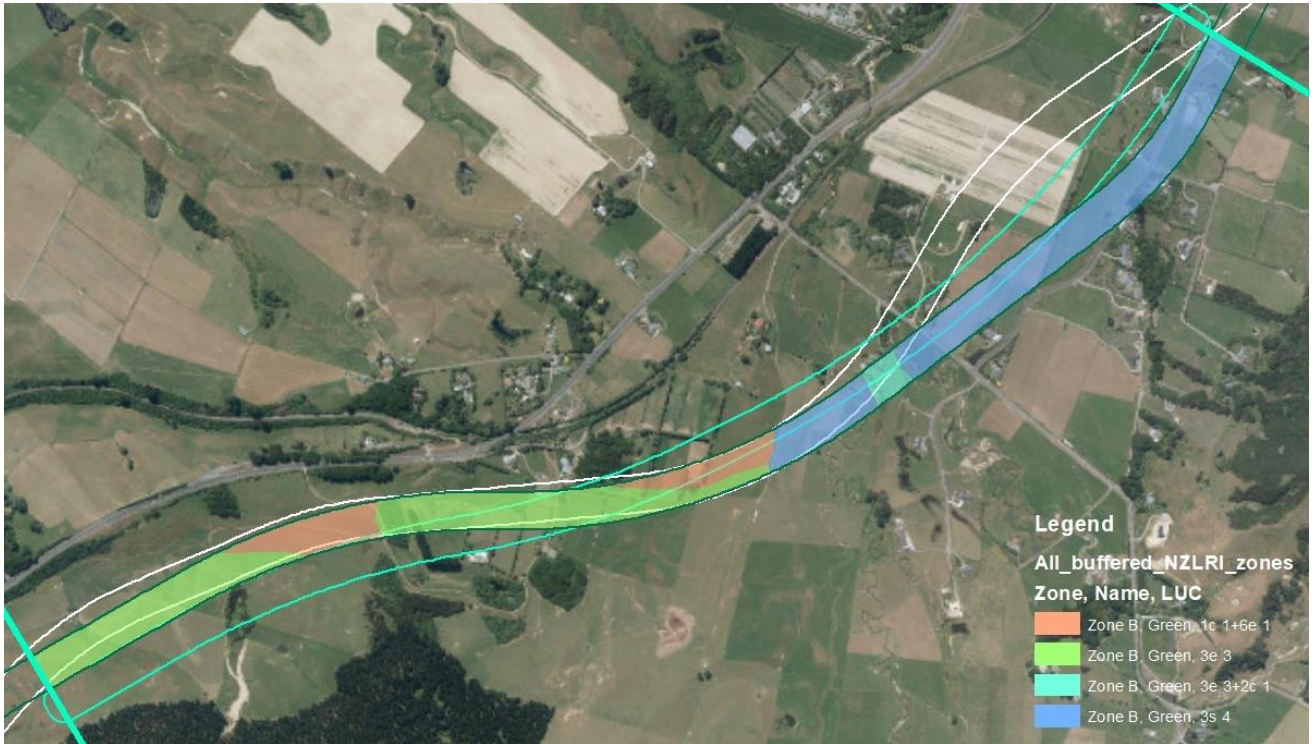
**Summary:**

- No real difference between options
- MCA – 3 for all options

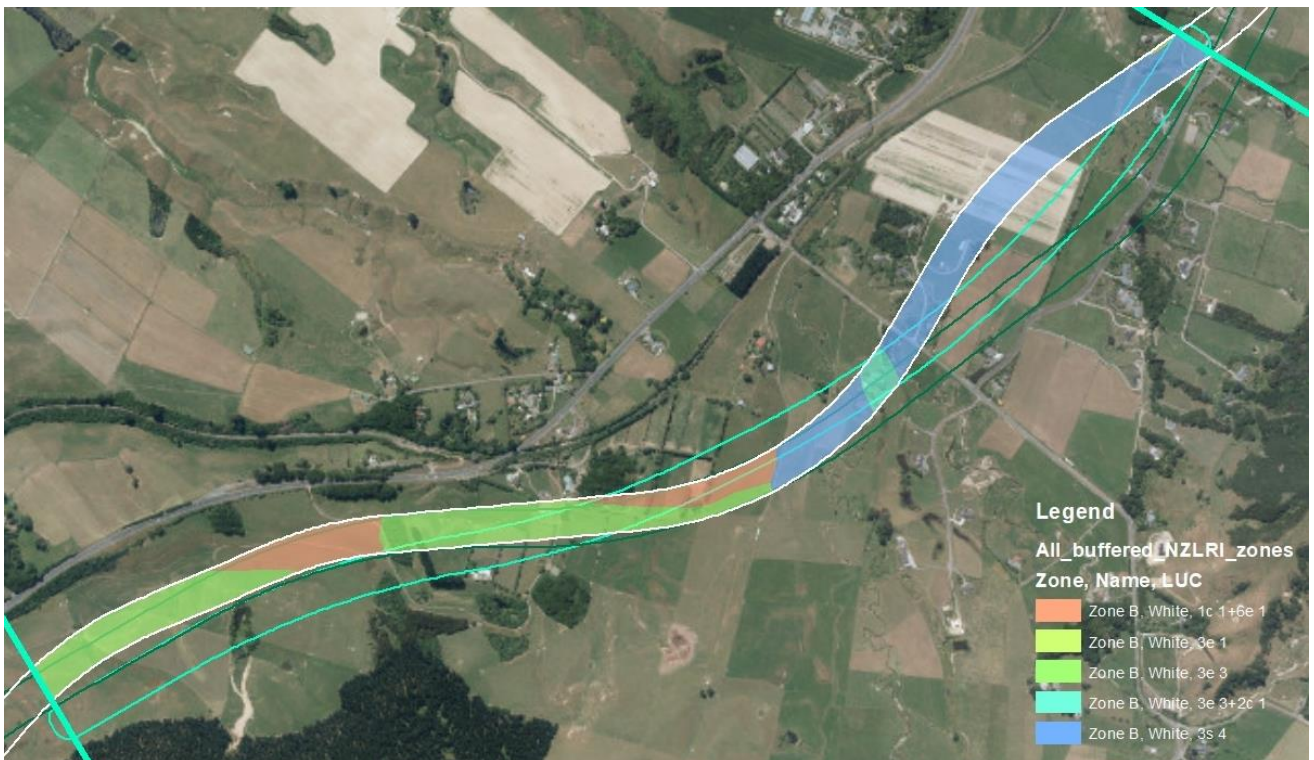
**9.2.2 Zone B - Cyan**



### 9.2.3 Zone B - Green



### 9.2.4 Zone B - White



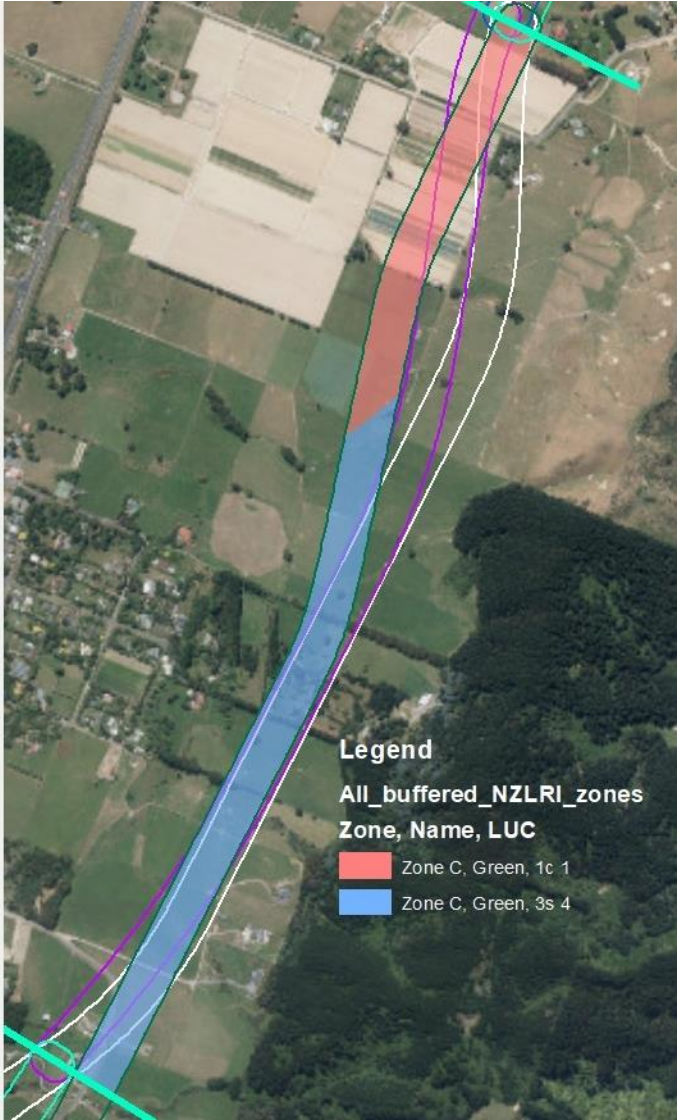
9.3 Zone C

9.3.1 Zone C - LUC

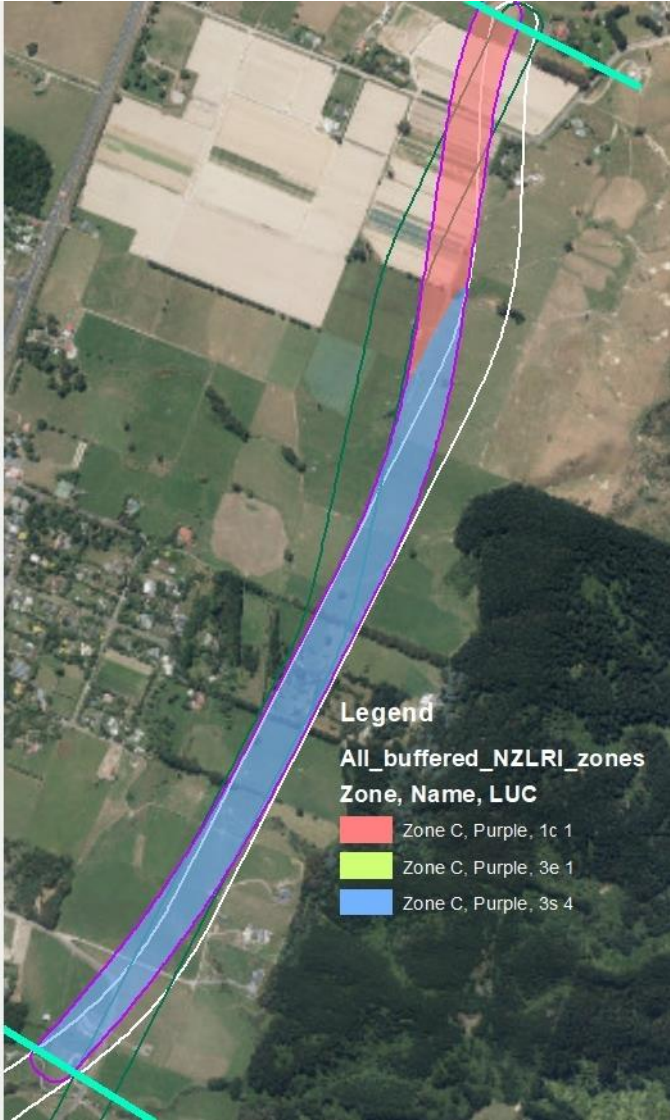


<b>Zone C</b>	<b>60.4</b>	<b>Summary:</b> <ul style="list-style-type: none"> <li>• White is the preferred option due to less Class 1 land</li> <li>• MCA - White = 3, Green &amp; Purple = 4</li> </ul>
<b>Green</b>	<b>20.0</b>	
I	7.3	
1c 1	7.3	
III	12.7	
3s 4	12.7	
<b>Purple</b>	<b>20.1</b>	
I	5.5	
1c 1	5.5	
III	14.6	
3e 1	0.0	
3s 4	14.6	
<b>White</b>	<b>20.3</b>	
I	4.2	
1c 1	4.2	
III	16.0	
3s 4	16.0	

9.3.2 Zone C - Green



9.3.3 Zone C - Purple



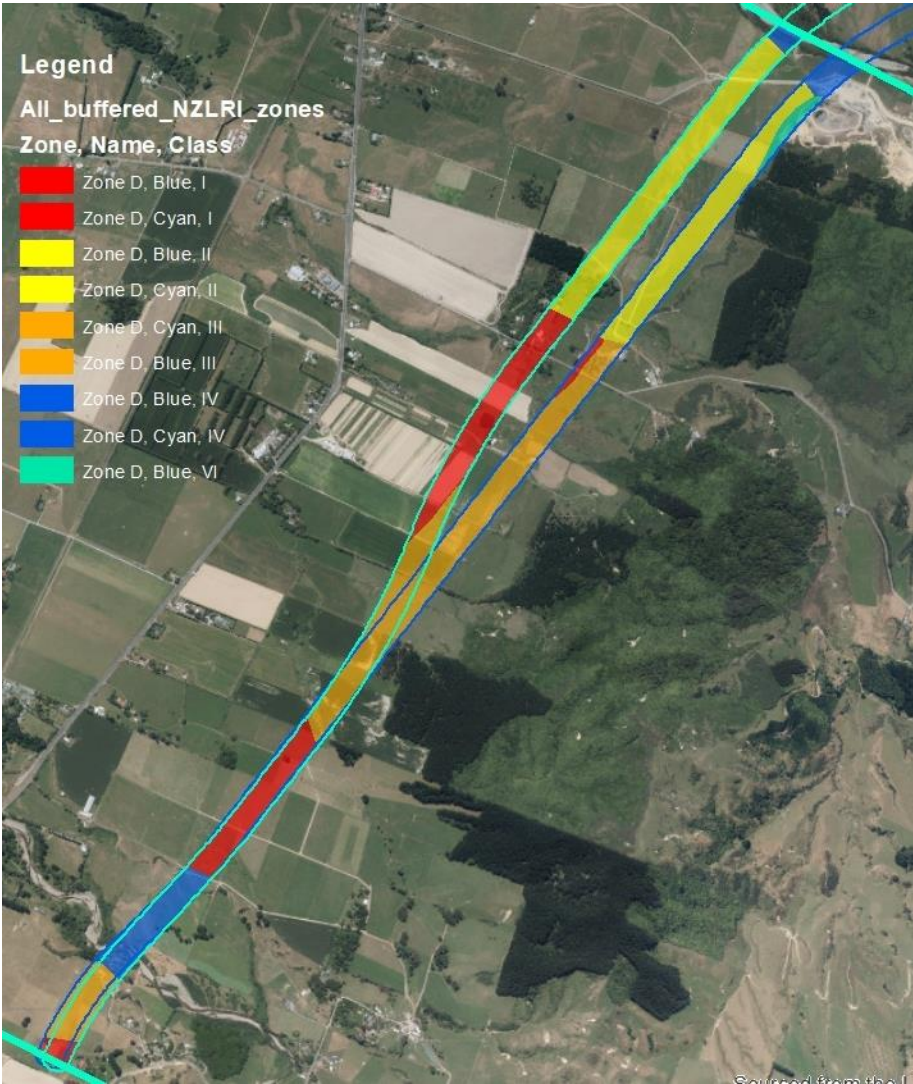


9.3.4 Zone C - White



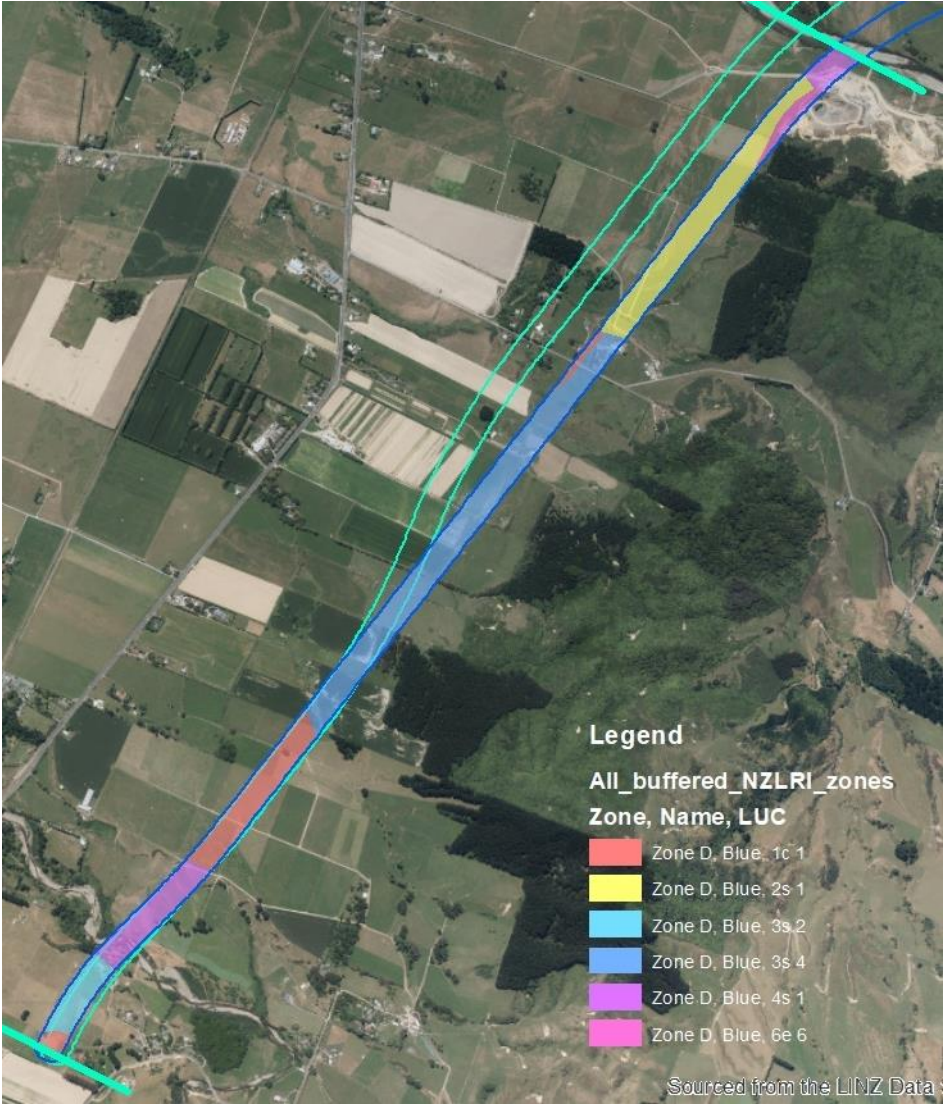
9.4 Zone D

9.4.1 Zone D - LUC

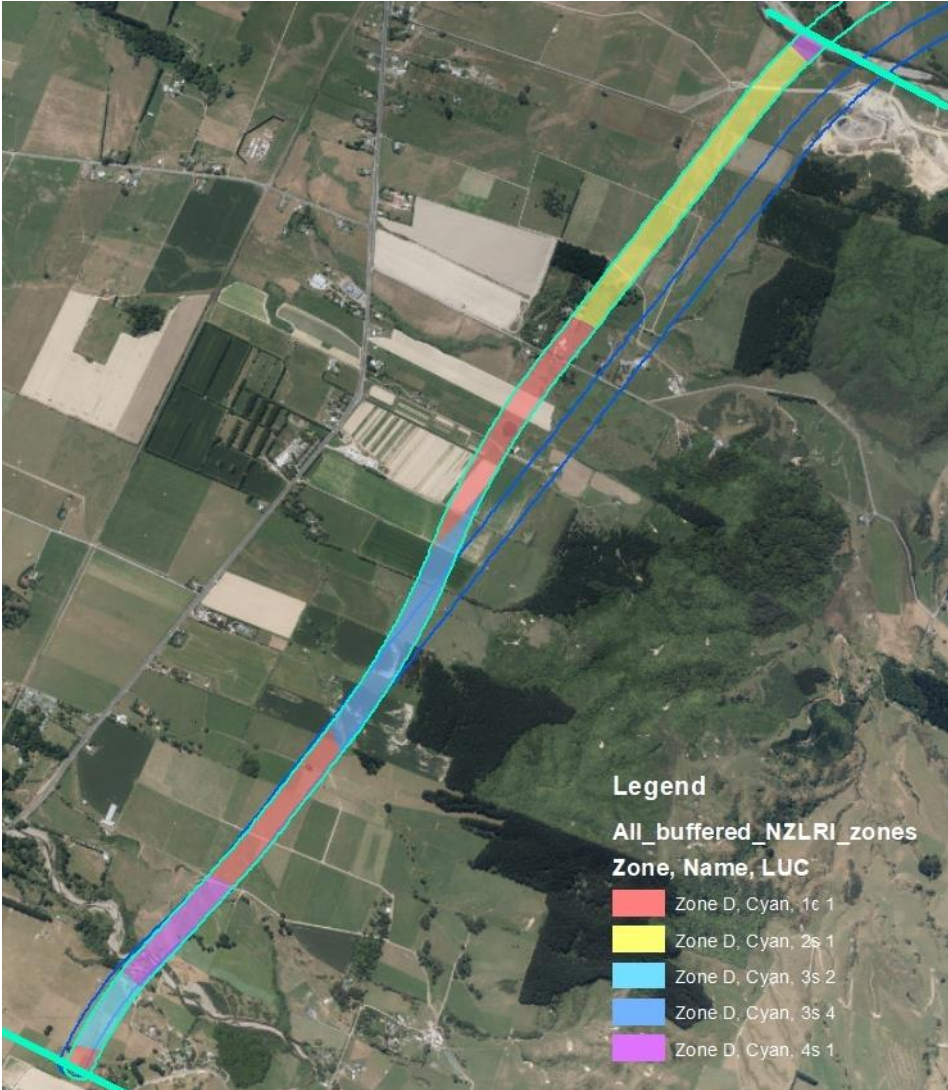


<b>Zone D</b>	<b>74.4</b>	<b>Summary:</b> <ul style="list-style-type: none"> <li>• Blue is the preferred option</li> <li>• MCA - Blue = 3 &amp; Cyan = 4</li> </ul>
<b>Blue</b>	<b>37.3</b>	
I	6.4	
1c 1	6.4	
II	8.2	
2s 1	8.2	
III	16.3	
3s 2	2.5	
3s 4	13.8	
IV	5.3	
4s 1	5.3	
VI	1.1	
6e 6	1.1	
<b>Cyan</b>	<b>37.1</b>	
I	12.9	
1c 1	12.9	
II	10.0	
2s 1	10.0	
III	9.6	
3s 2	2.4	
3s 4	7.3	
IV	4.6	
4s 1	4.6	

9.4.2 Zone D - Blue

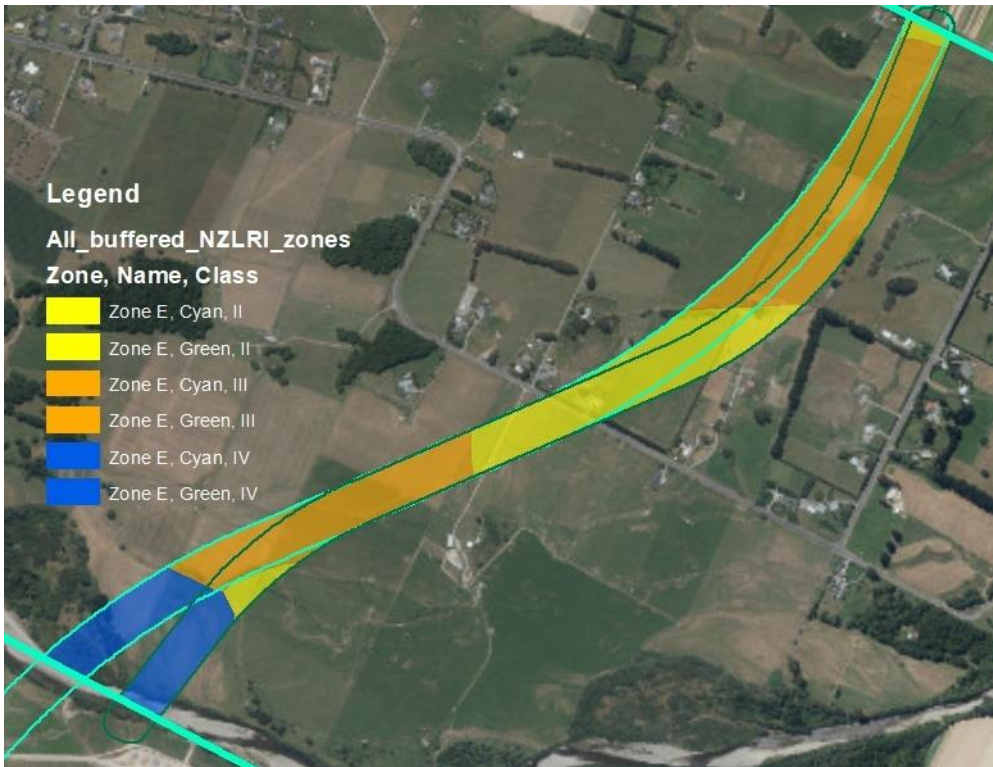


9.4.3 Zone D - Cyan



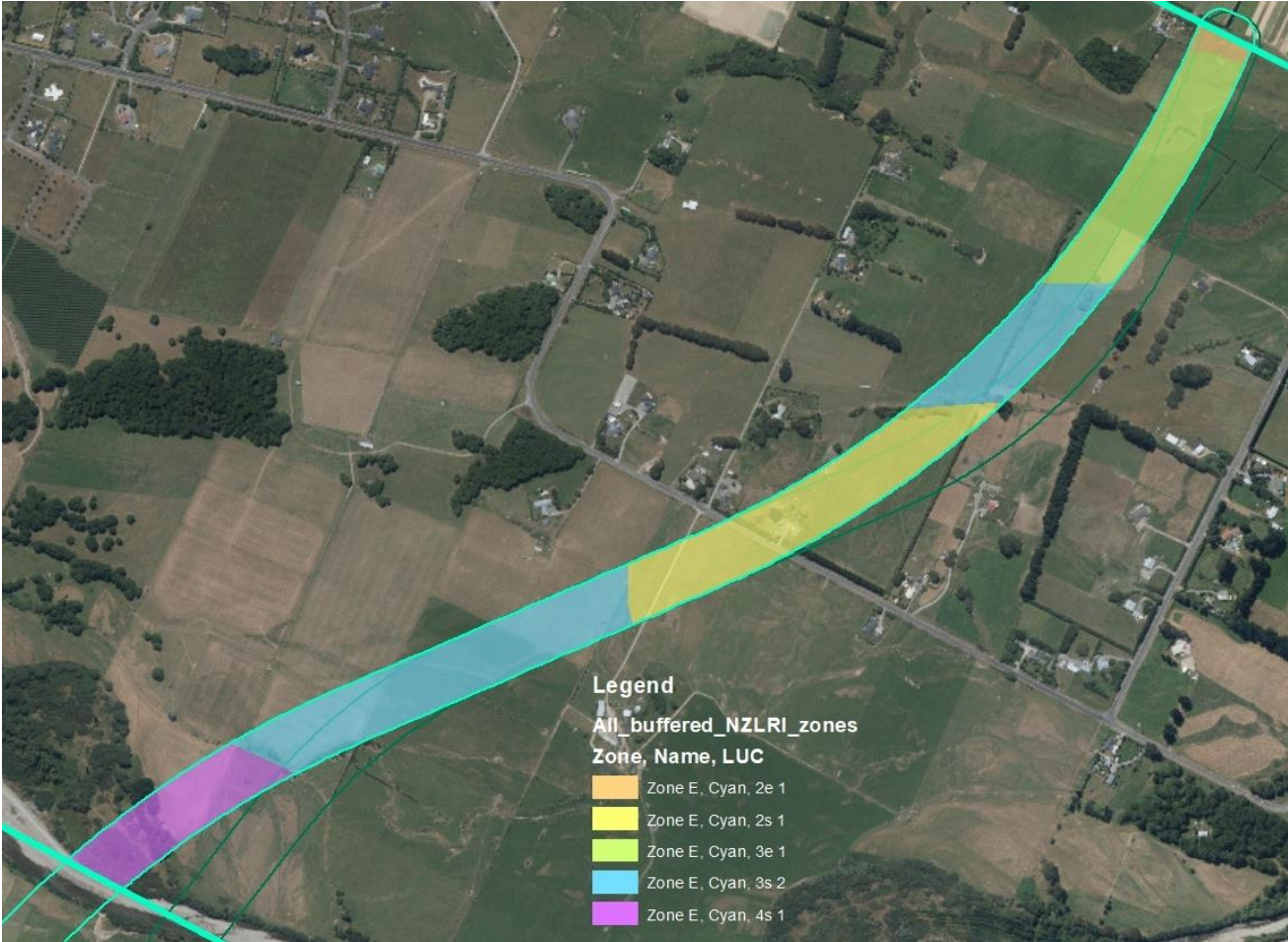
## 9.5 Zone E

### 9.5.1 Zone E - LUC

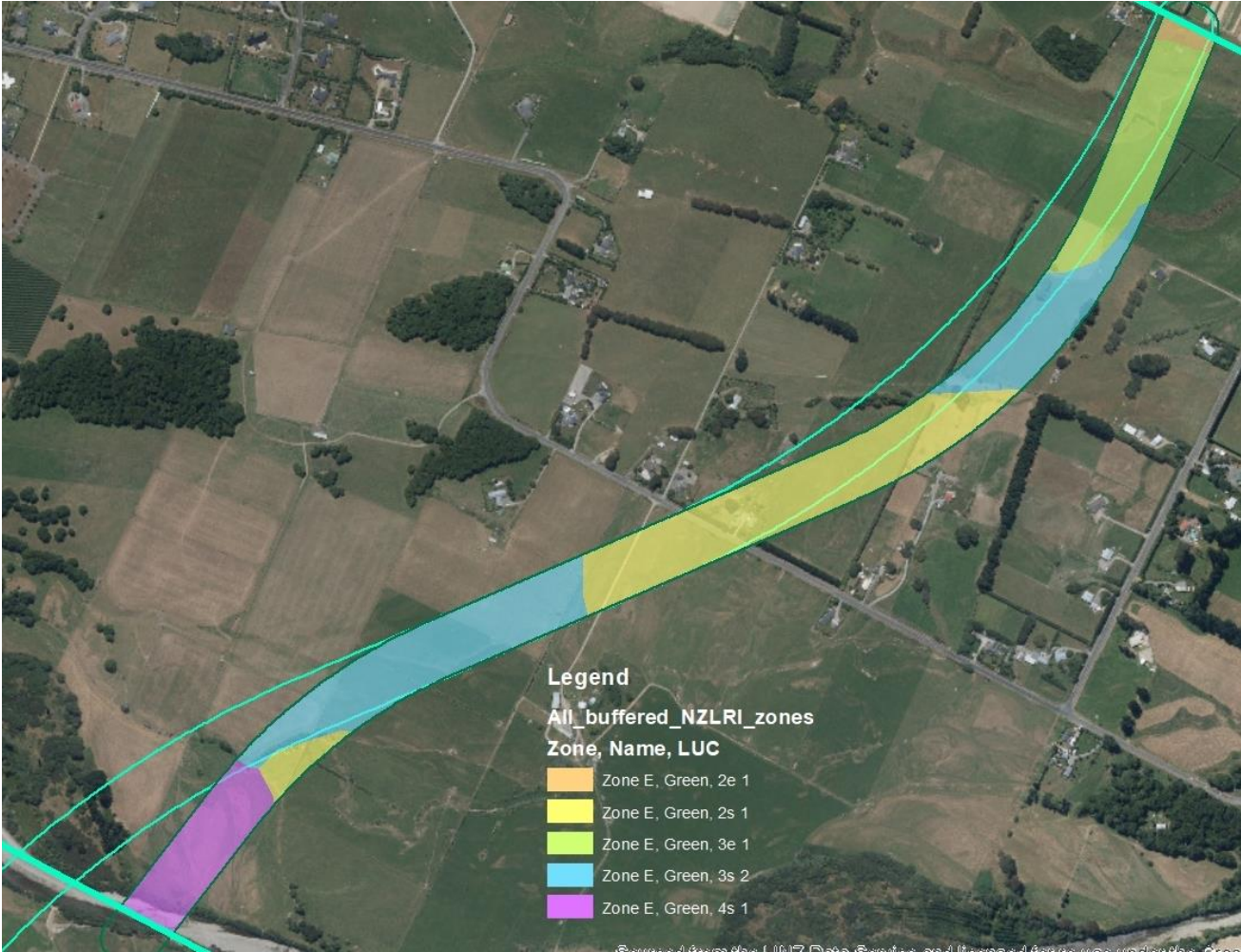


<b>Zone E</b>	<b>38.3</b>	<p><b>Summary:</b></p> <ul style="list-style-type: none"> <li>Both options have similar impact on productive land</li> <li>MCA = 3's</li> </ul>
<b>Cyan</b>	<b>19.3</b>	
<b>II</b>	5.4	
2e 1	0.3	
2s 1	5.1	
<b>III</b>	11.2	
3e 1	3.6	
3s 2	7.7	
<b>IV</b>	2.7	
4s 1	2.7	
<b>Green</b>	<b>19.0</b>	
<b>II</b>	6.6	
2e 1	0.3	
2s 1	6.4	
<b>III</b>	9.9	
3e 1	3.0	
3s 2	6.9	
<b>IV</b>	2.4	
4s 1	2.4	

9.5.2 Zone E - Cyan



9.5.3 Zone E - Green





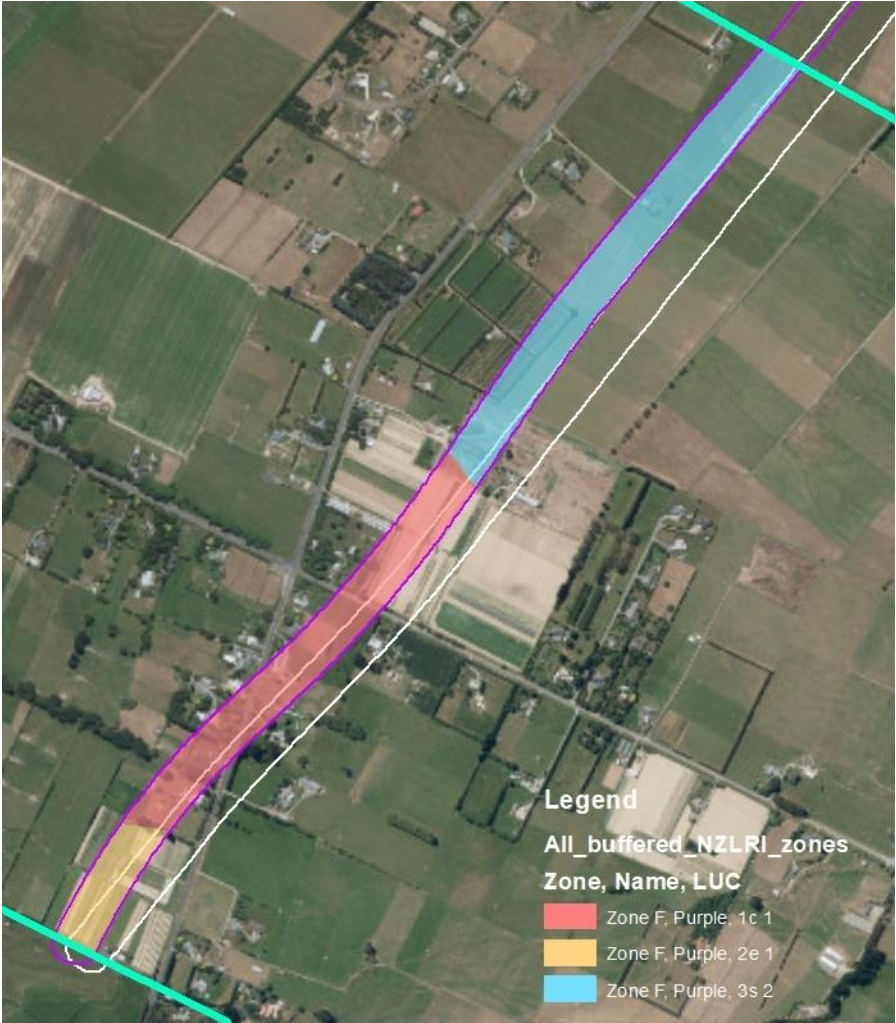
## 9.6 Zone F

### 9.6.1 Zone F - LUC

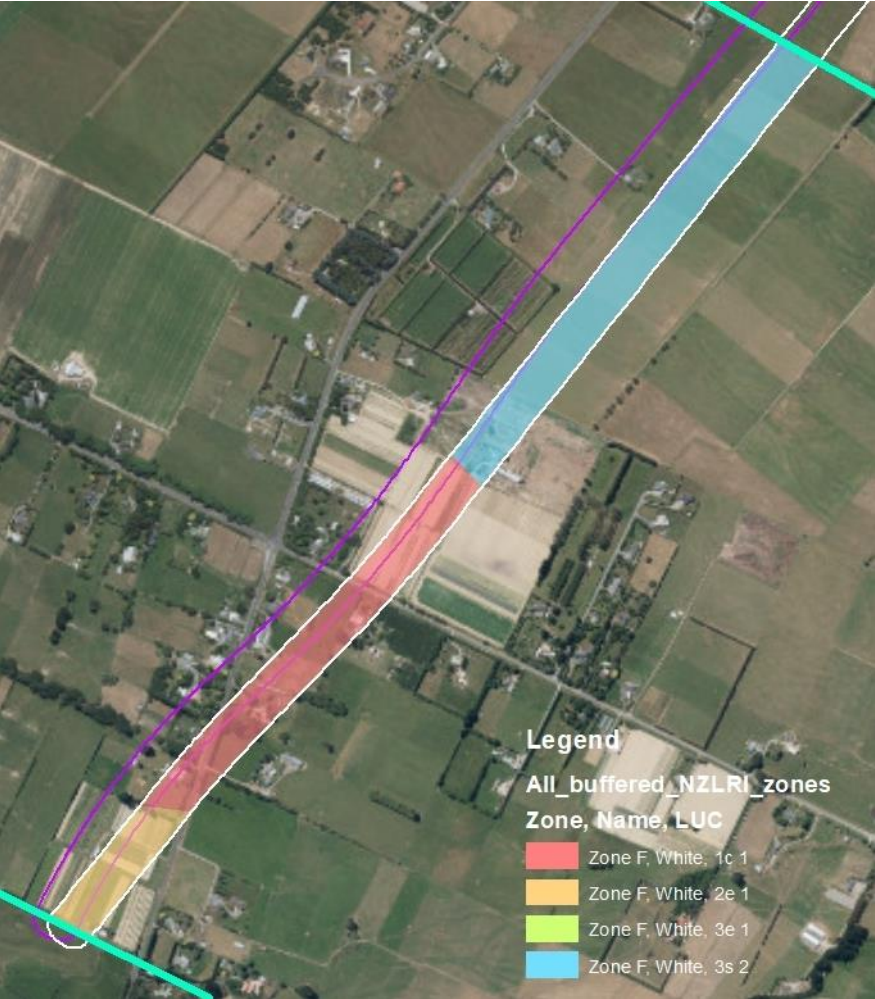


<b>Zone F</b>	<b>39.8</b>	<b>Summary:</b> <ul style="list-style-type: none"> <li>Both options have similar impact on productive land</li> <li>MCA = 4</li> </ul>
<b>Purple</b>	<b>19.9</b>	
I	8.4	
1c 1	8.4	
II	2.4	
2e 1	2.4	
III	9.1	
3s 2	9.1	
<b>White</b>	<b>19.9</b>	
I	7.9	
1c 1	7.9	
II	2.7	
2e 1	2.7	
III	9.3	
3e 1	0.0	
3s 2	9.3	

9.6.2 Zone F - Purple



9.6.3 Zone F - White



## 9.7 Zone G

### 9.7.1 Zone G - LUC



<b>Zone G</b>	<b>55.3</b>	<b>Summary:</b> <ul style="list-style-type: none"> <li>No difference between the options.</li> <li>All Class 3 land</li> <li>MCA = 3</li> </ul>
<b>Cyan</b>	<b>18.4</b>	
III	18.4	
3s 2	18.4	
<b>Purple</b>	<b>18.5</b>	
III	18.5	
3s 2	18.5	
<b>White</b>	<b>18.5</b>	
III	18.5	
3s 2	18.5	

9.7.2 Zone G - Cyan



9.7.3 Zone G - Purple

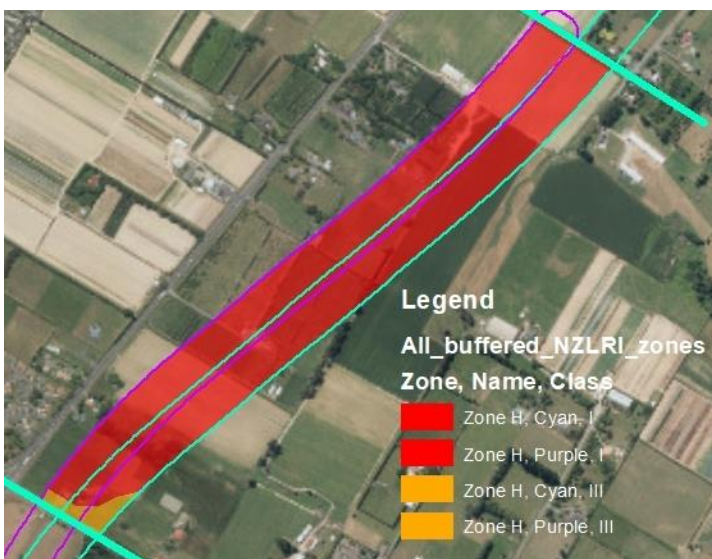


### 9.7.4 Zone G - White



### 9.8 Zone H

#### 9.8.1 Zone H - LUC



<b>Zone H</b>	<b>24.4</b>
<b>Cyan</b>	<b>12.2</b>
I	
1c 1	11.7
III	
3s 2	0.6
<b>Purple</b>	<b>12.2</b>
I	
1c 1	11.9
III	
3s 2	0.3

**Summary:**

- No difference between the options.
- Generally all Class 1 land
- MCA = 5

### 9.8.2 Zone H - Cyan



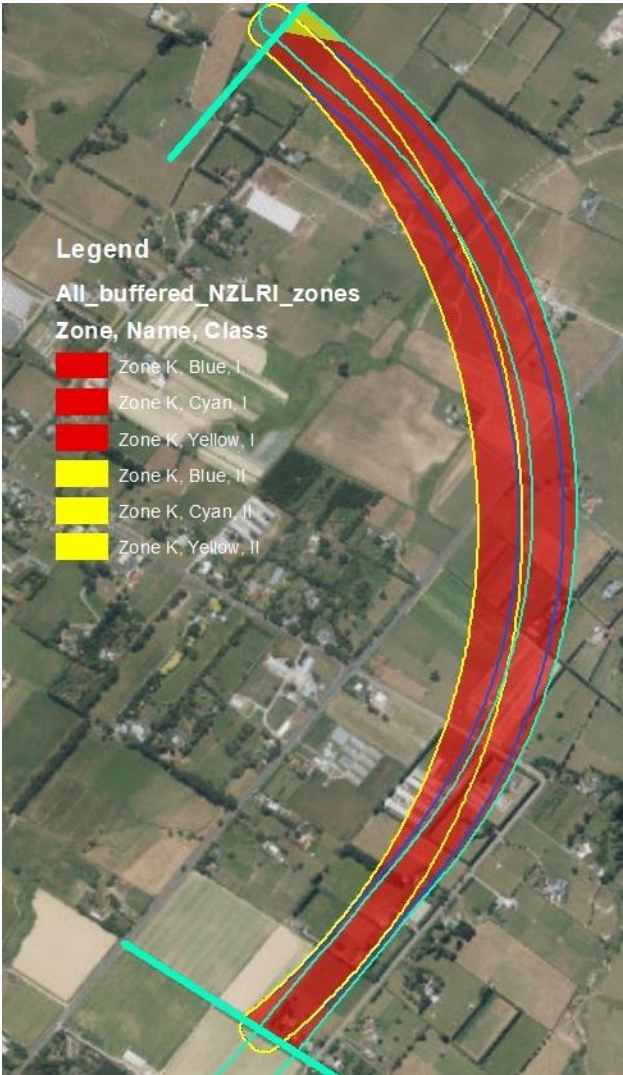


9.8.3 Zone H - Purple



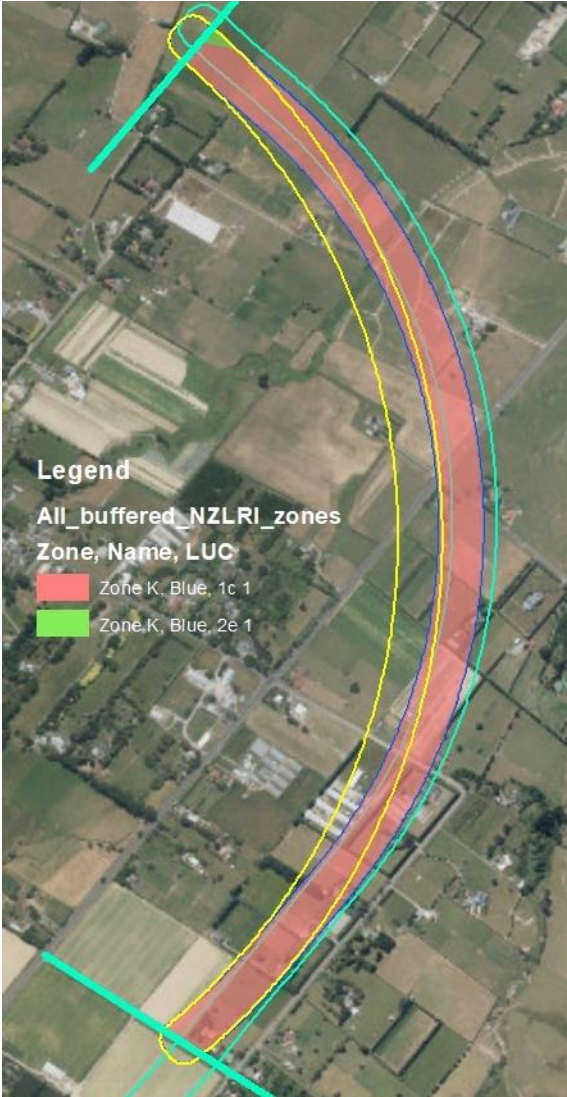
9.9 Zone K

9.9.1 Zone K - LUC

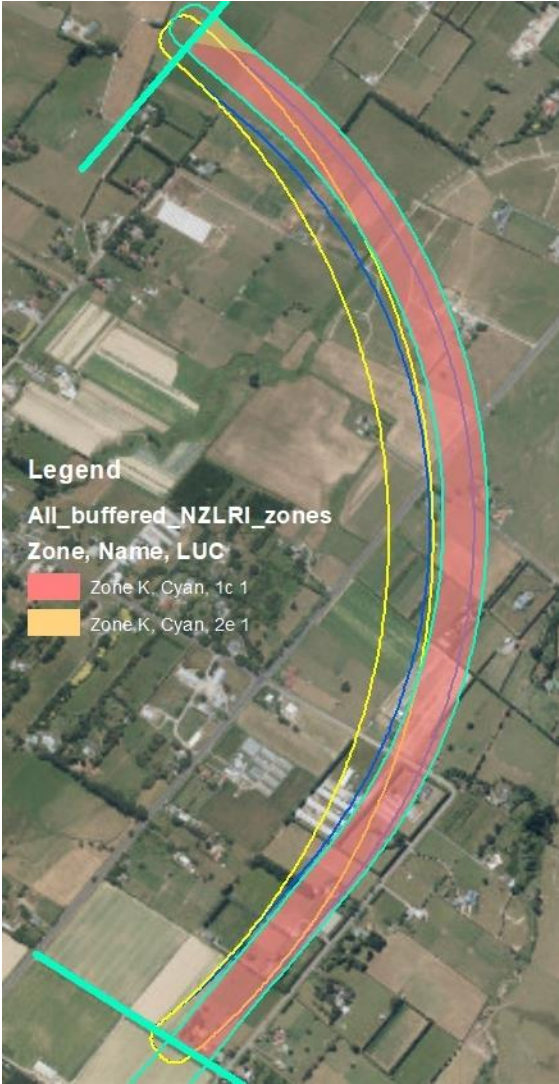


<b>Zone L</b>	<b>83.2</b>	<b>Summary:</b> <ul style="list-style-type: none"> <li>• The black has the most impact on productive land and there is no real differences between the other three options.</li> <li>• All class 1 and 2 land</li> <li>• MCA – all 5</li> </ul>
<b>Black</b>	<b>21.3</b>	
1c 1	8.9	
2e1	0.2	
2e1+6e3	12.1	
2s2	0.1	
<b>Green</b>	<b>20.4</b>	
1c 1	5.3	
2e1+6e3	15.0	
2s2	0.1	
<b>Orange</b>	<b>21.1</b>	
1c 1	5.7	
2e1+6e3	15.3	
2s2	0.1	
<b>Purple</b>	<b>20.4</b>	
1c 1	5.0	
2e 1	0.2	
2e1+6e2	15.1	
2s2	0.1	

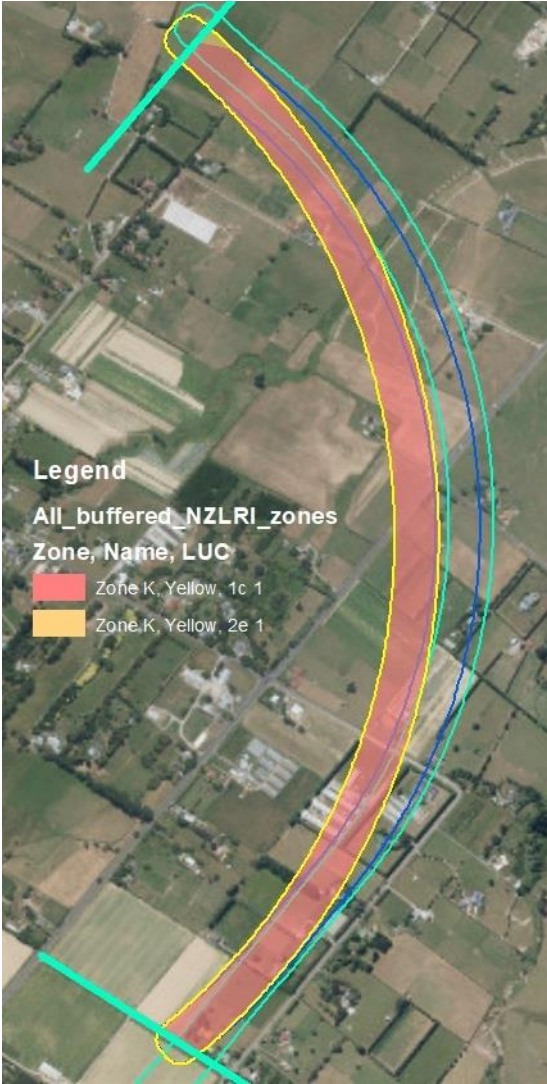
9.9.2 Zone K - Blue



9.9.3 Zone K - Cyan



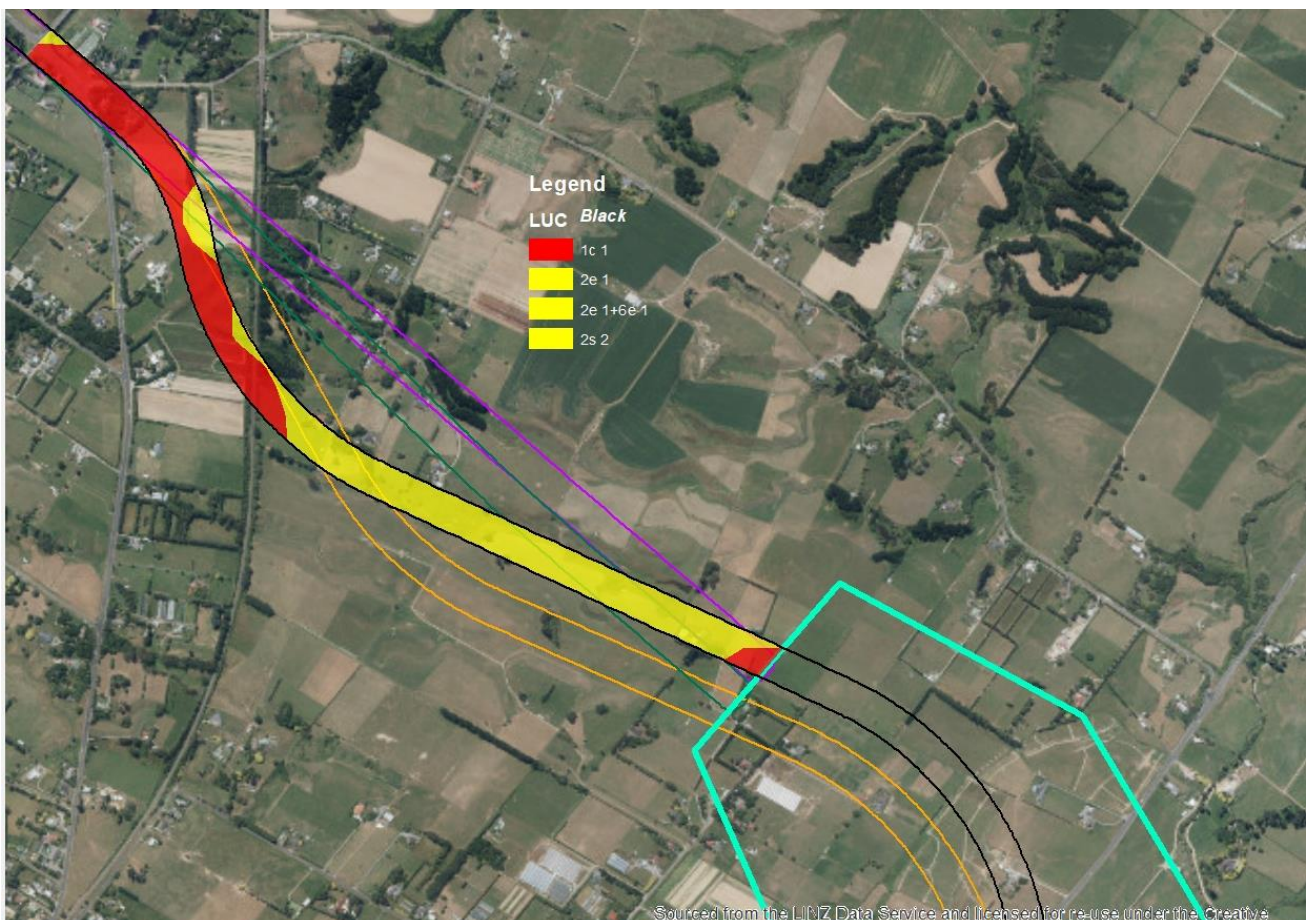
9.9.4 Zone K - Yellow



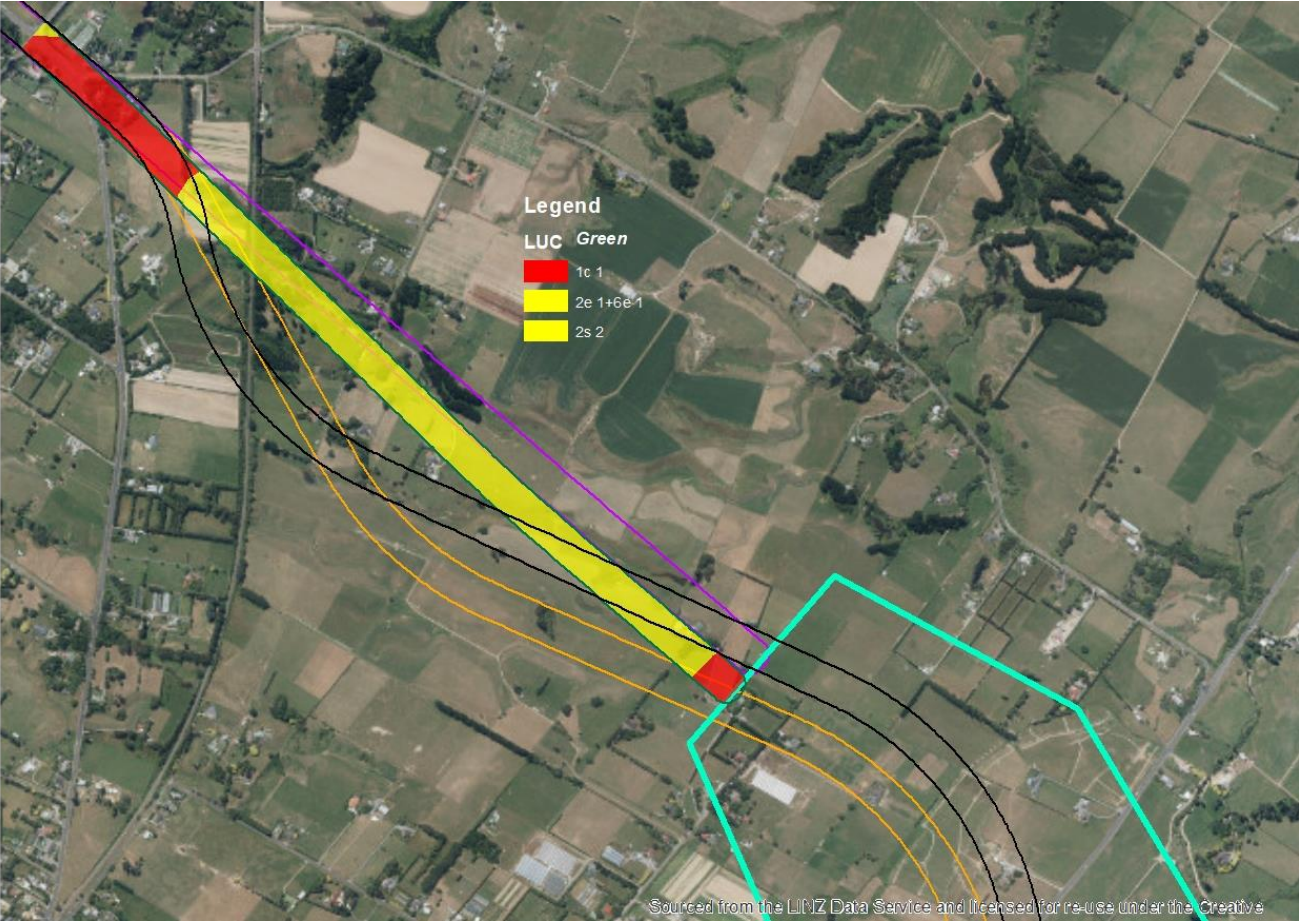
## 9.10 Zone L

<b>Zone L</b>	<b>83.2</b>	<b>Summary:</b> <ul style="list-style-type: none"> <li>The black has the most impact on productive land and there are no real differences between the other three options.</li> <li>All class 1 and 2 land</li> <li>MCA – all 5</li> </ul>
<b>Black</b>	<b>21.3</b>	
1c 1	8.9	
2e1	0.2	
2e1+6e3	12.1	
2s2	0.1	
<b>Green</b>	<b>20.4</b>	
1c 1	5.3	
2e1+6e3	15.0	
2s2	0.1	
<b>Orange</b>	<b>21.1</b>	
1c 1	5.7	
2e1+6e3	15.3	
2s2	0.1	
<b>Purple</b>	<b>20.4</b>	
1c 1	5.0	
2e 1	0.2	
2e1+6e2	15.1	
2s2	0.1	

### 9.10.1 Zone L - Black

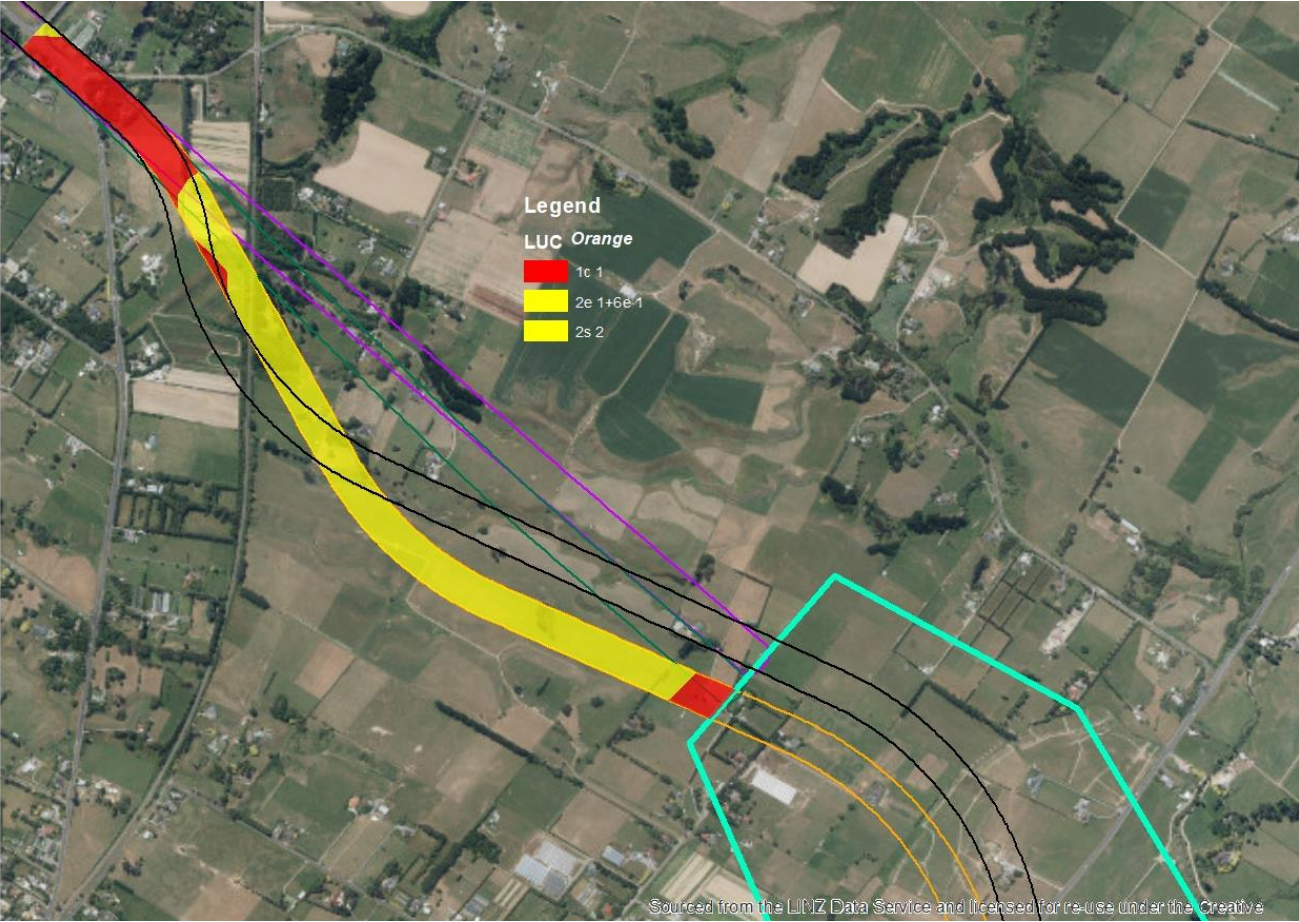


9.10.2 Zone L - Green

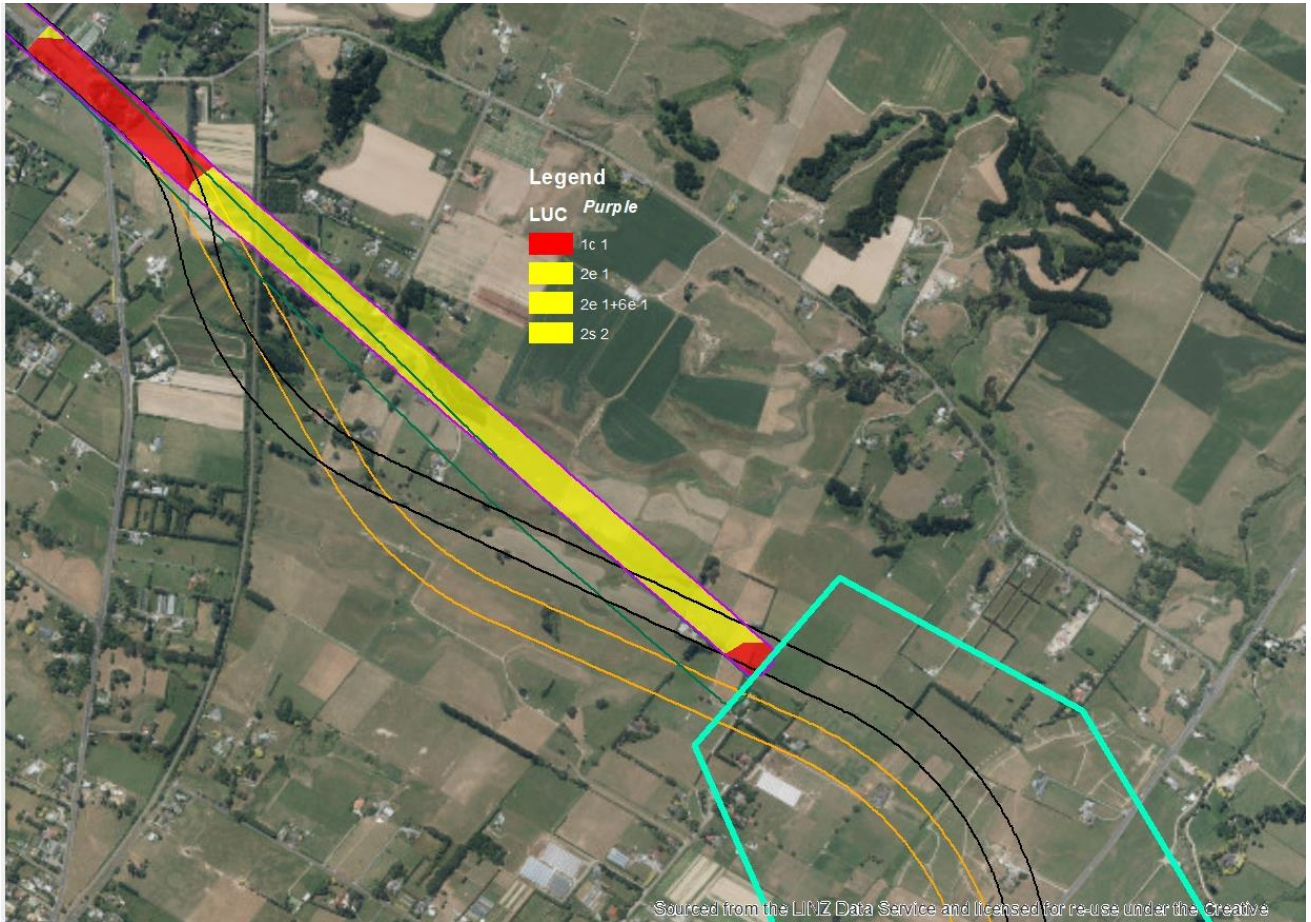




9.10.3 Zone L - Orange





### 9.10.4 Zone L - Purple



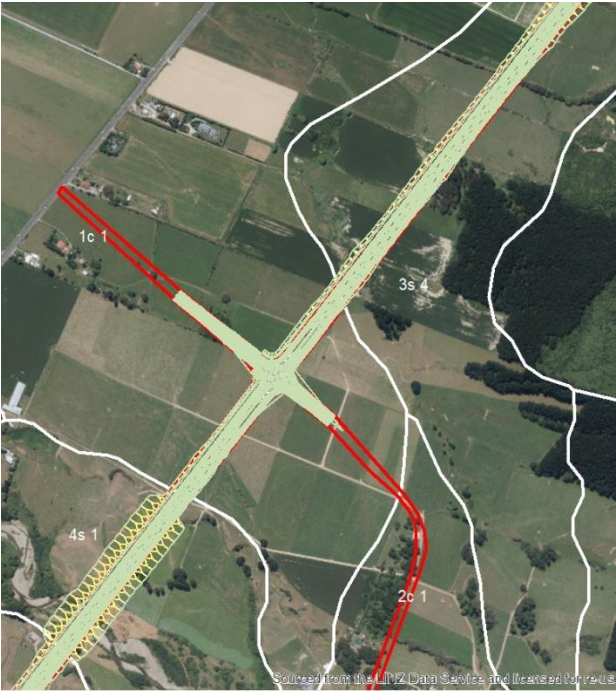

<b>Zone L</b>	<b>83.2</b>	<b>Summary:</b> <ul style="list-style-type: none"> <li>• The black has the most impact on productive land and there are no real differences between the other three options.</li> <li>• All class 1 and 2 land</li> <li>• MCA – all 5</li> </ul>
<b>Black</b>	<b>21.3</b>	
1c 1	8.9	
2e1	0.2	
2e1+6e3	12.1	
2s2	0.1	
<b>Green</b>	<b>20.4</b>	
1c 1	5.3	
2e1+6e3	15.0	
2s2	0.1	
<b>Orange</b>	<b>21.1</b>	
1c 1	5.7	
2e1+6e3	15.3	
2s2	0.1	
<b>Purple</b>	<b>20.4</b>	
1c 1	5.0	
2e 1	0.2	
2e1+6e2	15.1	
2s2	0.1	

# 10 APPENDIX 2: LAND RESOURCES MAPS FOR THE DIFFERENT INTERCHANGES

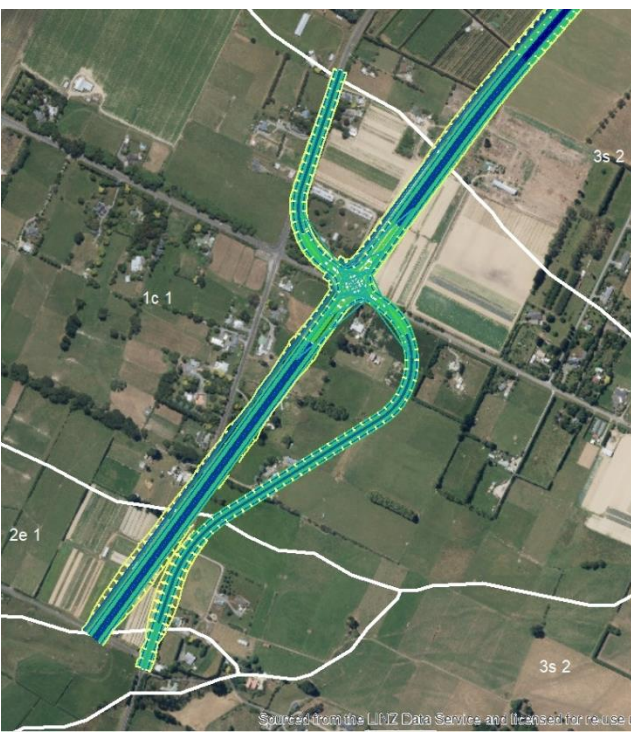

## 10.1 South Manakau

Roundabout	Grade separation
	


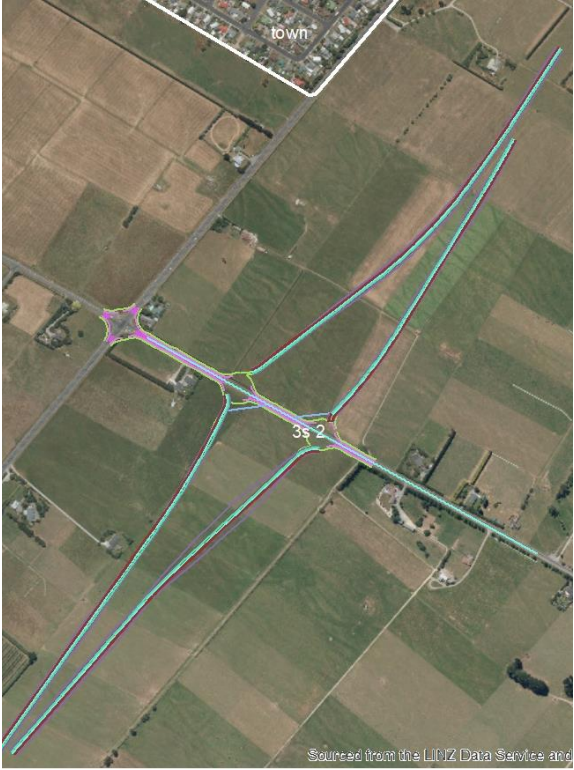
## 10.2 North Manakau

Roundabout	Grade separation
	

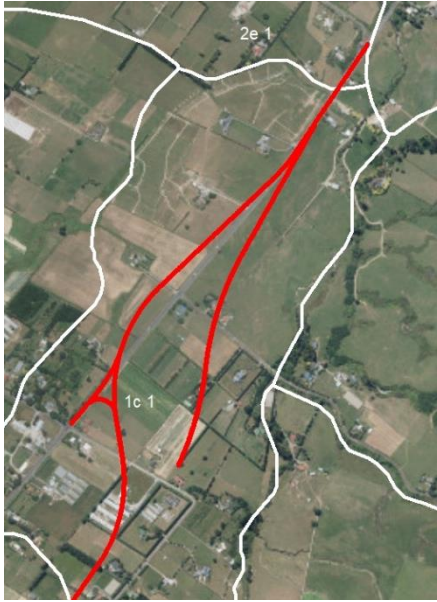

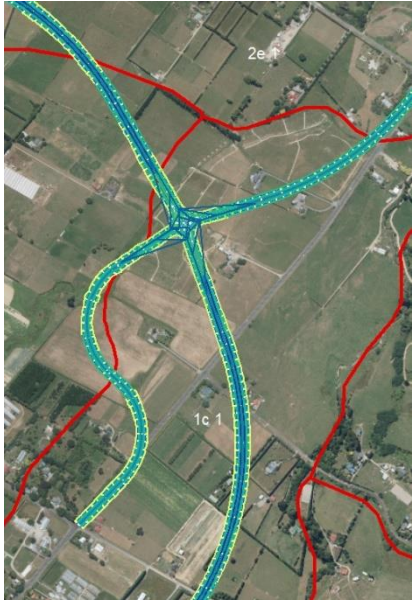
## 10.3 Kimberley

Roundabout	Grade separation
	

## 10.4 Tararua

Roundabout	Grade separation
 <p>RAB</p> <p>3s 2</p> <p><small>Sourced from the LINZ Data Service and licensed for reuse under a Creative Commons license.</small></p>	 <p>town</p> <p>3s 2</p> <p><small>Sourced from the LINZ Data Service and licensed for reuse under a Creative Commons license.</small></p>

## 10.5 SH57



Split Bifurcation	Split grade separation	Split roundabout
 <p>2e 1</p> <p>1c 1</p>	 <p>2e 1</p> <p>1c 1</p>	 <p>2e 1</p> <p>1c 1</p>

## 10.6 North Levin

Roundabout	Grade separation
 <p>Sourced from the LINZ Data Service and licensed to us under the Creative Commons Attribution-NonCommercial-ShareAlike license</p>	 <p>Sourced from the LINZ Data Service and licensed to us under the Creative Commons Attribution-NonCommercial-ShareAlike license</p>



## 11 APPENDIX 3: LAND USE CAPABILITY

The table below details the Land Use Capability units shown on the maps in Appendix 1 and 2.

LUC Class	LUC unit description	Parent material	Soil	Slope (°)	Strengths	Limitations
1	<p><b>1c1</b></p> <p>Flat to gently undulating, high and medium-height terraces with a mantle of loess and minor tephra. The soils are deep, fertile and well drained. The terraces typically occur between 10-60 m a.s.l. where rainfall is 1000-1200 mm p.a. Occurs between Shannon and Otaki.</p> 	Loess and minor tephra.	Levin silt loam Kiwitea silt loam	0-3	Contour. Access. Deep, fertile soils. Good natural drainage.	Potential to dry out slightly in the summer.
2	<p><b>2e1</b></p> <p>Undulating high and medium-height terraces with a mantle of loess and minor tephra. The soils are deep, fertile and well drained. There is a potential for slight sheet and rill erosion when cultivated. Occurs in the Levin district.</p> 	Loess and minor tephra.	Kiwitea Levin silt loam	4-7	Contour. Access. Deep, fertile soils. Good natural drainage.	Potential for slight sheet and rill erosion when cultivated.
	<p><b>2s1</b></p> <p>Flat, low river terraces and levees of the floodplains with alluvial soils. The soils are sandy in texture and moderately deep overlying gravels. They are fertile and well drained although they tend to dry out in summer. Occurs on Manawatu, Ohau and Waikanae floodplains.</p>	Fine-grained alluvium.	Manawatu	0-3	Contour. Access. Deep, fertile soils. Good natural drainage.	Potential to dry out slightly in the summer. Potential for slight streambank erosion where adjacent to a stream.

LUC Class	LUC unit description	Parent material	Soil	Slope (°)	Strengths	Limitations
	<p><b>2s2</b></p> <p>Flat to undulating medium-height terraces overlain by slightly consolidated Aeolian sands. Soils are sandy in texture and well drained, tending to dry out in summer.</p>	Weakly to unconsolidated sands.	Koputaroa	0-7	Contour. Access. Good natural drainage.	Potential to dry out in the summer. Potential for slight wind erosion when cultivated.
3	<p><b>3e1</b></p> <p>Dissected terrace land formed from unconsolidated sands and conglomerate. Soils are intergrades between yellow-brown earths and yellow-brown loams developed from loess and minor tephra. Potential for moderate sheet and rill erosion when cultivated.</p>	Loess and minor tephra.	Levin Kiwitea	4-15	Contour. Access. Good natural drainage.	Potential for moderate sheet and rill erosion when cultivated.
	<p><b>3e3</b></p> <p>Rolling dissected terrace land and fans with a mantle of loess over sands conglomerate and colluvium.</p>	Loess or loess over colluvium	Shannon Wu Tokomaru Ko	4-15	The soil texture and topsoil depth, allow soil to hold on longer under drought conditions than free draining soils. Good natural fertility (unless gleyed). This unit can be used to finish stock.	Often easily pugged with heavy cattle following prolonged wet periods. Cropping versatility is restricted by wetness that can delay planting. Lacking shade and shelter.



LUC Class	LUC unit description	Parent material	Soil	Slope (°)	Strengths	Limitations
	<p><b>3s2</b></p> <p>Flat, medium height alluvial terraces with somewhat excessively drained soils developed from stony alluvium.</p> 	Alluvium over gravels. (Al/Gr)	Kopua	0-3 (A)	Contour. Access. Good drainage.	May dry out in summer.
	<p><b>3s4</b></p> <p>Flat to gently undulating high terraces with a mantle of loess. The presence of a subsoil pan causes perching of water. Soils are poorly drained in winter but subject to summer soil moisture deficiencies.</p> 	Loess	Tokomaru Ohakea Shannon Halcombe	3-7		
4	<p><b>4s1</b></p> <p>Flat low river terraces with shallow, sandy to stony soils. Soils are somewhat excessively drained and subject to seasonal moisture deficiencies.</p>	Gravels Patchy alluvium over gravels.	Rangitikei	0-3	Contour. Holds on longer during dry periods.	Poor drainage due to high water table. Highly prone to pugging damage from cattle.
6	<p><b>6e6</b></p> <p>Moderately steep to steep greywacke hill country in areas with moderate rainfall (1140-1270mm p.a) with soil moisture deficiencies. There is potential for moderate soil slip erosion.</p>	Patchy loess over greywacke. Greywacke		21-35	Reasonably well drained. More stability with shorter slopes. Erosion scars heal quickly. Good natural fertility.	Potential for moderate soil slip. Easily pugged by heavy cattle following prolonged wet periods. Not suitable for cultivation. Access limitations. Seasonal moisture deficit.

