SAFETY ASSESSMENT

Invercargill 66 KV Poles

For Powernet

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Safety Assessment

66KV power poles, Invercargill

1. Introduction

1. This report assesses the safety of the proposed power pole locations for the planned new 66KV line between Invercargill and Kekeno. The proposed location for each pole has been reviewed with recommendations for relocation and/or protection of those that could pose an unacceptable safety concern for traffic and other road users.

2. The "National Code of Practice for Utility Operators Access to Transport Corridors" 9 October 2024 and relevant AUSTROADS Guides to Road Design have been referenced when considering the proposed locations of the poles.

2. Assumptions

3. In many locations, the proposed power lines follow an existing power line within the road reserve. Those lines will be replaced and the existing lines relocated to the new poles.

4. The new steel poles are much longer than the existing wooden or concrete poles and due to the greater strength of the steel poles will require fewer poles than the existing lines. The steel poles also have a greater diameter than the wooden poles.

5. The outreach arms for the new poles are longer than the existing poles meaning that the new poles cannot be located as close to the boundary as the existing poles to avoid aerial trespass.

6. New poles need to be at least 2.2 metres from property boundaries.

7. Some of the waratahs indicating the pole locations had been removed at the time of the site visit. However, enough information was available to allow for an assumption to be made about the proposed location.

3. Clearzone recommendations

8. AUSTROADS Guide to Road Design Part 6: "Roadside Design, Safety and Barriers" provides guidance on applying the clearzone. Table 4.1 from the Guide is reproduced below.

Table 4.1: Clear zone distances from edge of through travelled way

Design speed (km/h)	Design ADT	Clear zone width (m)					
		Fill batter			Cut batter		
		6:1 to flat	4:1 to 5:1	3:1 and steeper[2]	6:1 to flat	4:1 to 5:1	3:1 and steeper[2]
≤ 60	< 750	3.0	3.0	[2]	3.0	3.0	3.0
	750 – 1500	3.5	4.5	[2]	3.5	3.5	3.5
	1501 – 6000	4.5	5.0	[2]	4.5	4.5	4.5
	> 6000	5.0	5.5	[2]	5.0	5.0	5.0
70 – 80	< 750	3.5	4.5	[2]	3.5	3.0	3.0
	750 – 1500	5.0	6.0	[2]	5.0	4.5	3.5
	1501 – 6000	5.5	8.0	[2]	5.5	5.0	4.5
	> 6000	6.5	8.5	[2]	6.5	6.0	5.0
90	< 750	4.5	5.5	[2]	3.5	3.5	3.0
	750 – 1500	5.5	7.5	[2]	5.5	5.0	3.5
	1501 – 6000	6.5	9.0	[2]	6.5	5.5	5.0
	> 6000	7.5	10.0[1]	[2]	7.5	6.5	5.5
100	< 750	5.5	7.5	[2]	5.0	4.5	3.5
	750 – 1500	7.5	10.0[1]	[2]	6.5	5.5	4.5
	1501 – 6000	9.0	12.0[1]	[2]	8.0	6.5	5.5
	> 6000	10.0[1]	13.5[1]	[2]	8.5	8.0	6.5
110	< 750	6.0	8.0	[2]	5.0	5.0	3.5
	750 – 1500	8.0	11.0[1]	[2]	6.5	6.0	5.0
	1501 – 6000	10.0[1]	13.0[1]	[2]	8.5	7.5	6.0
	> 6000	10.5[1]	14.0[1]	[2]	9.0	9.0	7.5

9. The clearzone as measured in Table 4.1 is from either the edgeline where an edgeline is marked or from the edge of seal or formed metalled carriageway where there is no marked edgeline.

10. It is noted that due to the constraints of working within the road reserve, existing and proposed poles may breach the clearzone recommendations.

11. Property boundaries have been assumed from the Invercargill Maps Aerial and Property Viewer.

4. Consideration of pole locations

Poles 2 to 11

12. These poles are replacing an existing line within the Kiwirail reserve and are well protected from being accessed by the public or traffic. They are beyond the scope of this assessment.

Poles 12 to 20A

13. Poles 12 to 20A are along the road reserve of Colyer Road and replace a row of concrete poles. The existing poles are about 4 metres from the carriageway in a road reserve of about 7 metres.

14. The speed limit is 60 km/hr.

15. The CAS database shows that there have been no reported crashes on this section of Colyer Road in the last 5 years.

16. Colyer Road is sealed to pole 14 then unsealed. MobileRoads indicates that the traffic volume on Colyer Road is 150 vpd. The shoulder is generally a low angle fill batter so Table 4.1 suggests a clearzone of 3.0 metres is desirable.

17. In consideration of the good safety record of the existing poles and the low traffic volume, it is considered that replacing the poles in the same line as the existing poles is acceptable but the poles should be aligned as close as possible to the property boundary as possible to maximise the available clearzone.

18. It was noted that poles 17 and 18 are in a drainage channel that is deeper than typical on Colyer Road due to the culvert under a vehicle crossing. This leads to a greater clearzone being recommended. The shoulder around poles 17 and 18 should be raised to be a more consistent gradient with the remainder of the shoulder while still allowing longitudinal drainage and reduce the risk of the poles being struck by an out of control vehicle.

Recommendation:

- Locate the new poles as close as possible to the property boundary.
- Raise the shoulder of the road around poles 17 and 18.

Poles 20B to 32

19. Poles 20B to 32 are within private property and beyond the scope of this assessment.

Poles 33 to 56

20. These poles are proposed to be on the northern side of Motu Rimu Road. There is an existing row of poles on the southern side between pole 33 and Tiwai Road that will be removed and the line replaced on the new poles on the northern side of the road.

21. Motu Rimu Road has a traffic volume of 327 vpd.

22. The speed limit is 80 km/hr suggesting a clearzone of 3.5 metres is typically recommended but this increases where the fill batter slope increases.

23. CAS identifies 16 crashes on Motu Rimu Road between SH1 and Wilson Road from 2020 to 2024 inclusive. Most of the crashes involved vehicles losing control on the curve between Boundary Road and Tiwai Road and sliding into the drainage channels. These crashes resulted in 2 serious, 4 minor and 7 non injury crashes.

24. The ICC property boundary aerial photo shows that Motu Rimu Road is off set from the centre of the road reserve. The road reserve is about 29 metres wide and the northern

side of the road is about 15 metres between the boundary and the carriageway. This width appears to be consistent between poles 33 and 42. These poles could be located closer to the boundary than has been indicated ensuring they are outside of the clearzone.

25. The waratahs for Pole 43 and 44 could not be found but the plan indicates pole 43 is closer to the carriageway due to the shape of the property boundary. Given the high number of loss of control crashes reported on the curve that result in vehicles leaving the carriageway, it is considered that this pole could be at risk of being struck by out of control vehicles.

26. ICC should be advised of the high crash rate in the area since they may want to address the underlying safety problems that are evident on the curve. Depending on what solutions the ICC propose, a crash barrier should be considered to be erected around pole 43.

27. Pole 44 should be located as close to the property boundary as possible. The area near the boundary is raised and would redirect any out of control vehicle away from the pole as well as being outside the clearzone.

28. Poles 45 and 46 are on private property and beyond the scope of this assessment.

29. Poles 47 to 50 follow an existing power line but will be further from the carriageway than the current poles. The poles could typically be located on the southern side of the swale drain which will assist with safety by directing vehicles away from the pole as well as not obstructing drainage or maintenance of the swale.

30. The reserve width for poles 51 to 56 is about 10 metres and poles can be located outside the clearzone.

31. Wilson Road north is effectively a private road. Pole 56 will be far enough from the carriageway of Motu Rimu Road that it should not restrict sight distance for a driver exiting Wilson Road north.

Recommendation:

- Locate the new poles 33 to 42 as close as possible to the property boundary.
- Consider providing a barrier around pole 43.
- Ensure Pole 44 is located close to the property boundary and behind the soil mounds.
- Erect poles 47 to 50 on the southern side of the swale drain.
- Erect poles 51 to 56 as close as possible to the boundary.

Poles 57 to 85

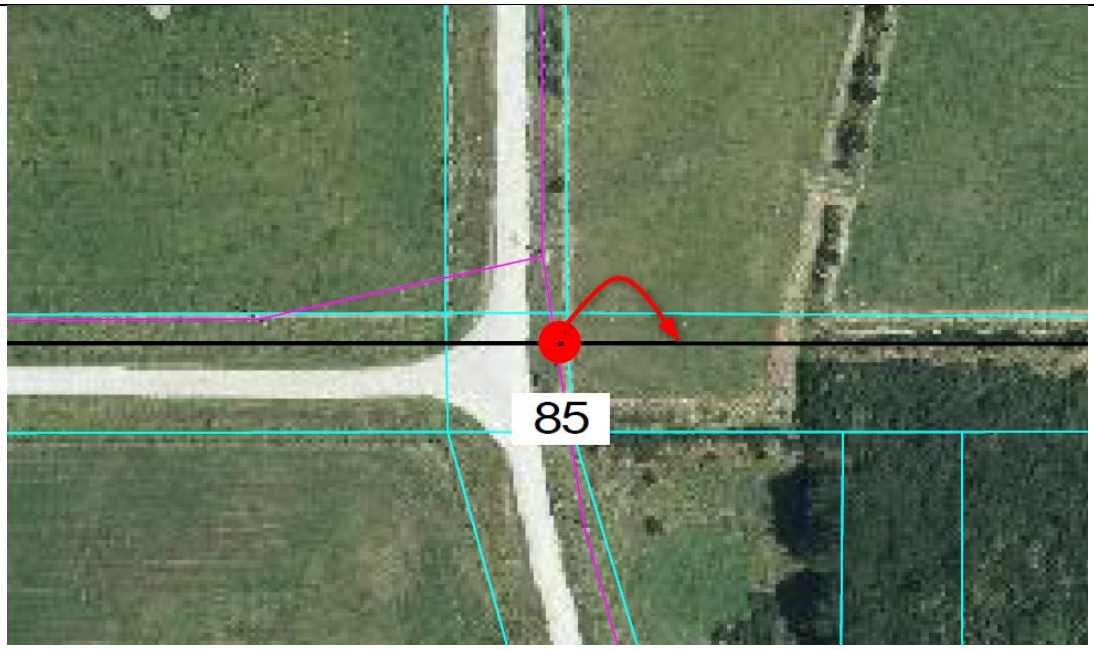
32. These poles traverse the length of Wilson Road north and Murphy Road. A short section of existing power lines is located south of Wixon Road that will be replaced. Otherwise, this is a new route.

33. Both roads are unsealed with very low traffic volumes between 20 and 30 vpd.

34. Both roads have a speed limit of 80 km/hr.

35. Pole 77 is located on the outside of the curve at the intersection with the Gorge Road-Invercargill Highway. The pole can be located outside of the clearzone.

36. Pole 85 is located at the end of Murphy Road on Wixon Road. The pole could be exposed to being struck by a vehicle that misses the end of the road. There are no lines along Wixon Road that would need to be hung from pole 85. The pole should be moved beyond the clearzone by altering the spacing between poles 83 and 86 and erecting pole 85 in the paddock.



Recommendation:

- Relocate pole 85 further north into the paddock.

Poles 86 to 98

37. These poles are on unformed road reserve so cannot be easily accessed by the public and are beyond the scope of this assessment.

Poles 99 to 104

38. These poles are erected along Lardner and Judge Roads. Both roads are short culs-de-sac which carry little traffic and follows an existing power line route. The low speeds and low traffic volumes will allow these poles to function safely.

Poles 105 to 107

39. These poles are on private property so are beyond the scope of this assessment.

Poles 108 to 124A

40. These poles are along the southern side of Mason Road east to Mill Road. A short row of existing poles on the southern side at the western end will be replaced and a short row of poles on the northern side at the eastern end near Mill Road will be removed. The southern shoulder has a reserve width of 6.6 metres from the edgeline to the boundary so the new poles can be erected about 4.5 metres from the edgeline. The traffic volume on Mason Road is 190 vpd.

41. The speed limit is 80 km/hr.

42. CAS identified 3 reported crashes on Mason Road since 2020. None of the crashes resulted in a pole being struck.

43. The shoulder where the poles will be located is typically on a slight cut batter along this route. The clearzone recommended for a road such as this is about 3.5 metres.

44. Pole 124A is located opposite the Mill Road intersection. While exposed to vehicles missing the intersection at the end of Mill Road, the pole will be located at the top of a bank which should preclude vehicles from striking the pole.

Recommendation:

- Ensure the poles are erected as close as possible to the property boundary.

Poles 125 to 153

45. This route runs along Mill Road. The route begins on the western side then moves to the eastern side at pole 131 near where the existing power line crosses. The shoulders of the road are essentially flat.

46. The speed limit of Mill Road is 80 km/hr

47. CAS reports two crashes at the Oteramika Road intersection with one of the crashed vehicles striking a fence post. There were no midblock crashes.

48. South of Oteramika Road, Mobileroads identifies the traffic volume as 234 vpd while north of Oteramika Road, the traffic volume is 1536 vpd.

49. The western shoulder of Mill Road is 7.9 metres from the edge of seal to the boundary and the recommended clearzone south of Oteramika is 3.5 metres. The eastern shoulder is 6 metres from the edge of seal to the boundary and the clearzone can therefore be exceeded.

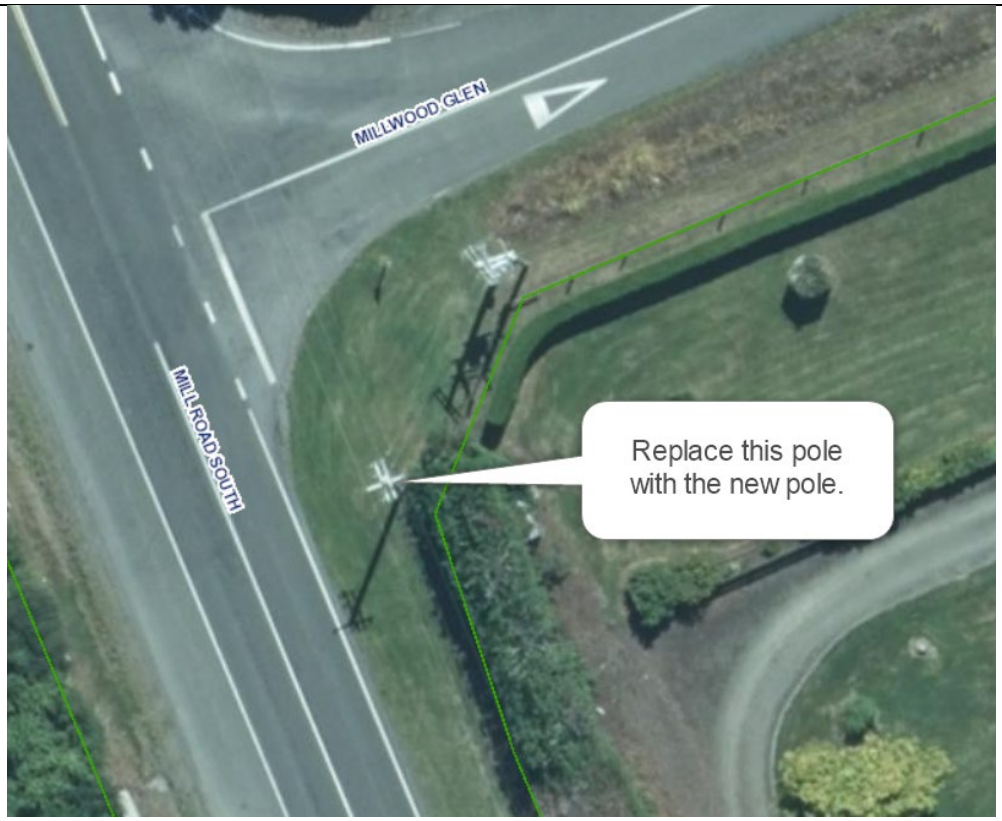
50. North of Oteramika Road, the eastern shoulder is 6.8 metres between the edge of seal and the boundary. The recommended clearzone is between 5 and 5.5 metres due to the increased traffic volume. Given that the poles can be erected about 4.6 metres from the edge of the carriageway for a minor breach of the clearzone and that there has been no safety concerns identified on Mill Road midblock, these locations are considered acceptable.

51. There is a private road between 109 and 119 Mill Road and a second cul-de-sac called Millwood Glen. Both have similar designs for the intersections with Mill Road. Poles 143 and 147 are shown in similar positions on these intersections. It is considered that these poles would be exposed to being struck by turning vehicles in their proposed locations as well restricting visibility to the left from the limit line or the side road.

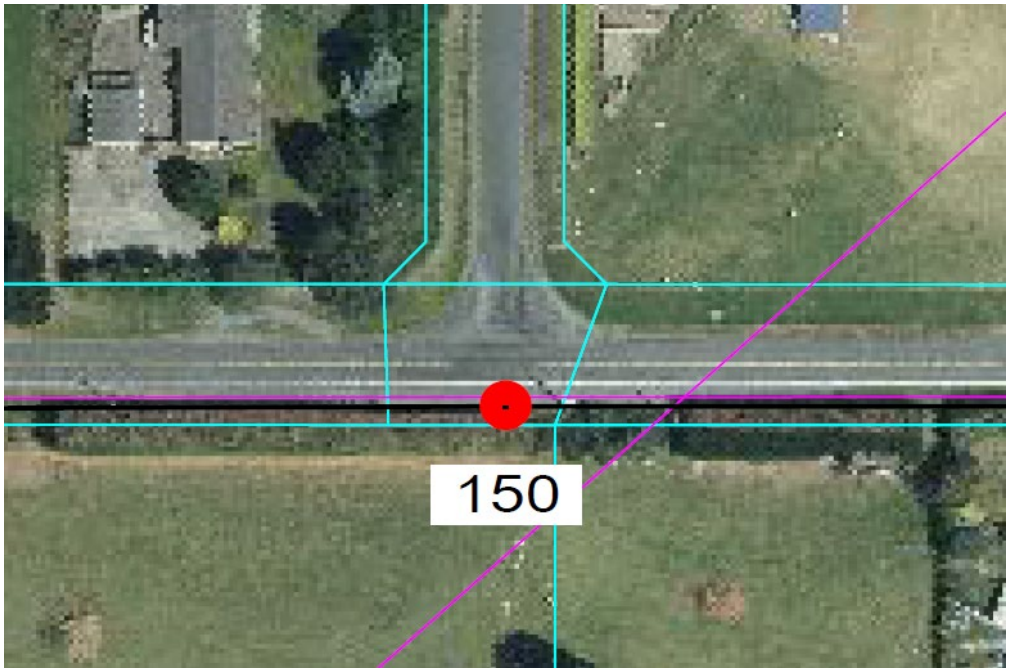
52. Note also the streetlights that will need to be considered.

53. The second photograph shows Millwood Glen and it is considered that this shows a reasonable revised solution for the intersections. The boundaries are splayed to allow for the sight triangles and the wooden pole on the right is an appropriate location for the new pole to follow the boundary without causing aerial trespass. It is less likely to cause a visibility obstruction than if it was erected where the waratah is shown and will be less likely to be struck by a vehicle manoeuvring at the intersection.

54. It is considered that poles 143 and 147 should be located as shown in the aerial photo below with the side road pole to follow the splayed boundary. Note that streetlighting will need to be considered.



55. Pole 150 is shown directly opposite the Milton Park Road intersection. This pole would be exposed to potentially being struck by any vehicle eastbound on Milton Park Road failing to stop at the intersection. The pole should be relocated to the side along Mill Road so that it is not in the direct alignment of Milton Park Road.



Recommendation:

- Ensure the poles are erected as close as possible to the property boundary.
- Change the locations of poles 143 and 147 as shown.
- Relocate pole 150.

Poles 153A to 165

56. These poles are on SH 1 (East Street) between Mill Road and 78 East Road where the line crosses East Road. The speed limit for the first 400 metres west from Mill Road is 100 km/hr reducing to 80 km/hr for the remaining 800 metres of the section.

57. The proposed line follows an existing row of power poles that will be removed.

58. The road shoulder is about 6.5 metres wide between the edgeline and the boundary on the southern side. The shoulder is generally flat.

59. Mobileroads suggests the traffic volume is 7045 vpd.

60. CAS identified 7 crashes in the last 5 years in this section of SH1. Two of the crashes involved loss of control due to adverse weather but did not result in any poles being struck.

61. Based on the speed limits, the recommended clearzone is 10 metres for the first 400 metres from Mill Road reducing to 6.5 metres for the remaining 800 metres.

62. Given that the available reserve width is only 6.8 metres in total and the poles will be within 4.5 metres of the edgeline, it is considered that this section of poles will require protection. The poles will be closer to the carriageway than the existing poles and although the risk of injury when struck will be similar, the likelihood of the poles being struck increases with the higher traffic volume. There is a demonstrated potential for loss of control crashes caused by environmental conditions that can result in poles being struck.

63. The most appropriate form of protection is a TL3 guardrail, either W section or wire rope. A W section guardrail is likely to be a better option requiring less deflection and a quicker installation and less traffic control. A complication is the number of vehicle accesses that will need breaks in the guardrail and the length of need may not always be met by the guardrail as a result.

64. Although protected by guardrail, the poles will need to be located away from the vehicle crossings. It is noted that some of the poles were located close to the culverts under the vehicle crossings. These would impede drainage performance and

maintenance of the culverts as well as restricting visibility from the vehicle crossing. This was particularly noted for poles 160, 161 and 163. Where possible, the large poles should be at least 5 metres from a residential vehicle crossing to allow a driver to see past the pole towards oncoming traffic without needing to pull onto the sealed shoulder. Pole 160 also is shown within the manoeuvre area for the mailbox.

Recommendation:

- Ensure the poles are erected as close as possible to the property boundary.
- Erect guardrail along the frontage to protect the new poles.
- Relocate poles 160, 161 and 163 to retain drainage and maintain sight distance.

Poles 166 to 173

65. These poles are on private property and are beyond the scope of this assessment.

Poles 174 to 179

66. These poles are proposed for the southern side of Findlay Road adjacent to the racecourse. An existing row of poles is erected on the northern side of Findlay Road. An existing row of power poles is also erected on the southern side east of the proposed new poles.

67. Mobileroads suggests the traffic volume on Findlay Road is about 2300 vpd.

68. A CAS search revealed no crashes on this section of Findlay Road in the last 5 years.

69. The speed limit on Findlay Road is 50 km/hr. The southern road reserve is flat and is 6.5 metres wide from the edgeline to the boundary. The clearzone is consequently 3.0 metres.

70. The proposed poles are outside the recommended clearzone and are therefore acceptable.

71. The waratah for Pole 174 could not be found. The shape of the vehicle crossing appears to be different to the arial photo the design is based on. It is unclear if the pole is proposed to be within the manoeuvre area for the vehicle crossing. This will need to be checked on site and the pole protected or the vehicle access redefined with kerb to ensure manoeuvring vehicles cannot strike the pole.

Recommendation:

- Ensure pole 174 is not within the manoeuvre area for the vehicle access.