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SHIRE OF CUBALLING

Wandering / Narrogin Rd Clearing Purpose Permit – A Report on Clearing Impact Mitigation and Avoidance by the Shire of Cuballing

Location : Cuballing, WA
Prepared for : Department of Water & Environmental Regulation and the Shire of Cuballing
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Revision	Prepared By	Signature	Date Issued
0	[redacted]		

1. Introduction

The Wandering - Narrogin Rd is one of the Shire of Cuballing's (SoC) Roads of Regional Significance (or 2040 Road), which are secondary sealed roads that link Regional towns and areas to the MRWA controlled road network and other 2040 roads. This entire road network is essentially the heavy freight network throughout the state of WA. The SoC receives limited Road Funding via the State Road Funds to Local Government Agreement (SRFtLGA) each year to preserve / upgrade their 2040 Roads within their Road Network. Since 2019, this road also became one of the Wheatbelt Secondary Freight Network (WSFN) Routes (Route # 31 – Narrogin to North Bannister). The SoC is planning to widen and upgrade this 16km section of this road to the required Type 6 Standard Sealed Road with WSFN Funding, commencing in the 2026/27 Yr.

2. Background Information

The Wandering - Narrogin Rd is one of the main sealed arterial roads linking Perth to the Eastern Wheatbelt agricultural area. Other East – West aligned routes that also link the Eastern Wheatbelt agricultural area to Perth and Port comprise all MRWA controlled highways, including the York – Merredin Rd, Brookton Hwy and to a lesser extent the Williams – Kondinin Rd and Collie – Lake King Rd. The Wandering – Narrogin Rd is the only main East – West aligned Freight Route Road that is controlled by Local Government. In addition to this, it also provides the first opportunity for Freight Operators and Residents from the mid to lower Eastern Wheatbelt Region to exit off the Albany Highway at North Bannister and take the straightest and quickest route from Perth to their base. For this reason, both the Freight and Light Vehicle counts on the Wandering – Narrogin Rd have increased significantly over the past thirteen (13) year period - as shown in Table 1 below.

WANDERING – NARROGIN RD – ROAD COUNT SUMMARY					
SLK	**DATE FROM**	**DATE TO**	**No. DAYS**	**AADT**	**ESA**
23.0	15 July 2011	16 Feb 2012	216	289.8	101.9
22.5	29 March 2024	18 Dec 2024	263	550.7	163.7

Table 1

In the last thirteen (13) year period, the Average Annual Daily Traffic (AADT) count has increased by 90% and the Equivalent Standard Axles (ESA) Heavy Vehicle count has increased by 60.6%. The current AADT and ESA counts are considered significantly high for a Local Government controlled road.

The existing Road Carriageway Parameters comprise a:

- Pavement width from 8.5 to 9.5m width
- Seal Width from 7.2 – 7.6m width
- Cleared width along this road currently, is generally from 14.0 to 16.0 m width.

The required Upgraded Type 6 Standard Road comprises a minimum 10.4m pavement width and 8.0m seal width (in line with both the SRFtLGA and WSFN Funding requirements). This standard has been put in place to ensure that all of these types of Local Government managed Secondary and Regionally Significant Sealed Distributor / Freight Roads are constructed to the same standard and subsequent permitted Heavy Vehicle level.

To construct the required wider pavement and provide sufficient table drainage to preserve the new road pavement well into the future (a desired pavement life of 40 years), the minimum desired road profile clear zone is 19m. To put the use of the word "minimum" into context, this is the minimum clear width in less undulating type topography. Where roads are located within areas of undulating topography and there are high natural surface slopes aligned transverse to the road alignment, then to cater for table drainage on the upstream verge and suitably designed embankment batter slopes to provide sufficient vehicle runoff recovery, desired minimum clear widths well in excess of 19m will be required. For the 16.5km section of the Wandering - Narrogin Rd from SLK 0.0 – 16.5, the topography is generally considered as less undulating than average for the area, and subsequently a desired 19m clear width would suffice for the majority of this road section. Note that less undulating topography creates another issue involving drainage, in that lesser surface slopes are not as proficient in conveying surface water flows away from road alignments. The result being that additional width is required for table drains to be deepened in order to provide sufficient grade to assist in conveying surface water along roads to the nearest intersecting waterway.

The profile for the desired minimum 19m Clear Width is shown in Figure 1 in Appendix 1 below. As can be seen, this permits a minimum width of 4.3m for each table drain. This width would be the bare minimum required to construct graded table drains to convey surface water along flat sections of any road, to the intersecting natural waterways.

Despite the above, and as a Strategy to reduce the Clear Width for the Road Upgrade Works, we have compromised the Road Carriageway Upgrade Design to fit within a minimum 16m Clear Width extent. This design Profile is shown in Figure 2 in Appendix 1. As can be seen, this permits a minimum width of only 2.8m for each table drain, really only enough width to provide a Pavement Taper / Table Drain batter, with no backcut. These Table Drains will be constructed to a sub-standard at best, and we will be compromising the structural integrity of the road, via much reduced effectual drainage. This cause and effect is explained in section 3 below.

During recent planning to upgrade this section of the Wandering - Narrogin Rd, it became obvious that a Purpose Permit would need to be applied for, since the existing cleared width is less than the required compromised upgraded road carriageway clear width (of 16m).

3. Clearing Mitigation and Avoidance Strategy

The SoC are unable to utilise any strategy to avoid the Verge Clearing for the Upgrade of the Wandering – Narrogin Rd. This includes the relocation of the road alignment onto adjacent cleared freehold land, which was found to be financially unviable.

The SoC have only been able to use one (1) strategy to reduce the clearing area impact. This has been to reduce the clearing width from a desired 19m (9.5m each way from centre line) to 16m (8.0m each way from road centre line). However, this strategy will add an ongoing additional financial burden to the SoC, via not having desired sufficiently sized table drains that:

- can be constructed with sufficient depth and grade to convey surface water away from the road carriageway into intersecting waterways
- could otherwise be effectively and economically maintained via Grader as required.

and will ultimately reduce the expected life of the upgraded pavements.

It is estimated that the reduction in Clear Width from the desired 19m to the compromised 16m has reduced the clearing area impact by at least 200% (saving approximately 3.2 Ha of Native Vegetation from being cleared).

When near suitably sized table drains are constructed (ie within a 19m clear width), these can be accessed and maintained via Grader in a productive and economic manner. Current SoC table drain maintenance costs via Grader on this type of sealed Distributor Road ranges from $ 505 – 570 / km / side. As a result of the narrower table drains (within the 16m clear width), graders cannot always be utilised to maintain these insufficient width table drains, especially when trees are located on the edge of the table drain. In these instances, excavators and trucks are utilised to maintain these table drains as and when required. Apart from this generally resulting in often weed infested table drains that do not convey surface water away from the road carriageway in an effective manner, this type of maintenance operation can range in costs from $ 15,000 – 18,000 / km / side. Due to its cost, this type of maintenance might only occur once every five (5) plus years. It is estimated that the additional annual costs to maintain the table drains along this 16.5km section of the Wandering / Narrogin Rd will be in the vicinity of $ 17,000.

The end result of not being able to construct sufficient sized table drains is the potential accelerated rate of failure of the road pavement. This is especially the case in less undulating, low lying, flat areas with underlying clayey soils – which a large portion of this 16.5km section of the Wandering – Narrogin Rd is located within. In these areas, it is imperative that table drains can be constructed to sufficient grade and depth to convey surface water along the road to the nearest natural waterways, and away from the road alignment. When surface water sits along the road alignment, it recharges into the insitu soil, weakening it (especially expabnsive clays as is common along this 16.5km section) and reducing its ability to support the pavement under heavy loading. This waterlogging effect can reduce a pavement to 10% of its life under unfavourable circumstances, such as significant heavy traffic loading following 10+ year ARI rain events. The compromised table drains will not permit suitable table drains to always effectively convey surface water away from the road section, and the result for the SoC will be the potential reduced life of the Upgraded Road Sections.

The Upgrade Costs for this Road are expected to be in the vicinity of $480,000 – 500,000 per km. With suitable table drainage we would be expecting a design pavement life of 40 years. Due to the compromised table drains, the likelihood is that over 70% of this pavement will likely only last 20 years on average. Using an average cost per km of $490,000 / km, this 16.5km section of road would normally depreciate by $190,000 per annum over its life. As a result of the compromised table drains this 16.5km road section will potentially depreciate at around $ 290,000 per annum on average over its life, ultimately costing the SoC $100,000 per annum. This section at 16.5km comprises only 12.2% of the SoC's main Sealed Distributor Road Network of 135.53km, which currently all have compromised table drains, due to a lack of suitable clear width.

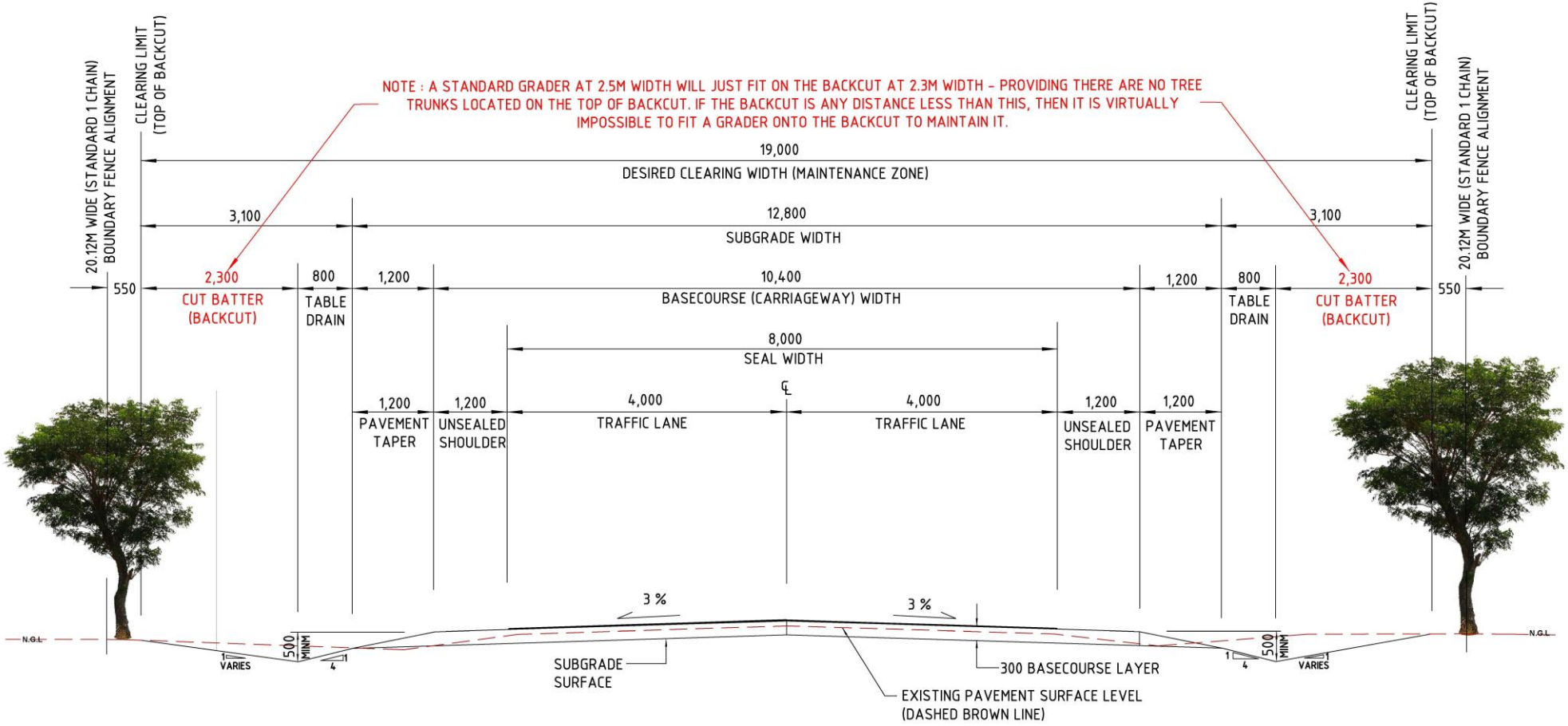
There are many photos of typical similar type sealed Wheatbelt Distributor roads showing accelerated deterioration (than above normal deterioration rate) in Appendix 3 below, as a result of poor, or lack of sufficient Table Drainage.

The SoC will also take on considerable additional safety risks as a result of the reduced, compromised clear width and insufficient sized table drains. These are as a result of:

- reduced table drainage capacity, which during large rainfall events could cause surface water to back onto the carriageway surface, thereby increasing the risk of vehicles plaining off the carriageway surface into the verge, resulting in Injury and / or Fatality.
- less runoff recovery area for vehicles, and infrangible trees being located closer to the edge of running surface (than it otherwise would be), thereby increasing the risk of vehicles that runoff the road carriageway, colliding with trees and resulting in Injury and / or Fatality.

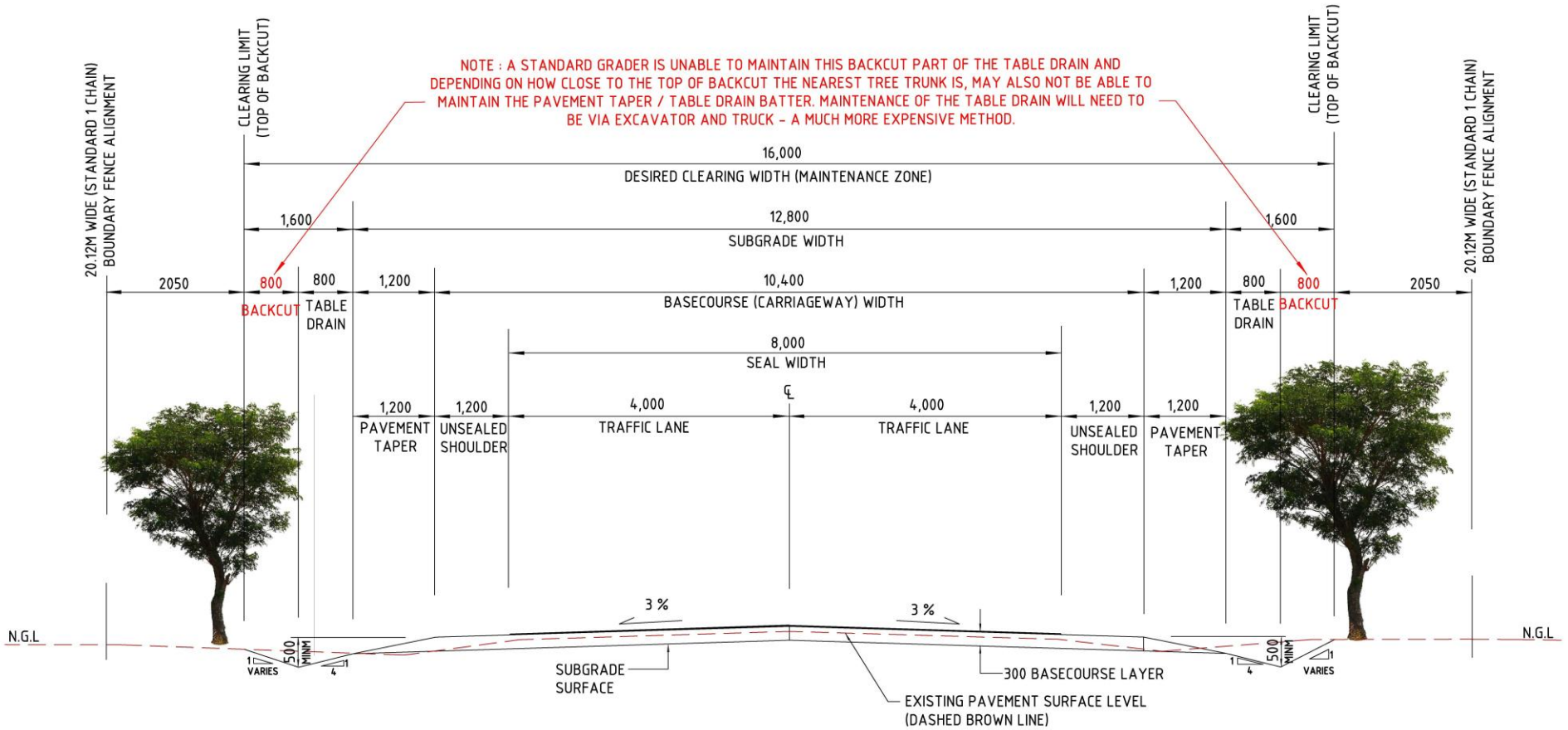
Appendix 1 – Desired and Compromised Road Profile Details

FIGURE 1



DESIRED STANDARD ROAD TYPE 6 PROFILE FOR UPGRADED OVERLAYED & RECONSTRUCTED SECTIONS ON WANDERING - NARROGIN RD ON LESSER UNDULATING TOPOGRAPHY - TANGENT SECTIONS SHOWN ONLY

FIGURE 2



COMPROMISED STANDARD ROAD TYPE 6 PROFILE FOR UPGRADED OVERLAYED & RECONSTRUCTED SECTIONS ON WANDERING - NARROGIN RD ON LESSER UNDULATING TOPOGRAPHY- TANGENT SECTIONS SHOWN ONLY

Appendix 2 – Road Count Data

Shire of Cuballing - Wandering - Narrogin Rd - Recent Vs Old Road Counts Summary																						
TRAFFIC IN BOTH DIRECTIONS							No. of Vehicles for AUSTROADS 94 Vehicle Classes (from Classifier Reports)															
Road Name	SLK	Location	Direction of Travel	Date From	Date To	No. Days	Class	1	2	3	4	5	6	7	8	9	10	11	12	Totals		
							ESA Multiplier	0.00	0.00	0.61	1.63	2.82	1.30	1.36	2.28	2.57	4.97	6.41	8.12			
Wandering - Narrogin Rd	23.00	0.15km west of the Cuballing West Rd Intersection	Both Traffic Lanes	15-Jul-11	16-Feb-12	216	Total Traffic	40036	2121	16502	669	54	544	753	150	605	289	877	3	62603	289.8	ADT
							Calculated ESA	0	0	10066	1090	152	707	1024	342	1555	1436	5622	24	22019	101.9	ESA
Wandering - Narrogin Rd	22.50	0.65km west of the Cuballing West Rd Intersection	Both Traffic Lanes	29-Mar-24	18-Dec-24	263	Total Traffic	112060	7897	15698	953	185	597	1321	595	1722	888	2904	3	144823	550.7	ADT
							Calculated ESA	0	0	9576	1553	522	776	1797	1357	4426	4413	18615	24	43058	163.7	ESA
							Total Traffic													0	#DIV/0!	ADT
							Calculated ESA	0	0	0	0	0	0	0	0	0	0	0	0	0	#DIV/0!	ESA
							Total Traffic													0	#DIV/0!	ADT
							Calculated ESA	0	0	0	0	0	0	0	0	0	0	0	0	0	#DIV/0!	ESA
							Total Traffic													0	#DIV/0!	ADT
							Calculated ESA	0	0	0	0	0	0	0	0	0	0	0	0	0	#DIV/0!	ESA

Class Speed Matrix

ClassMatrix-109
Site: Wandering Narrogin.0.0N
Description: **500 metres north Cuby West Rd**
Filter time: **8:15 Friday, 15 July 2011 => 11:33 Thursday, 16 February 2012**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Class													
km/h	SV 1	SVT 2	TB2 3	TB3 4	T4 5	ART3 6	ART4 7	ART5 8	ART6 9	BD 10	DRT 11	TRT 12	Total	
10- 20	31	.	2	.	.	.	.	.	.	.	.	.	33	0.1%
20- 30	77	1	4	2	.	.	1	.	1	.	.	.	86	0.1%
30- 40	35	5	16	7	1	.	2	2	.	.	9	.	77	0.1%
40- 50	78	9	16	21	.	2	1	3	2	9	125	.	266	0.4%
50- 60	166	18	43	73	2	3	8	7	32	39	123	.	514	0.8%
60- 70	589	110	127	123	3	10	28	15	72	59	61	.	1197	1.9%
70- 80	1694	295	338	141	9	32	79	32	63	44	90	.	2817	4.5%
80- 90	5512	620	783	114	14	50	111	33	127	45	161	1	7571	12.1%
90-100	12753	643	1286	92	11	68	107	25	108	40	63	.	15196	24.3%
100-110	9580	270	1821	46	9	82	118	12	47	19	133	1	12138	19.4%
110-120	4288	103	2978	39	5	139	157	17	153	34	111	1	8025	12.8%
120-130	3374	36	4497	4	.	90	109	3	.	.	.	.	8113	13.0%
130-140	1363	11	3080	5	.	57	23	1	.	.	1	.	4541	7.3%
140-150	393	.	1153	2	.	9	7	.	.	.	.	.	1564	2.5%
150-160	103	.	358	.	.	2	2	.	.	.	.	.	465	0.7%
Total	40036	2121	16502	669	54	544	753	150	605	289	877	3	62603	
	64.0%	3.4%	26.4%	1.1%	0.1%	0.9%	1.2%	0.2%	1.0%	0.5%	1.4%	0.0%		

AADT = 289.8
ESA = 101.9

Class Speed Matrix

ClassMatrix-111
Site: WAND - NARROGIN 0129.1.2EW
Description: **SLK 22.50**
Filter time: **10:05 Friday, 29 March 2024 => 11:49 Tuesday, 1 October 2024**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Class													
km/h	SV 1	SVT 2	TB2 3	TB3 4	T4 5	ART3 6	ART4 7	ART5 8	ART6 9	BD 10	DRT 11	TRT 12	Total	
10- 20	1	.	3	.	.	.	.	.	.	.	.	.	4	0.0%
20- 30	24	2	6	3	.	.	1	1	.	.	.	.	37	0.0%
30- 40	38	1	13	2	.	1	1	.	.	.	.	.	56	0.1%
40- 50	46	14	13	6	.	3	.	.	1	.	6	.	89	0.1%
50- 60	80	42	40	5	.	3	2	4	5	26	51	1	259	0.3%
60- 70	249	72	59	14	1	4	23	5	19	45	93	.	584	0.6%
70- 80	959	245	221	69	6	17	92	21	63	92	270	.	2055	2.1%
80- 90	3181	948	737	129	23	52	167	75	177	131	586	.	6206	6.3%
90-100	9909	1845	1796	313	61	139	321	235	625	229	755	.	16228	16.4%
100-110	31357	1779	3809	132	21	124	252	85	270	81	196	.	38106	38.6%
110-120	23803	533	3034	.	2	32	64	4	7	1	.	.	27480	27.8%
120-130	5094	69	734	.	.	10	15	.	.	.	.	.	5922	6.0%
130-140	1131	7	190	.	.	.	.	.	.	.	.	.	1328	1.3%
140-150	286	1	46	.	.	.	.	.	.	.	.	.	333	0.3%
150-160	63	.	3	.	.	.	.	.	.	.	.	.	66	0.1%
Total	76221	5558	10704	673	114	385	938	430	1167	605	1957	1	98753	
	77.2%	5.6%	10.8%	0.7%	0.1%	0.4%	0.9%	0.4%	1.2%	0.6%	2.0%	0.0%		

PART OF AADT = 550.7
PART OF ESA = 163.7

Class Speed Matrix

ClassMatrix-112
Site: WAND - NARROGIN 0129.1.2EW
Description: **SLK 22.50**
Filter time: **8:45 Wednesday, 2 October 2024 => 8:59 Wednesday, 18 December 2024**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Class													
	SV	SVT	TB2	TB3	T4	ART3	ART4	ART5	ART6	BD	DRT	TRT	Total	
km/h	1	2	3	4	5	6	7	8	9	10	11	12		
10- 20	2	.	.	.	.	.	.	.	.	.	.	.	2	0.0%
20- 30	10	.	4	1	.	.	.	.	.	.	.	.	15	0.0%
30- 40	21	2	6	2	.	.	.	.	.	.	1	.	32	0.1%
40- 50	31	9	9	5	.	.	.	.	.	.	5	.	59	0.1%
50- 60	61	7	12	.	1	3	1	6	2	8	59	.	160	0.3%
60- 70	97	18	20	2	4	2	8	6	14	25	42	.	238	0.5%
70- 80	361	96	69	9	5	11	23	7	36	46	98	.	761	1.7%
80- 90	1319	329	329	43	10	33	50	42	101	55	244	1	2556	5.5%
90-100	4298	777	807	154	29	82	153	84	312	109	406	1	7212	15.7%
100-110	14528	844	1797	62	18	60	102	17	87	40	92	.	17647	38.3%
110-120	11787	225	1433	2	2	20	36	2	3	.	.	.	13510	29.3%
120-130	2533	28	396	.	2	1	9	1	.	.	.	.	2970	6.4%
130-140	580	4	90	.	.	.	1	.	.	.	.	.	675	1.5%
140-150	172	.	18	.	.	.	.	.	.	.	.	.	190	0.4%
150-160	39	.	4	.	.	.	.	.	.	.	.	.	43	0.1%
Total	35839	2339	4994	280	71	212	383	165	555	283	947	2	46070	
	77.8%	5.1%	10.8%	0.6%	0.2%	0.5%	0.8%	0.4%	1.2%	0.6%	2.1%	0.0%		

PART OF AADT = 550.7
PART OF ESA = 163.7

Appendix 3 – Photos showing Pavement Failures on Various Wheatbelt Roads due to Poor Drainage

Photo of Pavement Failure on the Goomalling / Calingiri Rd at SLK 5.10 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of Pavement Failure on the Goomalling / Calingiri Rd at SLK 6.76 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of Pavement Failure on the Goomalling / Calingiri Rd at SLK 10.90 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of Pavement Failure on the Goomalling / Calingiri Rd at SLK 11.64 due to non-adequate table drainage and / or subsequent lack of maintenance. Note the surface water sitting in the drain.

Photo of Pavement Failure on the Goomalling / Calingiri Rd at SLK 24.78 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of Pavement Failure on the Goomalling / Calingiri Rd at SLK 26.92 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of Pavement Failure on the Kellerberrin / Bencubbin Rd at SLK 13.48 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of Pavement Failure on the Kellerberrin / Bencubbin Rd at SLK 16.69 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of Pavement Failure on the Kellerberrin / Bencubbin Rd at SLK 22.37 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of poorly maintained table drain on the Kellerberrin / Yoting Rd at SLK 17.58 due to insufficient table drain width to allow easy maintenance via Grader. Note this pavement has been upgraded relatively recently and has not had sufficient time to develop potential failure areas.

Photo of poorly maintained table drain on the Kellerberrin / Yoting Rd at SLK 19.63 due to insufficient table drain width to allow easy maintenance via Grader. Note this pavement has been upgraded relatively recently and has not had sufficient time to develop potential failure areas.

Photo of poorly maintained table drain on the Kellerberrin / Yoting Rd at SLK 19.66 due to insufficient table drain width to allow easy maintenance via Grader. Note this pavement has been upgraded relatively recently and has not had sufficient time to develop potential failure areas.

Photo of poorly maintained table drain on the Kellerberrin / Yoting Rd at SLK 20.18 due to insufficient table drain width to allow easy maintenance via Grader. Note this pavement has been upgraded relatively recently and has not had sufficient time to develop potential failure areas.

Photo of poorly maintained table drain on the Kellerberrin / Yoting Rd at SLK 20.27 due to insufficient table drain width to allow easy maintenance via Grader. Note this pavement has been upgraded relatively recently and has not had sufficient time to develop potential failure areas.

Photo of well shaped road carriageway and table drains on the York / Merredin Rd (MRWA controlled Highway) at SLK 83.66 with well maintained (via Grader) table drains.

Photo of Pavement Failure on the Pingelly / Alderside Rd at SLK 3.89 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of Pavement Failure on the Pingelly / Alderside Rd at SLK 4.61 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of poorly maintained table drain on the Pingelly / Alderside Rd at SLK 8.53 due to insufficient table drain width to allow easy maintenance via Grader. Note this pavement has no adjacent pavement failures due to the slope on land that is assisting conveying surface water along the table drain. This is evident from the scouring.

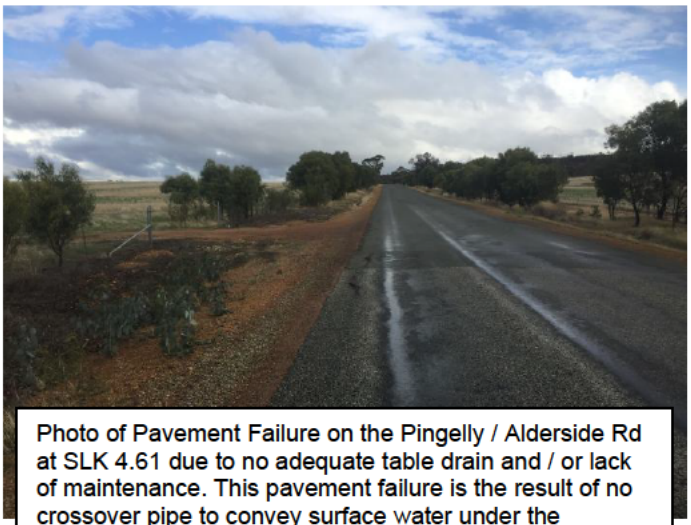


Photo of Pavement Failure on the Pingelly / Alderside Rd at SLK 4.61 due to no adequate table drain and / or lack of maintenance. This pavement failure is the result of no crossover pipe to convey surface water under the crossing and this water has penetrated the underlying soil, resulting in this pavement failure downstream.

Photo of Pavement Failure on the Pingelly / Alderside Rd at SLK 8.73 due to non-adequate table drainage and / or subsequent lack of maintenance.

Photo of Pavement Failure on the Great Southern Highway (MRWA Controlled Rd) at SLK 142.53 due ponding of surface water from no downstream drainage to run water away from pavement (above ground water main has hindered either proper downstream drain construction or limited maintenance of).

Photo of Pavement Failure on the Great Southern Highway (MRWA Controlled Rd) at SLK 143.15 due ponding of surface water from no downstream drainage to run water away from pavement (above ground water main has hindered either proper downstream drain construction or limited maintenance of).

Photo of Pavement Failure on the Great Southern Highway (MRWA Controlled Rd) at SLK 143.20 due ponding of surface water from no downstream drainage to run water away from pavement (above ground water main has hindered either proper downstream drain construction or limited maintenance of).

Photo of well shaped road carriageway and table drains on the Great Southern Highway (MRWA controlled Highway) at SLK 148.30 with well maintained (via Grader) table drains. Note the shedding of surface water along the table drain following a large rain event.

Photo of well shaped road carriageway and table drains on the Great Southern Highway (MRWA controlled Highway) at SLK 149.35 with well maintained (via Grader) table drains. Note the shedding of surface water along the table drain following a large rain event.

Photo of poorly maintained table drain on the Goomalling / Merredin Rd (MRWA Controlled Hwy) at SLK 102.47 due to insufficient table drain maintenance. Note the surface water sitting in the table drain due to the vegetation in the table drain preventing it from flowing downstream. This has resulted in surface water penetrating the underlying insitu soil, weakening it and causing the adjacent pavement failure.