Martins Creek Quarry Haul Routes

Analysis of future pavement maintenance requirements resulting from a proposed increase in quarry truck traffic

Report prepared by SMEC Australia

For

Buttai Gravel Pty. Ltd.

November 2015

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1. EXECUTIVE SUMMARY

1.1. Background

Martins Creek Quarry is located approximately 28 km north of Maitland in the NSW Hunter Region. The quarry operated by Buttai Gravel Pty. Ltd. (Daracon Quarries). Currently the quarry is producing approximately 906,500 tonnes of material per annum. This material is mainly trucked to the south of the quarry along two principal haul routes in order to service industry in the Newcastle / Maitland region. Buttai Gravel is looking to extend the production from the quarry to a total of 1.5 million tonnes per annum. It is recognised that the additional truck traffic required to haul this increased production may lead to increased maintenance requirements for the pavements of the haul routes.

In order to quantify the effects of the increased traffic loading on the road pavements, Buttai Gravel engaged SMEC to conduct pavement testing, analysis and pavement modelling of two haul routes currently being used to haul material from the Martins Creek Quarry to Melbourne Street, Maitland (Haul Route A), and the Tocal Road / Paterson Road intersection to William Bailey Street, Raymond Terrace (Haul Route B).

Haul Route A is approximately 28km and runs south from Martins Creek Quarry to Melbourne Street in East Maitland. It passes through two local government areas under the jurisdiction of Dungog Shire Council and Maitland City Council.

Haul Route B is approximately 23km and passes through two local government areas under the jurisdiction of Dungog Shire Council and Port Stephens Council's. To reach Haul Route B, truck traffic must first travel 9.4 km along Haul A from Martins Creek Quarry to the Tocal Road / Paterson Road intersection.

The length of road passing through each Council's jurisdiction can be seen in Table 1.1.

Table 1.1 Length of haul routes for each Council

Council Name	Length of Haul Route	Comment
Dungog Shire Council	13.22 km	Haul Route A from quarry entrance to 2.54 km south of Haul Route B Junction. Also includes the northern end of Haul Route B for a distance of 0.43km.
Maitland City Council	15.56 km	Southern end of Haul Route A from 2.54 km south of Haul Route B junction to Melbourne Street in East Maitland.
Port Stephens Council	22.91 km	All of Haul Route B except for the first 0.43 km at the northern end.

As a result of the increase in production from the quarry it is estimated that an additional 43 loaded trucks per day would be travelling south from the quarry to the intersection of Haul Route B. At this stage approximately 30 of these trucks would continue south along Haul Route A towards Maitland and 13 trucks would turn off and travel along Haul Route B towards Port Stephens. Each truck would return empty to the quarry along the same route.

The loaded trucks were modelled assuming 7.13 Equivalent Standard Axle loads (ESA) per truck. Each truck was assumed to carry 32.5 tonnes of material.

The two haul routes are shown on the map in Figure 1.1.

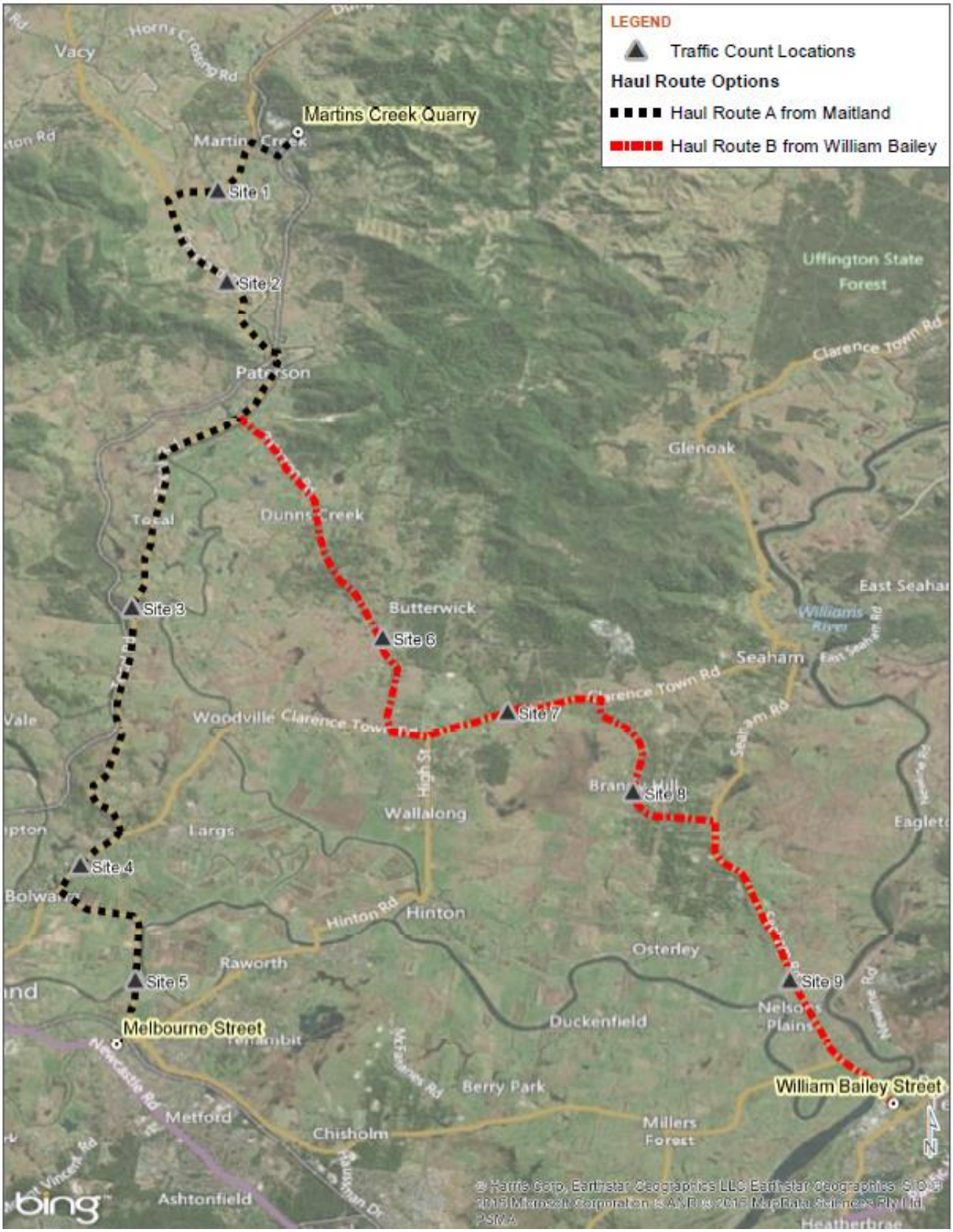


Figure 1.1: Location of the two haul routes referred to in this study

1.2. Study Methodology

The objective of the study was to determine the increased maintenance requirements and maintenance costs associated with the increased truck traffic that would result from extending production from the quarry from an annual output of 906.5 thousand tonnes per annum to an output of 1.5 million tonnes per annum. The requirement for the study was to model the performance of the road pavements over the next 25 years, with and without the additional traffic and then to compare the two modelling scenarios.

The tool used to model the road pavements over the next 25 years was the SMEC Pavement Management System (PMS). This tool utilises the World Bank's 'Highway Design and Maintenance Standards Model (HDM) to predict the future deterioration of road pavements under the effects of traffic loading and the environment. The SMEC PMS can also optimise the future maintenance program required to maintain the roads at a nominated condition level. The SMEC PMS is currently being used by more than 50 Local Government Authorities through Australia to help manage their road networks. In the Hunter Region the SMEC PMS is being used by Maitland, Port Stephens, Lake Macquarie and Wyong Councils. A more detailed overview of the SMEC PMS can be seen in APPENDIX A.

Prior to commencing the modelling a detailed assessment was made of the current condition of the road pavements. This assessment included:

- Roughness and rutting testing using a laser profiler
- Surface Defects (including surface cracking)
- Pavement and subgrade strength measured using a Falling Weight Deflectometer (FWD)
- An assessment of current pavement and surface age

The condition assessment was conducted in each direction for each 100m segment of the haul roads. The total length of road that was analysed was 103.4 lane kilometres. The pavement testing was carried out by ARRB Group ltd.

Current traffic data was collected using classified traffic counters placed for seven days at nine different locations along the haul routes. The location of the nine traffic count sites can be seen in Figure 1.1.

1.3. Summary of results of analysis

The current condition of the haul routes in 2015 is summarised in Table 1.2. The summary data indicates that the Maitland roads tend to be in better condition and have stronger pavements as compared to the Dungog and Port Stephens roads.

Table 1.2 Current condition of road pavements (Southbound lanes)

Condition Attribute	Dungog Roads	Maitland Roads	Port Stephens Roads
Average Roughness (NAASRA)	84.3	59.0	67.1
Average Rut Depth (mm)	5.9 mm	5.1 mm	6.3 mm
Average Cracking (% of surface affected)	1.6%	2.4%	4.4%
Average Stripping (% of surface affected)	1.5%	0.2%	0.2%
Average Pavement Condition Index (PCI)	8.1	8.5	8.0
Average Strength (Structural No.)	3.9	4.9	3.7

A detailed report showing all surveyed condition attributes by individual segment is provided in APPENDIX D.

The modelling analysis was carried out to predict the cost of the road maintenance that would be required to maintain the roads at the similar condition to the 2015 starting condition over a 25 year period. The analysis was first done based on the existing traffic counts and then this was repeated assuming the additional haul trucks resulting from the increased production, was added to traffic count data.

As a result of the modelling, it was predicted that the addition of the extra truck traffic would result in additional road maintenance requirements for the haul routes over the next 25 years. A summary of the analysis is shown in Table 1.3. All costs are expressed in today's dollars and are exclusive of GST.

Table 1.3 Future funding requirements for pavements (Includes Northbound and Southbound lanes)

Modelling scenario	Dungog Roads	Maitland Roads	Port Stephens Roads
Length of roads	13.22 km	15.56 km	22.91 km
Average increase in the number of Loaded trucks per day	42.7 / 30.4	30.4	12.3
Predicted 25 year funding requirements based on current traffic levels	$5,522,398	$5,737,960	$5,897,454
Predicted 25 year funding requirements based on increased truck traffic	$6,427,014	$5,792,692	$6,243,218
Increase in funding required over 25 years	$904,616	$54,732	$345,764
Average annual funding increase	$36,185	$2,189	$13,830
Annual funding increase per km of road	$2,737	$140	$604
Increase required per tonne carried	$0.07144	$0.00607	$0.09479

The analysis predicts that the Dungog roads would need the highest level of additional funding in order to maintain the road pavements at their current condition level. In comparison, the requirement for the Maitland roads is significantly less. It is concluded that the reason for this is because the Maitland roads are stronger and currently in better condition than both the Dungog roads and Port Stephens roads. This means that they are better able to cope with the increased traffic loading resulting from the extra truck traffic.

It should also be noted that the northern end of haul route A (located entirely in the Dungog jurisdiction) is carrying 43% more of the additional truck traffic as compared with the Maitland roads. Also, the Dungog roads are carrying 2.3 times more additional truck traffic when compared to the Port Stephens roads.

2. ABBREVIATIONS AND ACRONYMS

Table 2.1 Abbreviations and Acronyms

Abbreviation/ Acronym	Description
AADT	Average Annual Daily Traffic
CBR	California Bearing Ratio
ESA	Equivalent Standard Axle
EBM	Expenditure Budgeting Model
FWD	Falling Weight Deflectometer
HDM	Highway Design Maintenance Standards Model
IRI	International Roughness Index
Km	Kilometre
LGA	Local Government Authority
m	Metres
NAASRA	National Association of Australian State Road Authorities (now AUSTROADS)
NPV	Net Present Value
PCI	Pavement Condition Index
PMS	Pavement Management System

3. TRAFFIC LOADING

3.1. Haulage routes

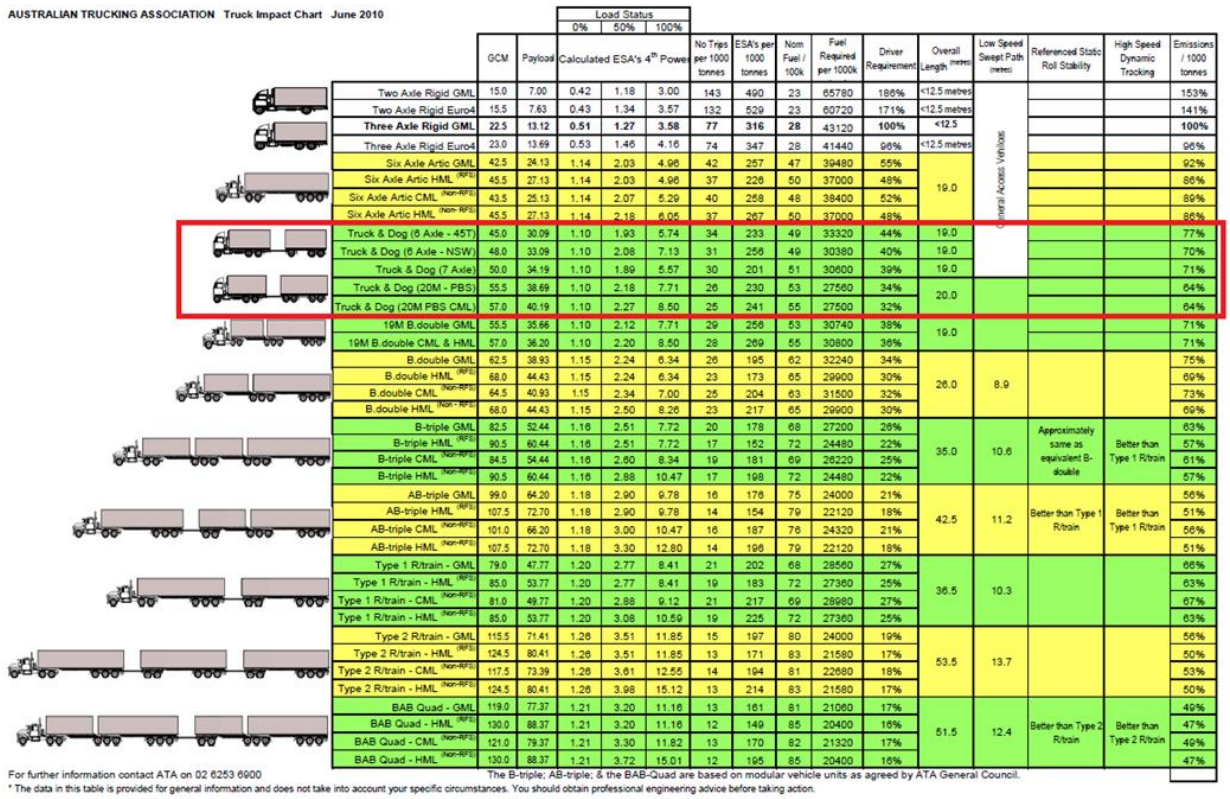
The traffic information used for the study was provided by the consultant, SECA Solutions Pty Ltd. SECA indicated that 85.4% of the total output from the quarry is transported along Routes A and B while the balance of the material (14.6%) is transported through other routes or by train and therefore will not be included in this analysis. South of the Tocal Road / Paterson Road junction Haul Route A will be used to transport 60.8% of the total tonnage and Haul Route B will be transporting 24.6% of the total tonnage.

It is assumed that this distribution of traffic will continue to apply following any increase in production from the quarry.

3.2. Axle loading

The loaded trucks travel south from the quarry and then return unloaded in a northerly direction. Because of the additional axle loading that is borne by the southbound lanes it is expected that these will deteriorate faster and it will be this deterioration that will drive the requirement for future maintenance treatments. In this analysis it has been assumed that, when a treatment occurs, then it will be applied to the full width of the road.

The configuration of a typical quarry truck used for the analysis was a six axle 'Truck and Dog' loaded to carry 32.5 Tonnes of material. When loaded each truck was assumed to have a pavement load rating of 7.13 Equivalent Stand Axle Loads (ESAs). When unloaded (for the return journey) each truck was assumed to rate at 1.1 ESAs. This information was extracted from the 'Australian Trucking Association Truck Impact Chart Jun2 2010'. Refer to Figure 3.1.



AUSTRALIAN TRUCKING ASSOCIATION Truck Impact Chart June 2010

	GCM	Payload	Load Status 0% Calculated ESA's 4th Power	Load Status 50% Calculated ESA's 4th Power	Load Status 100% Calculated ESA's 4th Power	No Trips per 1000 tonnes	ESA's per 1000 tonnes	Nom Fuel / 100k	Fuel Required per 1000k	Driver Requirement	Overall Length (metres)	Low Speed Swept Path (metres)	Referenced Static Roll Stability	High Speed Dynamic Tracking	Emissions / 1000 tonnes
Two Axle Rigid GML	15.0	7.00	0.42	1.18	3.00	143	490	23	65780	186%	<12.5 metres	General Access Vehicles			153%
Two Axle Rigid Euro4	15.5	7.63	0.43	1.34	3.57	132	529	23	60720	171%	<12.5 metres				141%
Three Axle Rigid GML	22.5	13.12	**0.51**	**1.27**	**3.58**	**77**	**316**	**28**	43120	**100%**	<12.5				**100%**
Three Axle Rigid Euro4	23.0	13.69	0.53	1.46	4.16	74	347	28	41440	96%	<12.5 metres				96%
Six Axle Artic GML	42.5	24.13	1.14	2.03	4.96	42	257	47	39480	55%	19.0				92%
Six Axle Artic HML (RPS)	45.5	27.13	1.14	2.03	4.96	37	226	50	37000	48%					86%
Six Axle Artic CML (Non-RPS)	43.5	25.13	1.14	2.07	5.29	40	258	48	38400	52%					89%
Six Axle Artic HML (Non-RPS)	45.5	27.13	1.14	2.18	6.05	37	267	50	37000	48%					86%
Truck & Dog (6 Axle - 45T)	45.0	30.09	1.10	1.93	5.74	34	233	49	33320	44%	19.0				77%
Truck & Dog (6 Axle - NSW)	48.0	33.09	1.10	2.08	7.13	31	256	49	30380	40%	19.0				70%
Truck & Dog (7 Axle)	50.0	34.19	1.10	1.89	5.57	30	201	51	30600	39%	19.0				71%
Truck & Dog (20M - PBS)	55.5	38.69	1.10	2.18	7.71	26	230	53	27560	34%	20.0				64%
Truck & Dog (20M PBS CML)	57.0	40.19	1.10	2.27	8.50	25	241	55	27500	32%					64%
19M B.double GML	55.5	35.66	1.10	2.12	7.71	29	256	53	30740	38%	19.0				71%
19M B.double CML & HML	57.0	36.20	1.10	2.20	8.50	28	269	55	30800	36%					71%
B.double GML	62.5	38.93	1.15	2.24	6.34	26	195	62	32240	34%	26.0	8.9			75%
B.double HML (RPS)	68.0	44.43	1.15	2.24	6.34	23	173	65	29900	30%					69%
B.double CML (Non-RPS)	64.5	40.93	1.15	2.34	7.00	25	204	63	31500	32%					73%
B.double HML (Non - RPS)	68.0	44.43	1.15	2.50	8.26	23	217	65	29900	30%					69%
B-triple GML	82.5	52.44	1.16	2.51	7.72	20	178	68	27200	26%	35.0	10.6	Approximately same as equivalent B-double	Better than Type 1 R/train	63%
B-triple HML (RPS)	90.5	60.44	1.16	2.51	7.72	17	152	72	24480	22%					57%
B-triple CML (Non-RPS)	84.5	54.44	1.16	2.60	8.34	19	181	69	26220	25%					61%
B-triple HML (Non-RPS)	90.5	60.44	1.16	2.88	10.47	17	198	72	24480	22%					57%
AB-triple GML	99.0	64.20	1.18	2.90	9.78	16	176	75	24000	21%	42.5	11.2	Better than Type 1 R/train	Better than Type 1 R/train	56%
AB-triple HML (RPS)	107.5	72.70	1.18	2.90	9.78	14	154	79	22120	18%					51%
AB-triple CML (Non-RPS)	101.0	66.20	1.18	3.00	10.47	16	187	76	24320	21%					56%
AB-triple HML (Non-RPS)	107.5	72.70	1.18	3.30	12.80	14	196	79	22120	18%					51%
Type 1 R/train - GML	79.0	47.77	1.20	2.77	8.41	21	202	68	28560	27%	36.5	10.3			66%
Type 1 R/train - HML (RPS)	85.0	53.77	1.20	2.77	8.41	19	183	72	27360	25%					63%
Type 1 R/train - CML (Non-RPS)	81.0	49.77	1.20	2.88	9.12	21	217	69	28980	27%					67%
Type 1 R/train - HML (Non-RPS)	85.0	53.77	1.20	3.08	10.59	19	225	72	27360	25%					63%
Type 2 R/train - GML	115.5	71.41	1.26	3.51	11.85	15	197	80	24000	19%	53.5	13.7			56%
Type 2 R/train - HML (RPS)	124.5	80.41	1.26	3.51	11.85	13	171	83	21580	17%					50%
Type 2 R/train - CML (Non-RPS)	117.5	73.39	1.26	3.61	12.55	14	194	81	22680	18%					53%
Type 2 R/train - HML (Non-RPS)	124.5	80.41	1.26	3.98	15.12	13	214	83	21580	17%					50%
BAB Quad - GML	119.0	77.37	1.21	3.20	11.16	13	161	81	21060	17%	51.5	12.4	Better than Type 2 R/train	Better than Type 2 R/train	49%
BAB Quad - HML (RPS)	130.0	88.37	1.21	3.20	11.16	12	149	85	20400	16%					47%
BAB Quad - CML (Non-RPS)	121.0	79.37	1.21	3.30	11.82	13	170	82	21320	17%					49%
BAB Quad - HML (Non-RPS)	130.0	88.37	1.21	3.72	15.01	12	195	85	20400	16%					47%

For further information contact ATA on 02 6253 6900

The B-triple; AB-triple; & the BAB-Quad are based on modular vehicle units as agreed by ATA General Council.

* The data in this table is provided for general information and does not take into account your specific circumstances. You should obtain professional engineering advice before taking action.

Figure 3.1: Australian Trucking Association Truck Impact Chart Jun2 2010

3.3. Current traffic volumes

In order to determine the current traffic volumes using the routes, SECA Solution Pty Ltd was commissioned to undertake classified traffic counts at nine different sites as indicated in Figure 3.2.

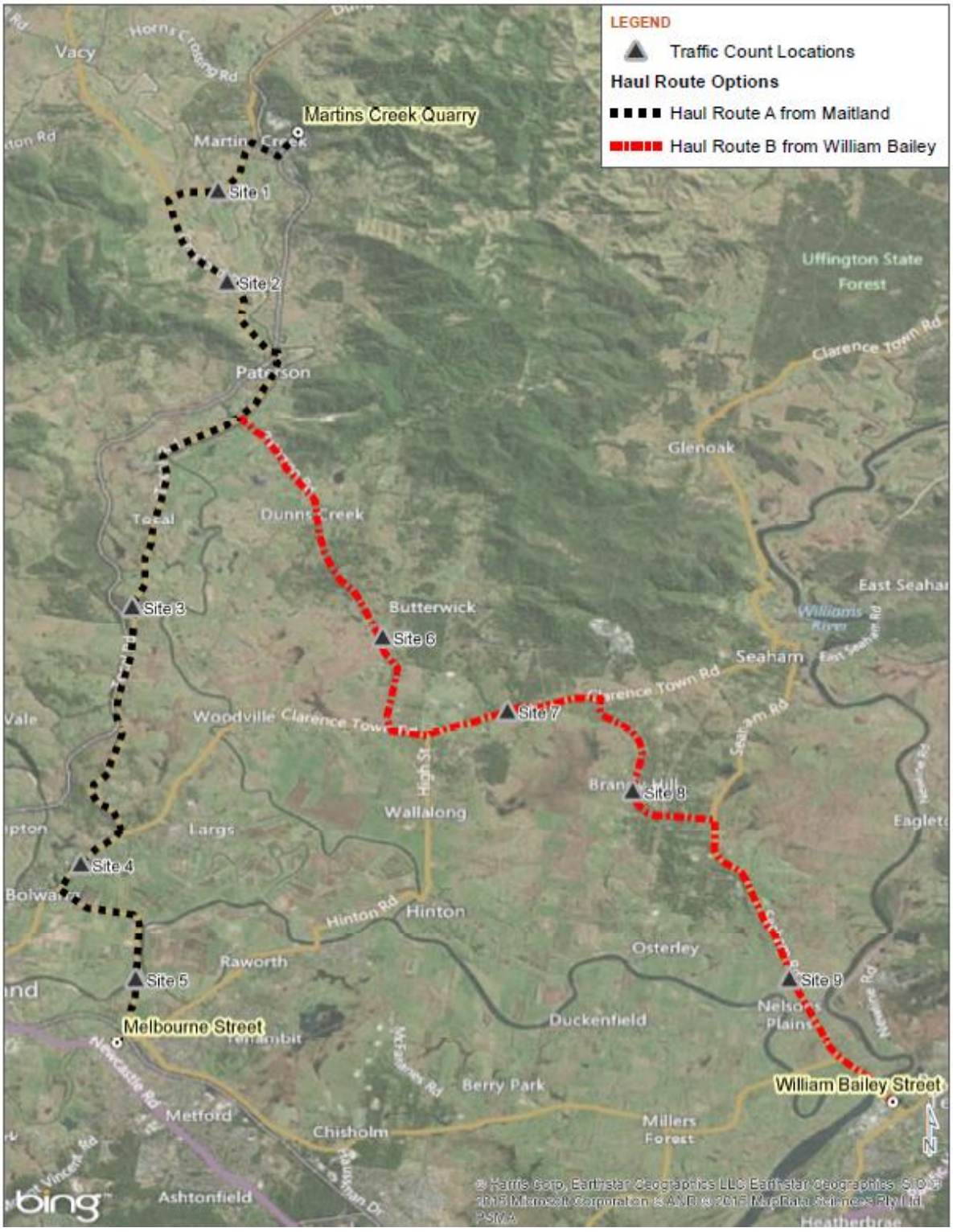


Figure 3.2: Location of traffic count sites

The traffic counts were taken over seven days commencing from Thursday 16th July 2015. The seven day counts were then averaged to obtain the Average Annual Daily Traffic (AADT) for each 13 different AUSTROADS traffic classification. The current traffic count data is shown in Table 2.

Table 2: Southbound classified traffic counts (Current traffic)

	Average number of vehicles per day by vehicle classification													
Site	Total AADT	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8	Class 9	Class 10	Class 11	Class 12	Class 13
1	671.9	514.5	17.1	47.4	12.0	0.9	4.4	1.9	1.9	64.4	7.4	0.0	0.0	0.0
2	1483.7	1259.0	34.4	74.0	18.6	1.0	5.4	10.4	3.4	67.4	10.0	0.0	0.0	0.0
3	1730.3	1542.7	37.1	58.4	14.6	1.4	4.0	3.4	2.4	56.3	9.9	0.0	0.0	0.0
4	5526.4	5032.6	109.3	239.1	34.7	5.4	15.1	2.9	4.1	72.9	10.3	0.0	0.0	0.0
5	4053.9	3770.6	70.7	138.4	16.7	2.3	13.0	3.6	3.0	30.9	4.7	0.0	0.0	0.0
6	645.1	566.9	16.6	28.6	8.6	0.7	2.1	5.1	0.6	15.1	0.9	0.0	0.0	0.0
7	1557.9	1379.3	41.7	58.9	33.0	0.7	5.7	15.7	1.9	20.4	0.6	0.0	0.0	0.0
8	815.3	691.1	20.9	32.0	9.1	0.4	3.7	1.0	0.6	52.3	4.1	0.0	0.0	0.0
9	3080.3	2709.1	53.3	166.9	44.1	2.4	14.1	19.3	7.6	58.7	4.7	0.0	0.0	0.0

3.4. Projected traffic volumes

Table 3: Southbound classified traffic counts (Increased truck traffic following increased quarry production)

	Average number of vehicles per day by vehicle classification													
Site	Total AADT	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8	Class 9	Class 10	Class 11	Class 12	Class 13
1	715.2	515.1	17.1	47.4	12.0	0.9	4.4	1.9	1.9	107.1	7.4	0.0	0.0	0.0
2	1517.4	1250.0	34.4	74.0	18.6	1.0	5.4	10.4	3.4	110.1	10.0	0.0	0.0	0.0
3	1766.0	1548.0	37.1	58.4	14.6	1.4	4.0	3.4	2.4	86.7	9.9	0.0	0.0	0.0
4	5557.3	5033.0	109.3	239.1	34.7	5.4	15.1	2.9	4.1	103.3	10.3	0.0	0.0	0.0
5	4084.5	3770.6	70.7	138.4	16.7	2.3	13.0	3.6	3.0	61.5	4.7	0.0	0.0	0.0
6	657.4	566.9	16.6	28.6	8.6	0.7	2.1	5.1	0.6	27.4	0.9	0.0	0.0	0.0
7	1570.1	1379.3	41.7	58.9	33.0	0.7	5.7	15.7	1.9	32.7	0.6	0.0	0.0	0.0
8	827.6	691.1	20.9	32.0	9.1	0.4	3.7	1.0	0.6	64.6	4.1	0.0	0.0	0.0
9	3092.6	2709.1	53.3	166.9	44.1	2.4	14.1	19.3	7.6	71.0	4.7	0.0	0.0	0.0

The projected traffic volumes under increased quarry production can be seen in Table 3 above. The additional quarry trucks are classified as Class 9 vehicles. A description of the Austroads vehicle classifications can be seen in Figure 3.3. Class 13 is any other vehicles not in these categories.

Axles	Groups	Description	Class		Parameters	Dominant Vehicle	Aggregate
2	1 or 2	Short - Sedan, Wagon, 4WD, Utility, Light Van	SV	1	d(1)>=1.7m, d(1)<=3.2m & axles=2		1 (Light)
3, 4 or 5	3	Short Towing - Trailer, Caravan, Boat, etc.	SVT	2	groups=3, d(1)>=2.1m, d(1)<=3.2m, d(2)>=2.1m & axles=3,4,5		
2	2	Two axle truck or Bus	TB2	3	d(1)>3.2m & axles=2		2 (Medium)
3	2	Three axle truck or Bus	TB3	4	axles=3 & groups=2		
>3	2	Four axle truck	T4	5	axles>3 & groups=2		
3	3	Three axle articulated vehicle or Rigid vehicle and trailer	ART3	6	d(1)>3.2m, axles=3 & groups=3		3 (Heavy)
4	>2	Four axle articulated vehicle or Rigid vehicle and trailer	ART4	7	d(2)<2.1m or d(1)<2.1m or d(1)>3.2m axles = 4 & groups>2		
5	>2	Five axle articulated vehicle or Rigid vehicle and trailer	ART5	8	d(2)<2.1m or d(1)<2.1m or d(1)>3.2m axles=5 & groups>2		
>=6	>2	Six (or more) axle articulated vehicle or Rigid vehicle and trailer	ART6	9	axles=6 & groups>2 or axles>6 & groups=3		
>6	4	B-Double B-Double or Heavy truck and trailer	BD	10	groups=4 & axles>6		
>6	5 or 6	Double road train or Heavy truck and two trailers	DRT	11	groups=5 or 6 & axles>6		
>6	>6	Triple road train or Heavy truck and three trailers	TRT	12	groups>6 & axles>6		

Figure 3.3: Austroads94 vehicle classification system

As a result of the increase in production from the quarry it is estimated that an average additional 42.7 loaded trucks per day would be travelling south from the quarry to the intersection of Haul Route B. Therefore this figure was added to the 'Class 9' counts for the site 1 and 2 traffic counts. After the intersection approximately 30.4 of these trucks would continue south along Haul Route A towards Maitland (affecting the counts at sites 3, 4 and 5) and 12.3 trucks would turn off and travel along Haul Route B towards Port Stephens (affecting the counts at sites 6, 7, 8 and 9). Each truck would return empty to the quarry along the same route.

4. ROAD ATTRIBUTE AND CONDITION DATA

4.1. Source of data

4.1.1. Pavement strength

In order to determine the current strength of the pavements, pavement deflection was measured in the outer wheel path at every 50m in both directions using a Falling Weight Deflectometer (FWD). This work was carried out by ARRB Group Ltd. The deflection data was converted to a Structural Number of the pavement and a subgrade CBR as a measure of the subgrade strength. The conversion was undertaken using the Roberts / Jameson equation. (Refer to APPENDIX C).

4.1.2. Road roughness and rutting

Roughness and rutting data was collected and averaged over each 100m segment of the roads for both the northbound and southbound lanes. The data was collected using a laser profiler and the work was carried out by ARRB Group Ltd.

4.1.3. Surface condition assessment

A visual assessment was made of the road surface using a vehicle instrumented with multiple video cameras integrated with GPS technology. The types of surface distresses that were captured are shown in Table 4.1.

Table 4.1 Surface Defects

Distress	Unit
Crocodile Cracking	% of section affected
Block Cracking	% of section affected
Transverse Cracking	% of section affected
Longitudinal Cracking	% of section affected
Potholes	Count per section
Shoving	% of section affected
Ravelling/Stripping	% of section affected

4.1.4. Age data and pavement structure

Both Maitland and Port Stephens Councils currently use the SMEC PMS to manage their road networks. Their existing databases already contained information relating to the haul routes within their jurisdictions. This information included pavement structure and treatment history data that could be used as inputs for the Martins Creek haul routes analysis.

There was less information available for the pavements lying within the Dungog Council jurisdiction since this Council is not a user of the SMEC System. For these road segments we had to make estimates of the surface age and rely on the FWD and condition assessment to determine the starting point for modelling the roads forward into the future.

In terms of surface types it was found that the roads of Dungog and Port Stephens were primarily chip seals while 43 % of the Maitland roads were surfaced with asphalt.

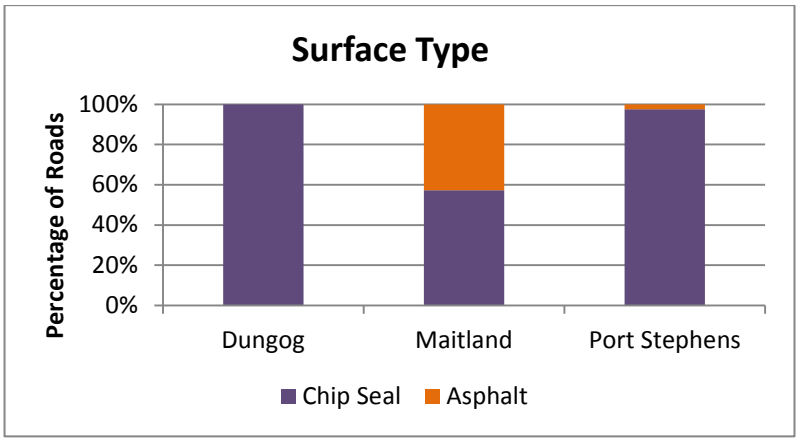


Figure 4.1: Percentage of road networks by surface types

4.2. Road segments

Within the PMS the network is defined as roads and those roads are further sub-divided into one or more segments. Each road segment should be homogeneous in condition, strength, traffic and age.

During the condition assessment undertaken by ARRB, the haul routes were first divided into links. The links started and ended at physical features along the route such as intersections, bridge abutments etc. In all there were 105 different links with an average length of 492m.

For rating purposes the links were further divided into 100m sections with the final section often being shorter since it ended at the link termination point rather than an even increment of 100m. It was these sections that were used for the analysis to model the future deterioration of the pavements under the effects of the traffic loading and the environment.

In total there were 570 northbound segments and 572 southbound segments that were entered into the database and analysed.

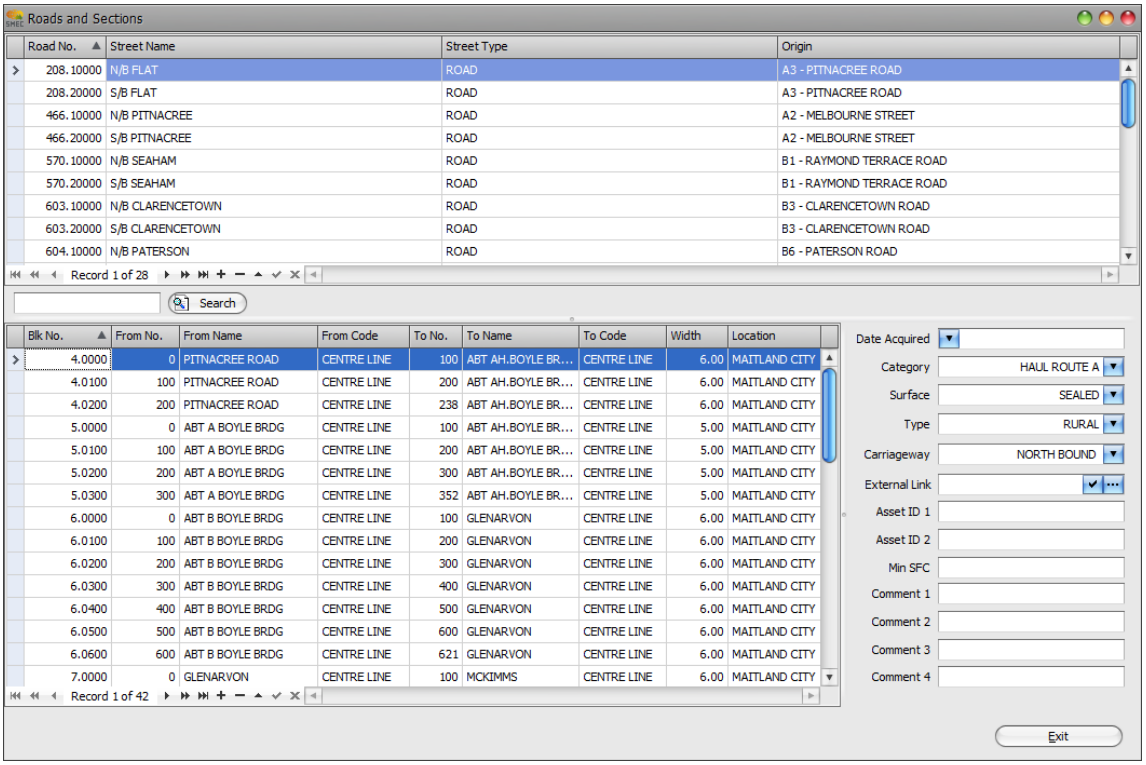


Figure 4.2: PMS form used to view / edit roads and road segments

A full list of the road segments used for the analysis can be seen in APPENDIX D.

Once each section was defined in the database, the section specific attribute and condition data was recorded and stored. Figure 4.3 shows an example of the types of data entered into the SMEC PMS in order to characterise the condition and attribute data for each road section.

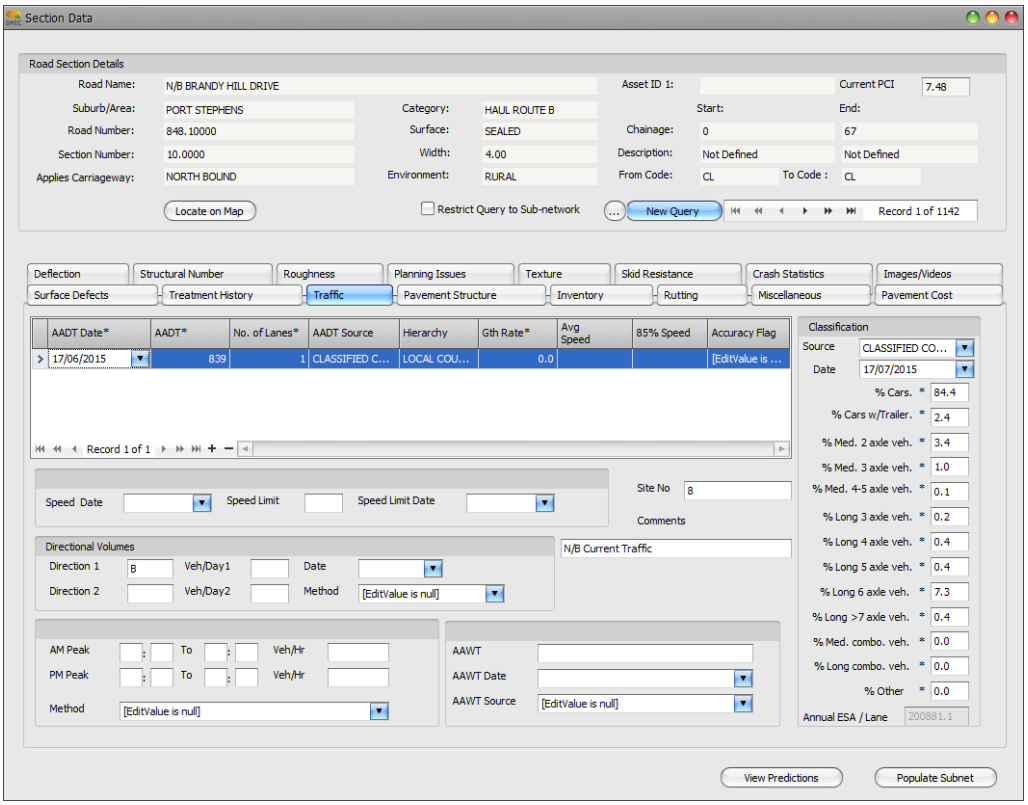


Figure 4.3: PMS form used to view / edit segment specific attribute data.

4.3. Pavement Condition Index (PCI)

The Pavement Condition Index (PCI) is a summarised score given to each road section based on a weighted combination of the different distresses affecting the pavement. A pavement without any distresses showing would have a PCI equal to 10. Each different type of distress discovered results in this score being lowered by an amount depending on the type and severity of the distress. A pavement with a PCI of zero would be in very poor condition (although PCI values can go negative when a pavement is very severely distressed). The types of distresses that are considered when determining a PCI score include roughness, rutting, all cracking, wide cracking, stripping / ravelling and potholing. Distresses such as bleeding, flushing and edge break are not included since these are not included in the pavement deterioration models used by the PMS. The formulation of the SMEC PCI value can be seen in APPENDIX B.

The PCI is a measure of pavement condition only. It does not take into consideration such things as road geometry, road width, and shoulder condition.

The PCI is useful for reporting the summary condition of single road sections but it can also be used to report the area weighted average condition of the entire road network (or any nominated sub-network such as the Maitland road sections).

The SMEC PMS is able to optimise future maintenance works programs to maximise the network PCI under budget constraint, or alternatively, determine the optimised works program (and funding required) to maintain the road network at a nominated average network PCI level. It is this second methodology that was used in this analysis.

5. CURRENT PAVEMENT CONDITION

The current condition of the southbound lanes of the haul routes in 2015 is summarised in Table 5.1. The summary data indicates that the Maitland roads tend to be in better condition and have stronger pavements as compared to the Dungog and Port Stephens roads.

Table 5.1 Summary of current condition of road pavements

Condition Attribute	Dungog Roads	Maitland Roads	Port Stephens Roads
Road Length	13.22 km	15.56 km	22.91 km
Average Roughness (NAASRA)	84.3	59.0	67.1
Average Rut Depth (mm)	5.9 mm	5.1 mm	6.3 mm
Average Cracking (% of surface affected)	1.6%	2.4%	4.4%
Average Stripping (% of surface affected)	1.5%	0.2%	0.2%
Average Pavement Condition Index (PCI)	8.1	8.5	8.0
Average Strength (Structural No.)	3.9	4.9	3.7

A detailed listing of the condition of every south bound segment is provided in APPENDIX D. A sub-set of this list (showing the road segments in poor to very poor condition) is presented in APPENDIX E.

A more detailed breakdown of the measured distresses can be seen in the following figures.

5.1. Pavement Condition Index (PCI)

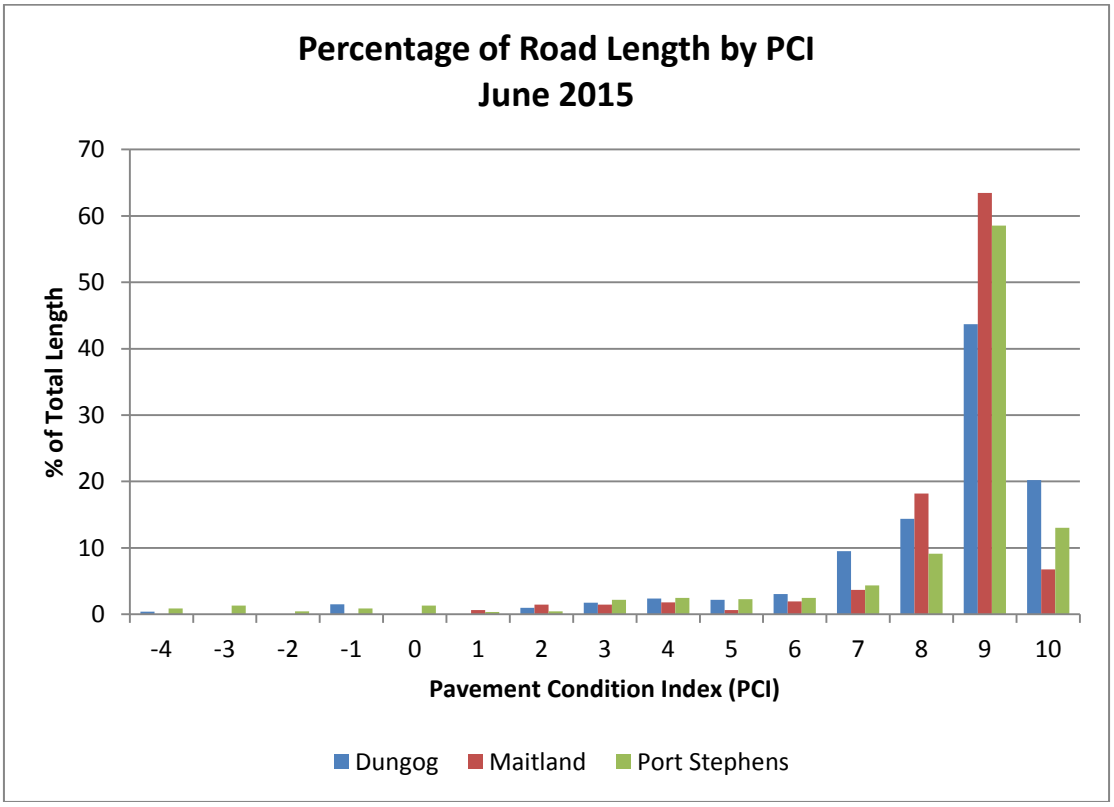


Figure 5.1: Distribution of PCI for each Council jurisdiction.

In the figure above, higher values of PCI indicate better pavement condition.

The following two graphs show how the PCI, as measured in 2015, varies along each of the haul routes.

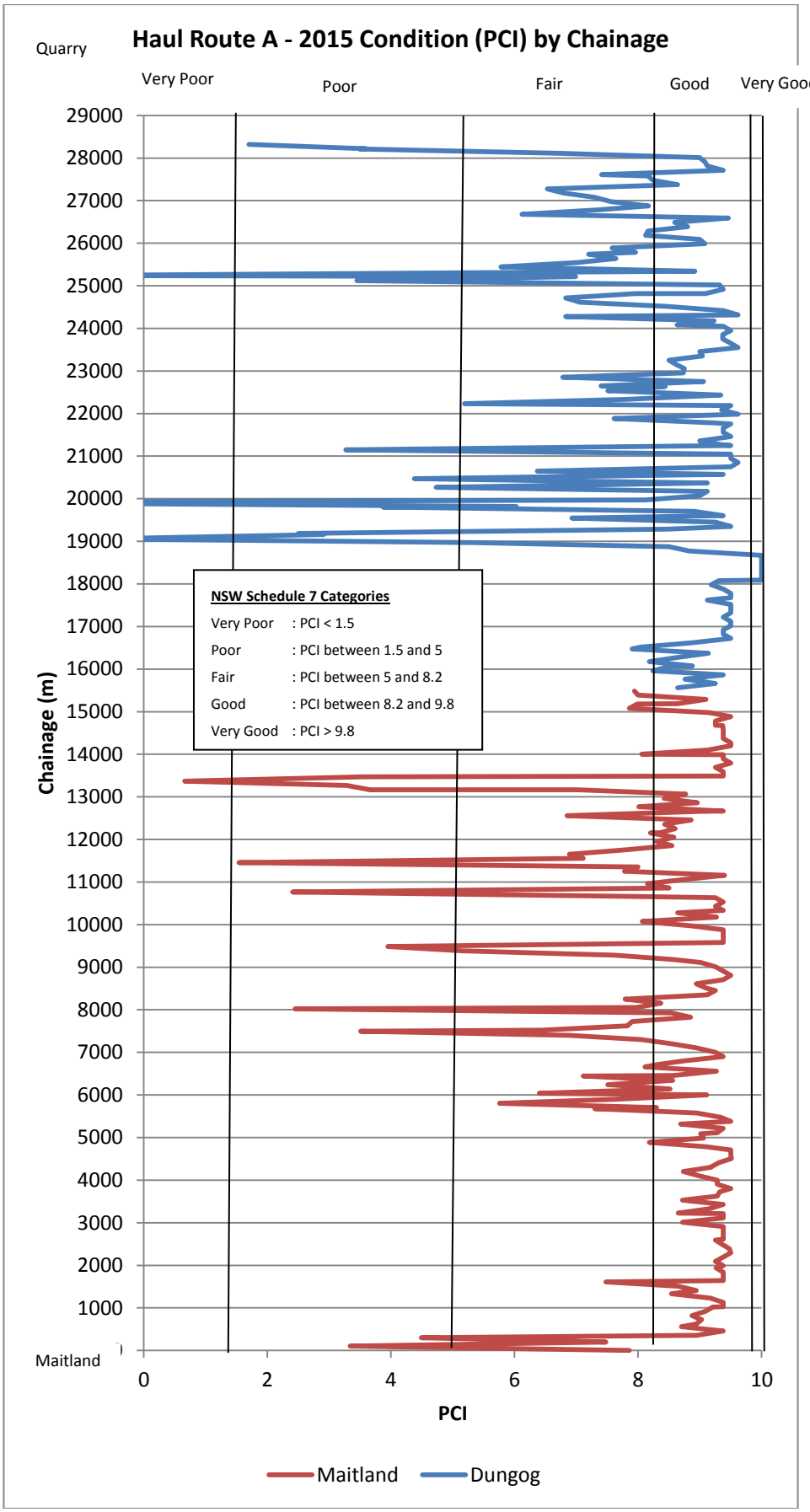


Figure 5.2: Pavement condition (PCI) along Haul Route A.

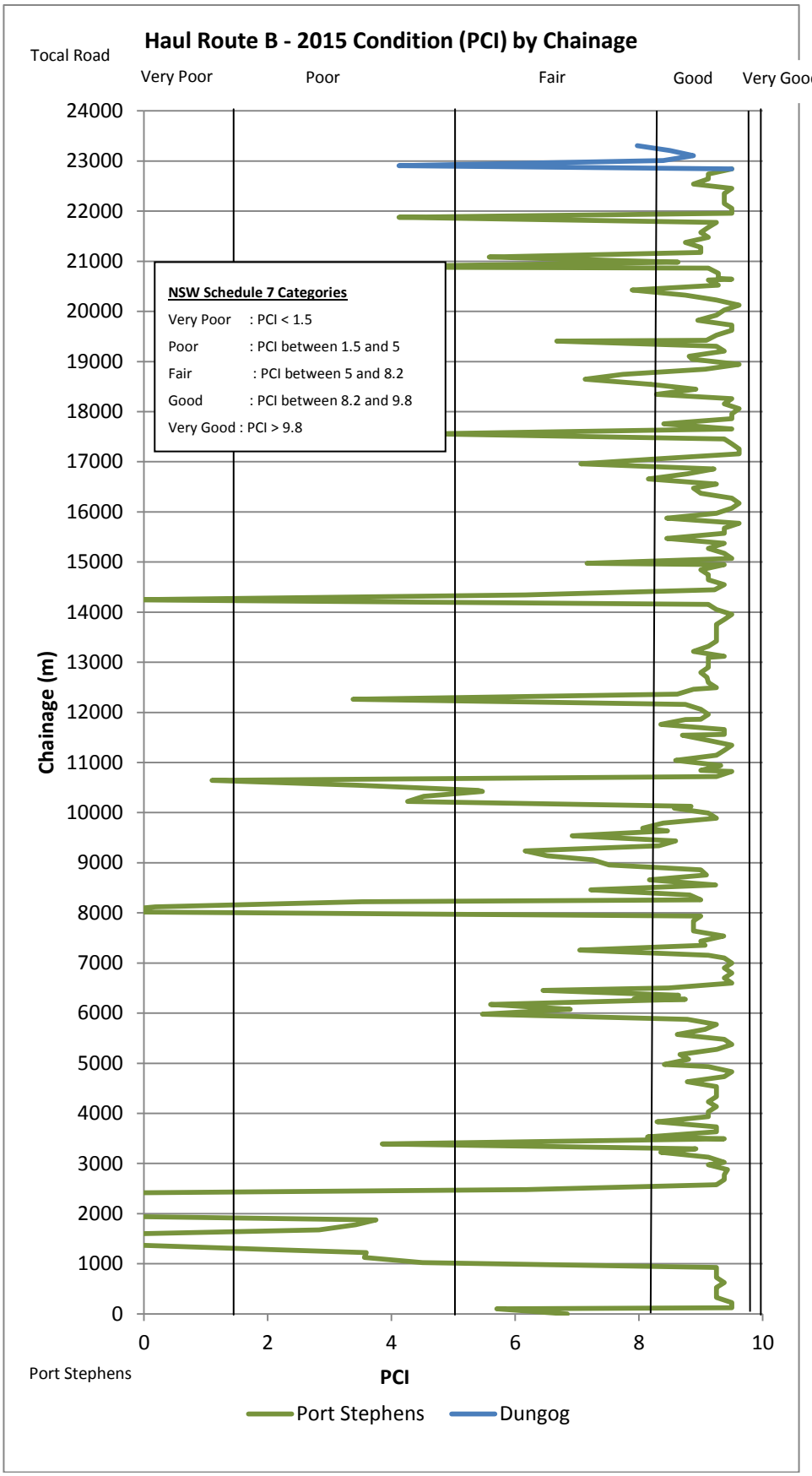


Figure 5.3: Pavement condition (PCI) along Haul Route B.

The International Infrastructure Management Manual refers to three different categories of Condition Grading Systems. These are:

- The Simple Approach (Using a scale of 1 to 5);
- The Intermediate Approach; and
- The Sophisticated Approach (using sophisticated condition methods involving multi-faceted distress modes)

The International Infrastructure Management Manual also states:

'Although these sophisticated systems may allow the condition to be assessed on up to ten different parameters with condition scores between 0 and 1,000 they can still be broken down into base scores of 1 to 5 if required.'

Although the SMEC PMS utilises the third (sophisticated) approach, there are still occasions where governmental requirements dictate that some reporting should be presented using the simplified 1 to 5 scale since this this should be achievable by all Local Government Councils irrespective of the sophistication of the tools that they are using. A case in point is the NSW Schedule 7 report that asks for an assessment of assets in terms of the simplistic 1 to 5 scale. With simple systems the 1 to 5 rating is generally determined as a simple subjective assessment. To replicate this rating, SMEC has consulted with our Local Government clients to translate the SMEC PCI scale to a 1 to 5 scale in line with the NSW reporting requirement. This consultative approach has led to a translation of SMEC PCI to a 1 to 5 scale as shown in Table 5.2.

Table 5.2 PCI Interpretation expressed as a 1 to 5 scale

PCI	Road Condition	Scale
Between 9.8 and 10	Very Good	1
Between 8.2 and 9.8	Good	2
Between 5 and 8.2	Fair	3
Between 1.5 and 5	Poor	4
Less than 1.5	Very Poor	5

The delineations showing the 1 to 5 scale have been shown in the charts labelled Figure 5.2 and Figure 5.3.

5.2. Road Roughness

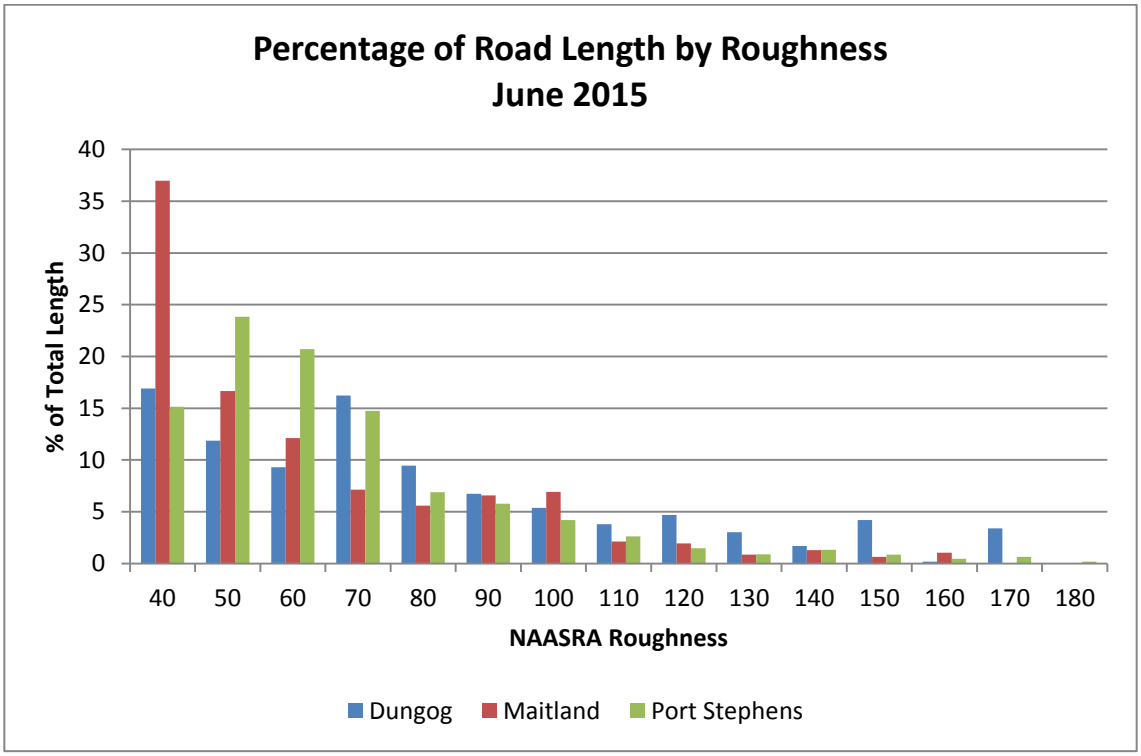


Figure 5.4: Roughness distribution for each Council jurisdiction.

In the figure above, lower roughness values indicate better pavement condition.

5.3. Pavement Rutting

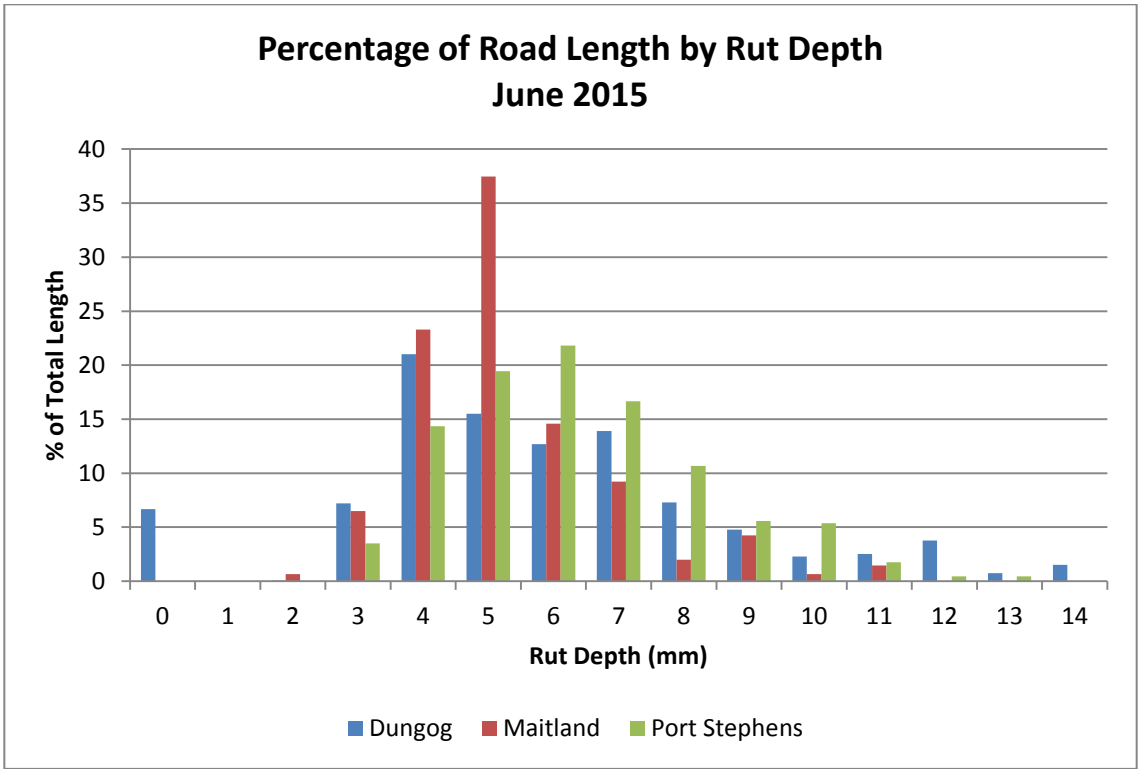


Figure 5.5: Rutting distribution for each Council jurisdiction.

In the figure above, lower rut depth values indicate better pavement condition.

5.4. Surface Cracking

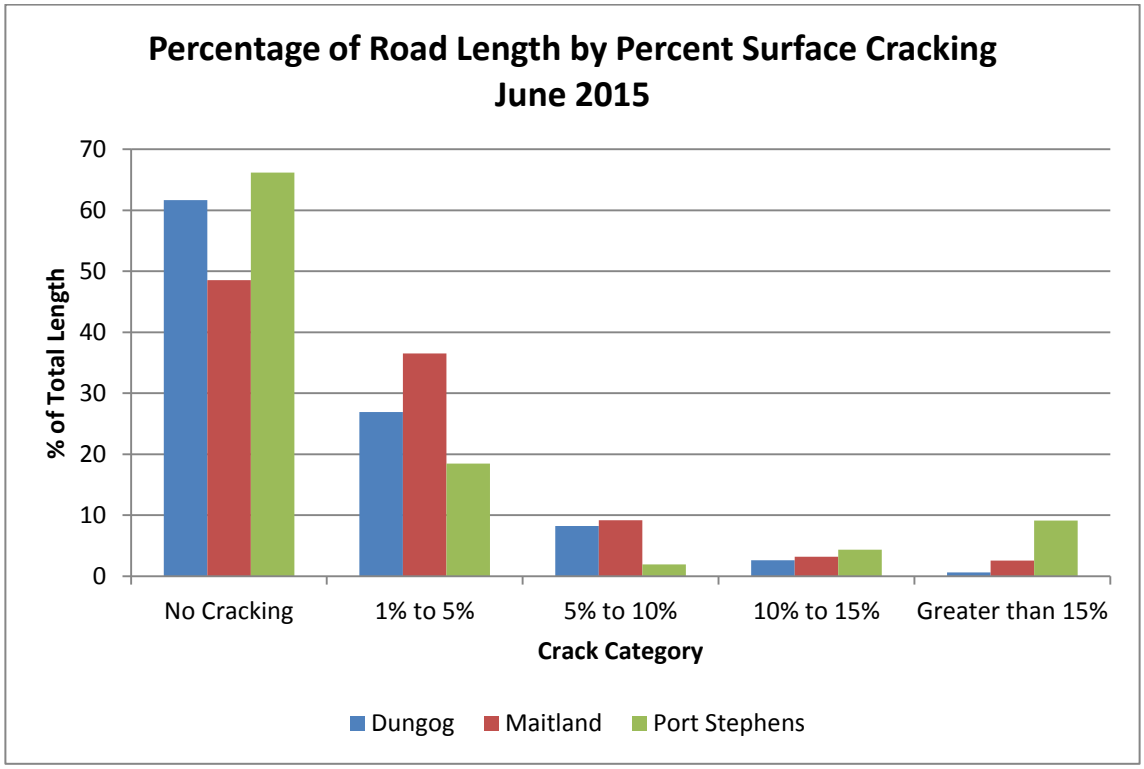


Figure 5.6: Surface cracking distribution for each Council jurisdiction.

In the figure above, lower cracking values indicate better pavement condition. It should be noted that cracking in chip seal surfaces is sometimes more difficult to detect as compared to cracking in asphalt surfaces. This is because a chip seal road has a more textured surface. Since Maitland has a higher percentage of asphalt roads (Refer to Figure 4.1), this may account for why the Dungog and Port Stephens roads have a greater percentage of their network recorded with zero cracking.

5.5. Pavement Strength

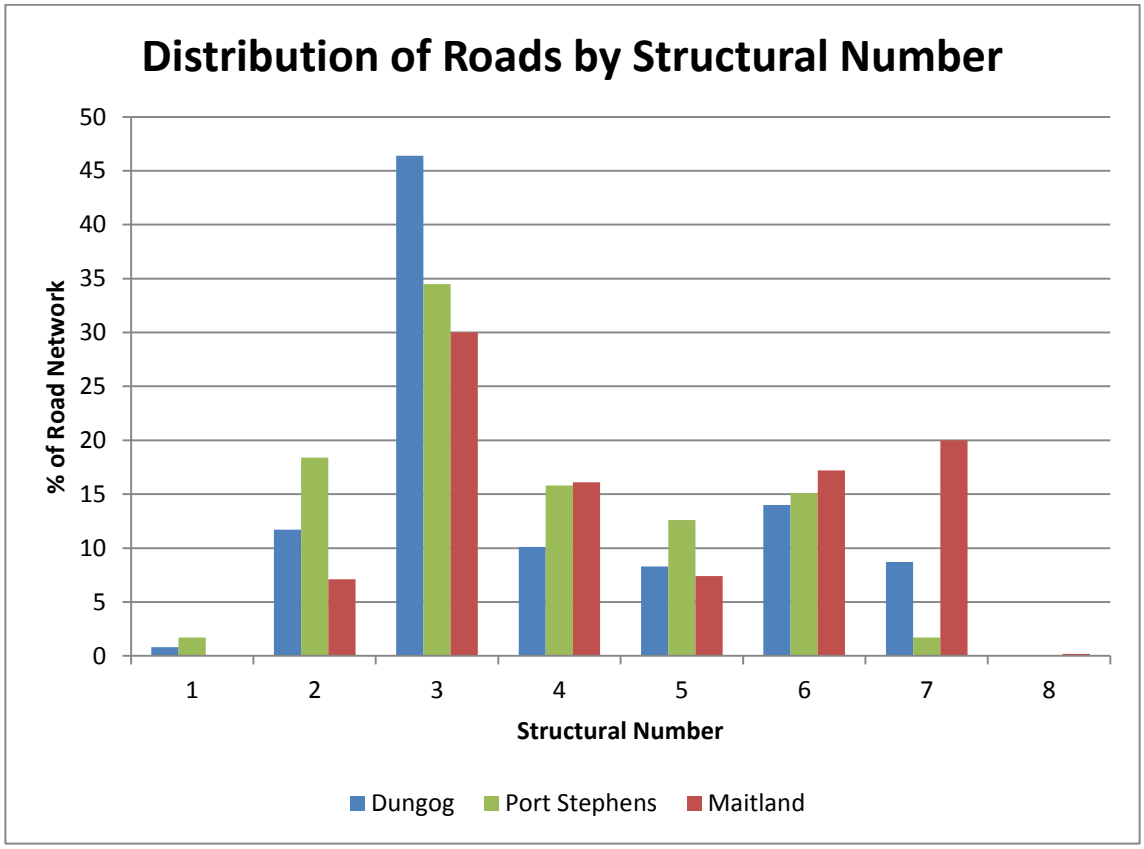


Figure 5.7: Pavement strength distribution for each Council jurisdiction.

In the figure above, higher structural numbers indicate stronger pavements.

6. PREDICTING FUTURE MAINTENANCE REQUIREMENTS

6.1. Pavement models

The SMEC PMS utilises the World Bank's HDM pavement deterioration models to predict the changes to the pavement condition while taking into account the effects of the environment, traffic loading and the application of future maintenance treatments. The models are incremental in that they look at the condition at the beginning of the year and then predict the annual changes to attributes such as:

- Roughness
- Rutting
- Texture depth
- Stripping
- All cracking
- Wide Cracking
- Potholing

The models can be calibrated to suit local climate conditions. For this analysis it was decided to adopt the model calibration factors currently being used by the Maitland City Council in their implementation of the SMEC PMS. This Council is a long term user of the system and is well experienced in its operation. Given that the environment would be expected to change very little over the length of the haul roads any environmental calibration factors developed for the Maitland network should also be applicable for both Dungog and Port Stephens road sections.

6.2. Treatment Options

The SMEC PMS allows each client to customise a range of treatment options under the categories of Preventive, Spray Seals, Overlays and Reconstruction / Rehabilitation treatments. During the analysis the system will then be able to draw on these various treatment options in order to determine the timing and types of treatments to be used in the formulation of an optimised works program. The treatment options and unit rates used in this analysis were taken from the current Maitland PMS database. Refer to Table 6.1.

Table 6.1 Treatment options used for the analysis

Code	Description	Type	Unit Rate
RS2	10MM SAM SPRAY SEAL	Spray Seal	$7.92
ST3	14/7MM TWO COAT STD SEAL	Spray Seal	$12.72
ST4	14/10MM TWO COAT STD SEAL	Spray Seal	$12.98
GEO	10MM SAM SEAL WITH GEO-FABRIC INTERLAYER	Spray Seal	$12.50
SCS	10MM SAM SEAL WITH ASPHALT CORRECTION	Spray Seal	$12.73
RS3	14MM SAM SPRAY SEAL	Spray Seal	$9.25
SMI	35MM ASPHALT O/LAY WITH SAMI INTERLAYER	Asphalt	$24.32
REG	30MM AC O/AY WITH CORRECTION COURSE	Asphalt	$23.50
MF5	50MM MILL & FILL ASPHALT	Asphalt	$28.75
AC1	30MM ASPHALT OVERLAY	Asphalt	$20.25
RH2	REHAB COLLECTOR ROAD	Rehabilitation	$95.00
RH3	REHAB ARTERIAL ROAD	Rehabilitation	$130.00
RH1	REHAB LOCAL ROAD	Rehabilitation	$75.00

6.3. Treatment rule-base

The SMEC PMS contains a rule-base that is used to select the various treatment options that are required to be analysed each year for each road segment. Based on the predicted condition for each analysis year, the rule-base applies a set of user-defined rules that consider factors such as surface condition, roughness, rutting, age, type of surfacing, location and traffic volumes in order to determine which possible treatment options should be selected for further analysis through life cycle modelling.

Although the rule-base can contain trigger points and selection criteria to determine possible treatment options at various stages of the pavements life, further analysis is then undertaken to determine the whole of life performance of each treatment option. The final formulation of the 25 year works program will then be determined by the optimisation module which will select the most beneficial treatments that will meet the optimisation goals for the network analysis.

6.4. Analysis Criteria

The goal of the analysis was to determine the increased road maintenance funding requirements for the haul roads resulting from the increased production of the Martins Creek quarry.

The requirement for the analysis was to first predict the maintenance funding requirements over the next 25 years if the quarry truck traffic remained at its current levels. The analysis was then repeated assuming that the number of quarry trucks using the hauls routes would increase in line with an increase in production from the quarry going from 906,500 tonnes per annum to a total of 1.5 million tonnes per annum.

The analysis was broken down by the three different council jurisdictions through which the haul routes passed. The criterion for each analysis was to determine the annual funding required to maintain each sub-network at its current condition level for the next 25 years.

Although the data was collected, and the pavement models were set up, to model both the southbound and northbound lanes, it was assumed that any future resurfacing or rehabilitation treatments would be applied to both southbound and northbound lanes at the same time. The reason for this is because the roads are single carriageway and there would be less efficiency in treating each lane of the road at different times. Since the southbound lanes were carrying the loaded quarry truck traffic it was expected that these lanes would deteriorate more quickly and therefore dictate when a treatment should apply. The works programming was therefore carried out for the southbound lanes but then the costs were calculated based on the treatment being applied to the full width of the road.

6.5. Analysis results

In the following three pages, Table 6.2, Table 6.3 and Table 6.4 show the annual results of the modelling for each of the three Council sub-networks. The left hand side of the table shows the modelling based on the current traffic scenario while the right hand side of the table shows the modelling based on the increased traffic scenario.

The ‘Capital Cost’ column contains the cost of all resurfacing and rehabilitation treatments that the system has chosen to maintain the PCI of the network close to 2016 levels.

All costs are expressed in today’s dollars and are exclusive of GST. The capital costs don’t include routine maintenance costs associated with minor pothole repairs, edge break repairs etc. However it was found that this cost was a function of the overall condition level of the road surface. Since the annual works program was designed to keep the condition at a constant level then there was no increase in the routine maintenance requirements required under the additional production scenario.

Table 6.2 Modelling results for Dungog roads (SB lanes only)

	Current – 906,500 Tonnes per Annum						Proposed – 1,500,000 Tonnes per Annum					
Year	Capital Cost	PCI	Cracking	Roughness	Rut Depth	Stripping	Capital Cost	PCI	Cracking	Roughness	Rut Depth	Stripping
2016	$48,551	8.2	2.4	85.5	5.8	1.9	$49,048	8.2	2.3	85.6	5.8	2
2017	$71,109	8.2	2.5	87.4	5.8	2	$79,209	8.2	2.4	87.2	5.8	2
2018	$106,106	8.2	2.7	89.2	5.8	1.6	$105,406	8.2	2.5	90.4	5.8	1.4
2019	$126,610	8.2	2.4	91.4	5.7	0.2	$148,028	8.2	2.4	91.3	5.7	0.8
2020	$63,789	8.2	2.2	94.6	5.8	0.3	$82,489	8.2	2.7	92.7	5.7	0.8
2021	$57,700	8.1	2.3	96.1	5.7	0.2	$55,500	8.2	2.2	96.1	5.7	0.5
2022	$32,688	8.1	1.9	99.1	5.8	0.3	$44,175	8.1	2.2	97.6	5.6	0
2023	$70,255	8.1	1.9	99.7	5.6	0.3	$62,823	8.1	2.1	98.8	5.6	0
2024	$59,400	8.1	1.8	100.9	5.6	0	$18,500	8.1	1.6	102.2	5.6	0
2025	$12,703	8.1	1.6	104.2	5.6	0	$81,166	8.1	1.6	104.1	5.5	0
2026	$59,413	8.1	1.4	106.7	5.6	0	$61,090	8.1	1.4	106.6	5.5	0
2027	$139,532	8.1	1.5	106.8	5.4	0	$106,134	8.1	1.5	106.9	5.4	0
2028	$178,384	8.2	1.5	106.5	5.3	0	$143,863	8.2	1.2	108.1	5.3	0
2029	$70,500	8.1	1.3	108.6	5.2	0	$71,359	8.2	1	110.2	5.2	0
2030	$115,422	8.1	1.3	109.2	5.1	0	$149,952	8.1	1.2	110.1	5.1	0
2031	$198,284	8.1	1.5	109	4.8	0	$261,419	8.2	1.6	108.1	4.7	0
2032	$148,027	8.1	1.7	108.6	4.7	0	$204,888	8.2	1.8	107.8	4.5	0
2033	$167,343	8.2	1.5	109.2	4.6	0	$272,304	8.1	2.1	106.8	4.2	0
2034	$266,164	8.1	1.8	108.4	4.3	0	$395,675	8.1	2.8	103	3.9	0
2035	$295,830	8.1	2.6	104.1	4.1	0	$382,363	8.1	3.8	97.1	3.6	0
2036	$200,531	8.2	2.4	103.9	4.0	0	$175,891	8.2	3.1	98.3	3.6	0
2037	$63,319	8.2	1.9	107.2	4.0	0	$74,973	8.2	3.2	99.8	3.6	0
2038	$66,972	8.2	1.3	110.6	4.0	0	$92,521	8.2	3	101.1	3.6	0
2039	$79,808	8.1	1.4	112.6	4.0	0	$28,455	8.2	2.6	103.7	3.6	0
2040	$62,759	8.1	1.3	114	3.9	0	$66,276	8.1	2.5	105.7	3.6	0
Totals	$2,761,199						$3,213,507					

Table 6.3 Modelling results for Maitland roads (SB lanes only)

	Current – 906,500 Tonnes per Annum						Proposed – 1,500,000 Tonnes per Annum					
Year	Capital Cost	PCI	Cracking	Roughness	Rut Depth	Stripping	Capital Cost	PCI	Cracking	Roughness	Rut Depth	Stripping
2016	$42,108	8.3	3.2	60.2	5.2	0.3	$42,108	8.3	3.2	60.2	5.2	0.3
2017	$49,624	8.1	4	61.5	5.2	0.5	$49,624	8.1	4.1	61.6	5.2	0.5
2018	$193,589	8.2	3.8	62.1	5.2	0.7	$193,589	8.2	3.9	62.2	5.2	0.7
2019	$97,377	8.5	2.5	62.6	5.2	0.4	$97,377	8.5	2.5	62.6	5.2	0.4
2020	$43,898	8.5	2.4	64.5	5.2	0.5	$45,516	8.5	2.4	64.6	5.2	0.5
2021	$50,606	8.5	2.1	66.5	5.3	0.5	$49,653	8.5	2.1	66.6	5.3	0.5
2022	$23,883	8.5	2	68.5	5.4	0.6	$76,983	8.5	2	68.3	5.3	0.6
2023	$162,953	8.5	2.2	68.9	5.3	0.5	$117,288	8.5	2.2	69	5.2	0.5
2024	$23,676	8.5	2	70.8	5.3	0.6	$31,845	8.5	2.2	70	5.2	0.6
2025	$30,210	8.5	1.8	72.3	5.3	0.7	$16,863	8.5	1.9	72.1	5.3	0.7
2026	$112,888	8.5	1.9	73.1	5.2	0.5	$115,940	8.5	2	73	5.2	0.3
2027	$71,277	8.5	2	74.5	5.2	0.3	$154,025	8.5	2.2	73.5	5.1	0.3
2028	$255,270	8.5	2.4	74	5.0	0.3	$201,614	8.5	2.5	73.7	5.0	0.1
2029	$148,992	8.4	2.9	75.1	4.9	0.3	$122,952	8.4	3.2	75	4.9	0.1
2030	$61,721	8.3	3	77.4	5.0	0	$144,100	8.4	3	76.6	4.9	0
2031	$197,676	8.4	2.7	78.2	4.9	0	$85,038	8.4	2.3	79	4.9	0
2032	$38,084	8.4	2.5	80.7	4.9	0	$25,903	8.3	2.5	81.6	4.9	0
2033	$30,182	8.2	2.7	83.3	5.0	0	$21,060	8.2	2.8	84.3	5.0	0
2034	$72,604	8.1	3.1	85.5	5.0	0	$99,807	8.1	3.4	85.8	4.9	0
2035	$97,606	8	3.6	87.1	4.9	0	$88,991	8	3.5	87.8	4.9	0
2036	$254,536	8.2	2.8	86.9	4.7	0	$201,695	8	3.3	88.2	4.8	0
2037	$113,489	8.2	2.6	87.9	4.7	0	$279,121	8.1	3.2	87	4.5	0
2038	$259,204	8.2	2.6	87.2	4.5	0	$244,545	8.1	3.6	86.7	4.4	0
2039	$132,392	8.1	3.1	88.3	4.4	0	$163,144	8.1	3.3	87.2	4.3	0
2040	$305,135	8.2	3.3	87.3	4.3	0	$227,565	8.2	3.6	86.6	4.2	0
Totals	$2,868,980						$2,896,346					

Table 6.4 Modelling results for Port Stephens roads (SB lanes only)

	Current – 906,500 Tonnes per Annum						Proposed – 1,500,000 Tonnes per Annum					
Year	Capital Cost	PCI	Cracking	Roughness	Rut Depth	Stripping	Capital Cost	PCI	Cracking	Roughness	Rut Depth	Stripping
2016	$23,175	8	4.5	69.4	6.3	0.3	$20,892	8	4.5	69.5	6.3	0.3
2017	$27,051	8	4.4	71.8	6.4	0.4	$19,369	8	4.3	72	6.4	0.4
2018	$28,833	8	4.2	74.3	6.4	0.7	$35,491	8	4.1	74.5	6.4	0.7
2019	$26,873	8	4	76.9	6.5	0.9	$38,375	8	4	77.1	6.5	0.8
2020	$73,961	8	3.7	79.8	6.5	1	$71,189	8	3.7	80.1	6.5	0.9
2021	$44,281	8	3.7	81.5	6.5	1.2	$40,770	8	3.6	82	6.5	1.1
2022	$32,513	8	3.4	84.3	6.5	1.4	$29,104	8	3.4	84.9	6.5	1.2
2023	$76,591	8	3.4	86	6.5	0.9	$97,186	8	3.3	86.7	6.5	0.8
2024	$38,509	8	3.2	88.9	6.5	0.9	$25,189	8	3.2	89.8	6.5	0.6
2025	$32,926	8	3	92	6.6	0.9	$39,262	8	2.9	92.9	6.6	0.6
2026	$35,845	8	2.8	95.1	6.6	1	$42,156	8	2.8	96.1	6.6	0.5
2027	$117,307	8	2.7	97.2	6.5	0.5	$117,419	8	2.6	98.4	6.6	0.5
2028	$48,681	8	2.4	100.5	6.6	0.6	$86,593	8	2.4	101.4	6.6	0.5
2029	$89,512	8	2	103.7	6.6	0.6	$171,458	8	2.2	102.8	6.5	0.6
2030	$172,992	8	1.9	104.9	6.5	0.3	$183,769	8	1.7	105.4	6.4	0.3
2031	$261,601	8	2.1	104.9	6.3	0.3	$213,099	8	1.9	105.9	6.3	0.3
2032	$180,937	8	1.8	106.8	6.3	0.4	$152,389	8	1.6	107.4	6.2	0.4
2033	$222,562	8	1.6	107.6	6.1	0.4	$207,870	8	1.5	107.8	6.0	0.4
2034	$164,312	8	1.3	109.4	6.0	0.4	$188,274	8	1.2	109.6	5.9	0.4
2035	$264,004	8	1.1	110.8	5.9	0.4	$208,905	8	1	111.4	5.9	0.4
2036	$79,015	8	0.5	114.4	6.0	0.4	$65,693	8	0.4	115	5.9	0.4
2037	$133,690	8	0.5	115.8	5.8	0.4	$174,570	8	0.5	115.5	5.7	0.4
2038	$146,602	8	0.6	115.3	5.7	0	$203,172	8	0.7	115.1	5.6	0
2039	$303,130	8	0.8	114.9	5.5	0	$358,652	8	1	113.7	5.3	0
2040	$323,824	8	1.1	112.8	5.1	0	$330,763	8	1.2	112	5.0	0
Totals	$2,948,727						$3,121,609					

The cost figures in the above tables are based on treating the southbound lanes only. Assuming that both southbound and northbound lanes will be treated at the same time, then these costs will need to be doubled. A summary of the annual figures are shown in Table 6.5 below.

Table 6.5 Future funding requirements for pavements (Includes Northbound and Southbound lanes)

Modelling scenario	Dungog Roads	Maitland Roads	Port Stephens Roads
Length of roads	13.22 km	15.56 km	22.91 km
Average increase in the number of Loaded trucks per day	42.7 / 30.4	30.4	12.3
Predicted 25 year funding requirements based on current traffic levels	$5,522,398	$5,737,960	$5,897,454
Predicted 25 year funding requirements based on increased truck traffic	$6,427,014	$5,792,692	$6,243,218
Increase in funding required over 25 years	$904,616	$54,732	$345,764
Average annual funding increase	$36,185	$2,189	$13,830
Annual funding increase per km of road	$2,737	$140	$604
Increase required per tonne carried	$0.07144	$0.00607	$0.09479

APPENDIX A SMEC PMS OVERVIEW

The SMEC Pavement Management and Road Inventory System (referred to as SMEC PMS) contains an integrated computer system which combines a powerful relational database, a sophisticated road deterioration predication model and an optimisation module to analyse, optimise and schedule maintenance and rehabilitation for a road network. It also contains a road inventory management module and facilities for records and reports. It contains an integrated computer system comprising the following modules:

- **database** including pavement condition, road inventory, pavement structure, traffic details and other records;
- **project analysis** including prediction modelling, candidate selection and life cycle costing;
- **network optimisation** covering budget allocation, optional and optimal treatments, maintenance implications, etc.;
- **scheduling and reporting** giving works programmes, management graphs and reports, network condition summaries, ad hoc queries, etc.; and
- **asset valuation** for road pavements and road inventory items such as kerbs, manholes, etc.
- **GIS display capability** allowing the data stored in the database to be linked to a map and for thematically displaying road attributes across the road network.

This structure is illustrated in Figure 6.1.

The SMEC PMS is project based and network operated with inventory, condition, structure, traffic and other data collected for each discrete road section. It undertakes road network analysis based on road section specific routine maintenance and treatments rather than global averages.

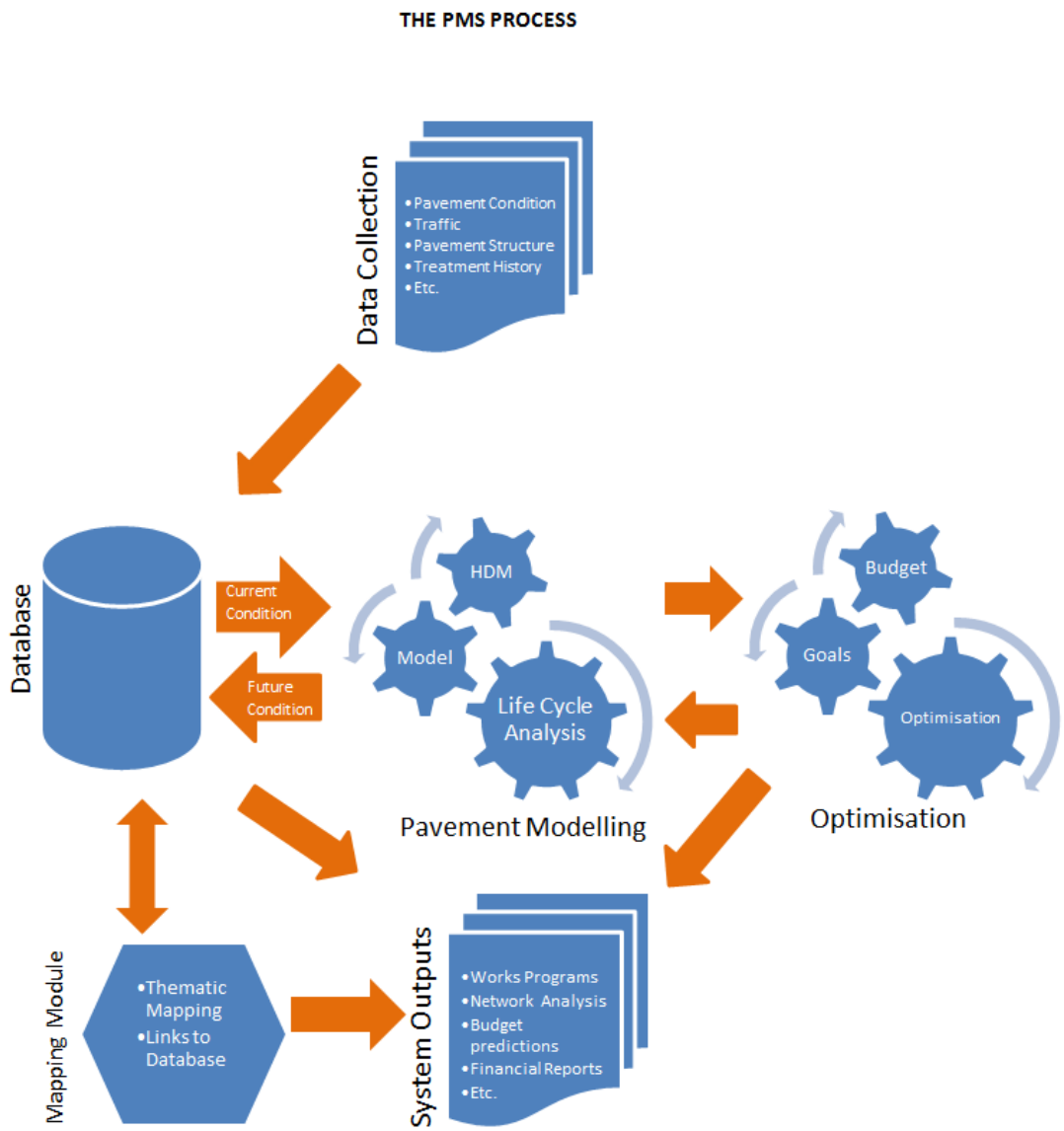


Figure 6.1 : Schematic of the SMEC System

The SMEC PMS is capable of both project level and network level optimisation under constraints of both budget and competing candidate projects and allows for consideration of 'must do' projects and restrictions on treatment.

The method of operation of the SMEC PMS, in simple terms, consists of:

- Obtaining road location, structural, traffic and condition data for each road section;
- Predicting future conditions and maintenance costs for different treatments, including minimum maintenance;
- Optimising the selection of treatments for different budget and other scenarios (e.g., 'must do' projects); and
- Determining the appropriate budget and treatments.

The minimum road related data required to operate the SMEC PMS is:

- Road pavement structure in terms of surface and base type, age, structural number and subgrade CBR;
- Road condition in terms of cracks, potholes, roughness, rutting and ravelling;

- Traffic in terms of number of vehicles in each classification and the average vehicle loading; and
- A pavement area (for costing).

In addition, it is necessary to have data on the different treatment options to be considered, the pavement deterioration model calibration factors and vehicles operating and maintenance costs.

The SMEC PMS is customised for each network, with information relating to the authority, the district, commencement date, environment and units of roughness and currency.

To assist in producing easily understood reports for different sets of roads (sub-networks), it is desirable to have additional data. These include:

- The location and classification of the road sections;
- The uses of the road (e.g. bus route, load limit); and
- Inventory items such as kerbs, manholes and drainage pits which may affect the maintenance and upkeep treatments selected.

In order to undertake relevant and specific analysis for a road managing agency, additional guidance / advice is required to enable effective use of the SMEC PMS and this includes:

- Objectives for the road network condition;
- The basis of optimisation to be used;
- The treatment options that are to be considered;
- Intervention policies to be considered (if any);
- Budgets to be considered; and
- Pavement treatment history.

The SMEC PMS utilises Relational Database Management System software to store, edit, update, query and report on the road inventory, condition, traffic and maintenance data and works programs and other outputs.

In a relational database system, the database is structured in tables. In the SMEC PMS the two basic types of database tables are:

- Those which store current and historical data relating to the survey condition, treatment history and inventory data and records for each location; and
- Those which store predicted future condition data based on the output of the prediction model, data summaries of past condition and output data (including works programs).

The road deterioration prediction model used by the SMEC PMS is the World Bank's HDM model. This model has been under development since 1969, with the production of HDM over an 18 year period of research and analysis by the World Bank in collaboration with major research institutions in Australia, Brazil, France, India, Kenya, Sweden, United Kingdom, Canada and United States. The model predicts maintenance and vehicle operating (i.e. user) costs, total life cycle costs and conditions and provides economic decision making criteria for consideration of multiple road design and maintenance alternatives.

The SMEC PMS undertakes optimisation and scheduling using the expenditure budgeting model (EBM) together with HDM life cycle cost data. The EBM performs a network level analysis to determine when and how each project is to be done. That is, it produces an optimised works program for a given year and budget.

APPENDIX B SMEC PAVEMENT CONDITION INDICATOR

The health of the road pavements in measured in terms of a number of recognised condition attributes. For the surface wearing course (and water proofing layer) the SMEC PMS is able to model the initiation and progression of cracking (commencing with fine cracking and progressing into wide cracking), stripping / ravelling, texture depth and development of potholes. For the pavement structural layers SMEC PMS models the development of road roughness (a measure of the loss of pavement shape) and rutting in the wheel paths.

In order to summarise the overall condition of each pavement segment the PMS utilises a formula that uses a weighted combination of the distress types to determine an overall Pavement Condition Index (PCI).

A pavement condition index (PCI) system which was derived by SMEC, in conjunction with other system users, is also available and can be queried from the database table PREDICTIONS. This PCI was formulated a number of years before the AUSTROADS PCIs were available and has been retained to give a degree of consistency between the current version and earlier versions of the software.

The way the SMEC PCI operates is that it assumes a ranking of 10 for a road without defects (perfect) and deducts points from this ranking depending on the level and types of distresses present in the pavement. In general terms, the PCI value may be interpreted as a simplified 1 to 5 scale as shown in Table B1.

Table B1: PCI Interpretation expressed as a 1 to 5 scale

PCI	Road Condition	Scale
Between 9.8 and 10	Very Good	1
Between 8.2 and 9.8	Good	2
Between 5 and 8.2	Fair	3
Between 1.5 and 5	Poor	4
Less than 1.5	Very Poor	5

The formula used to calculate the PCI is:

PCI = $10-D_1-D_2-D_3-D_4-D_5-D_6$

where:

D_1 = Deduct points for roughness =

Max $(0,((-4.361411 * 10^{-9} * AADT^2) + (4.91687 * 10^{-4} * AADT) + 7.74) * ROUGH /285 - 2.65)$

where AADT = annual average daily traffic

and ROUGH = pavement roughness in units NAASRA roughness. IRI results can be converted to NAASRA units using the following generic equation:

NAASRA = 26 x IRI

D_2 = Deduct points for all cracks

= Min (10, ACRACK*0.17)

where ACRACK = percentage of the pavement area cracked

D_3 = Deduct points for wide cracks

= WRCRACK*0.05

where

WRCRACK = percentage of the pavement area with wide cracks

D_4 = Deduct points for potholes

= Min(5, POTH*10)

where POTH = percentage of the pavement area potholed

D_5 = Deduct points for rutting

= RUT*0.125

where RUT = mean rut dept in mm

D_6 = Deduct points for ravelling

= RAREA*0.02

where RAREA = percentage of the pavement area ravelled

Note that the roughness deduction is a function of the roughness value and the traffic which the other deductions are a function of the extent only.

Because the deductions are accumulative, it is possible for a pavement which is in a bad condition to have a PCI ranking which is negative.

The following graphs show the deduct points calculated for each of the individual distress modes as a function of the extent of the distress.

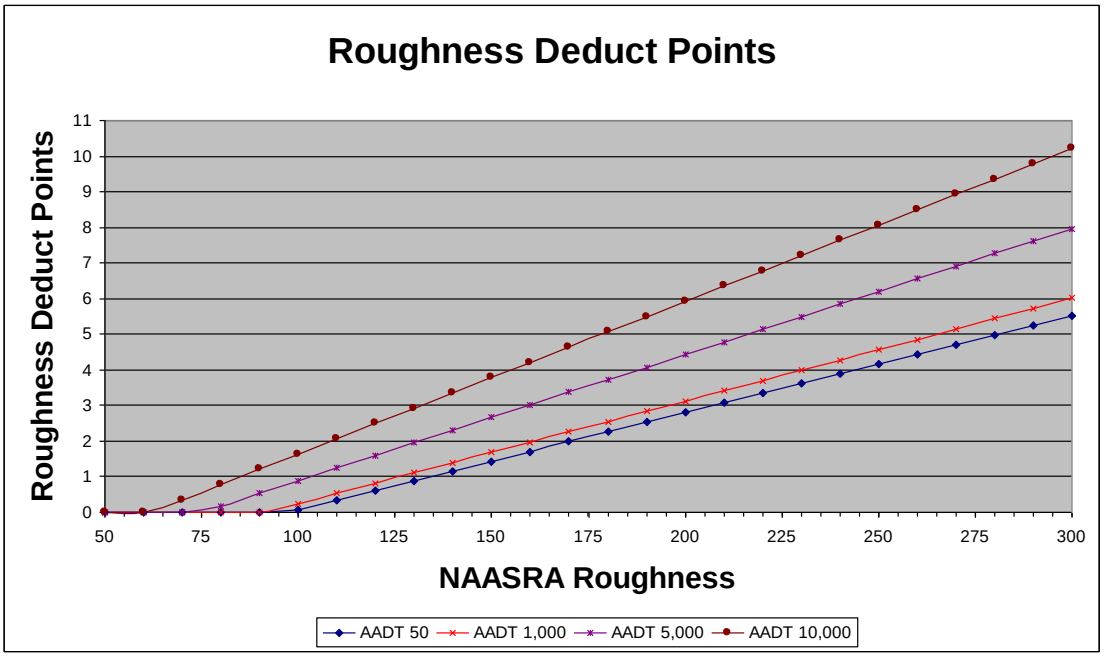


Figure 6.2: SMEC PCI Deduct Points based on Roughness

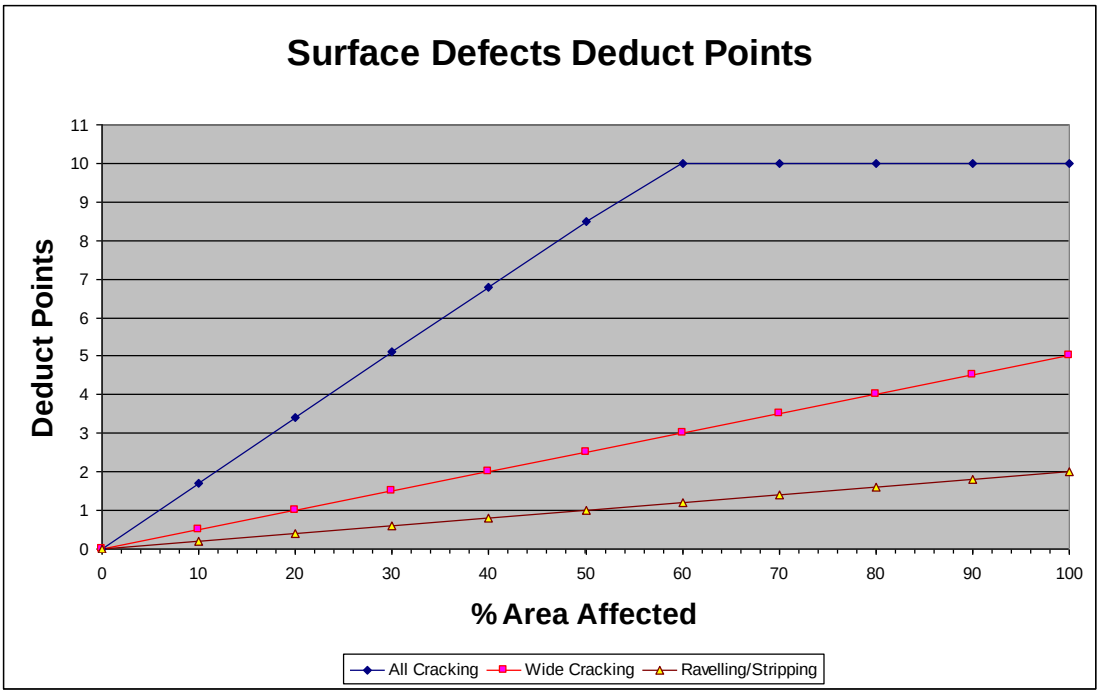


Figure 6.3: SMEC PCI Deduct Points based on Surface Defects

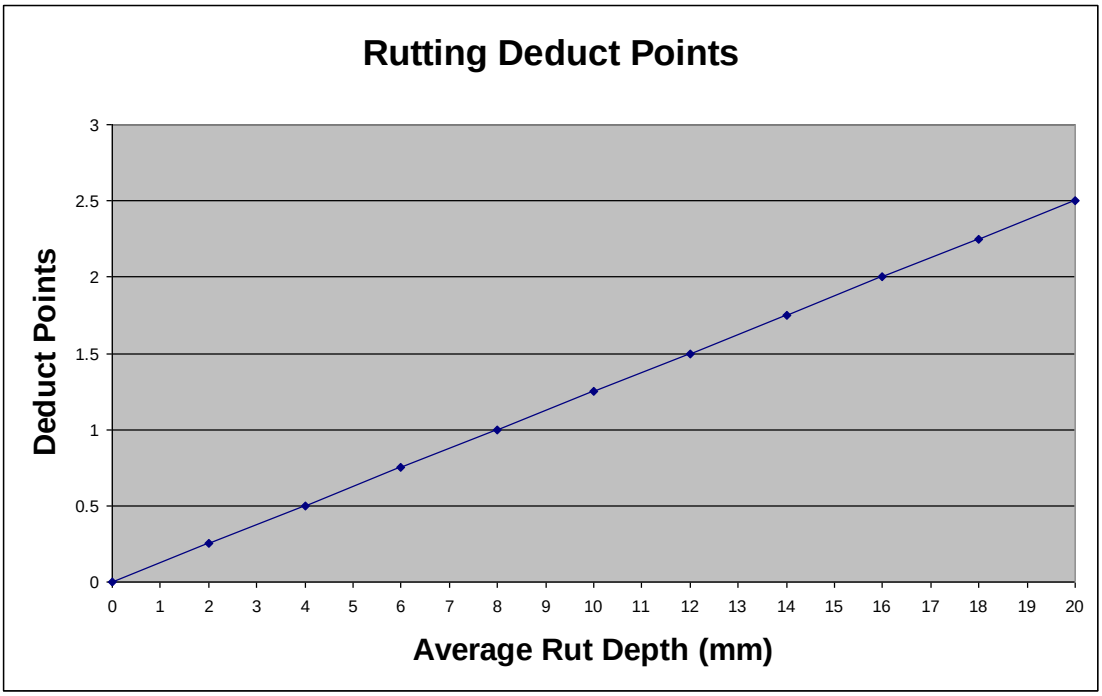


Figure 6.4: SMEC PCI Deduct Points based on Rutting

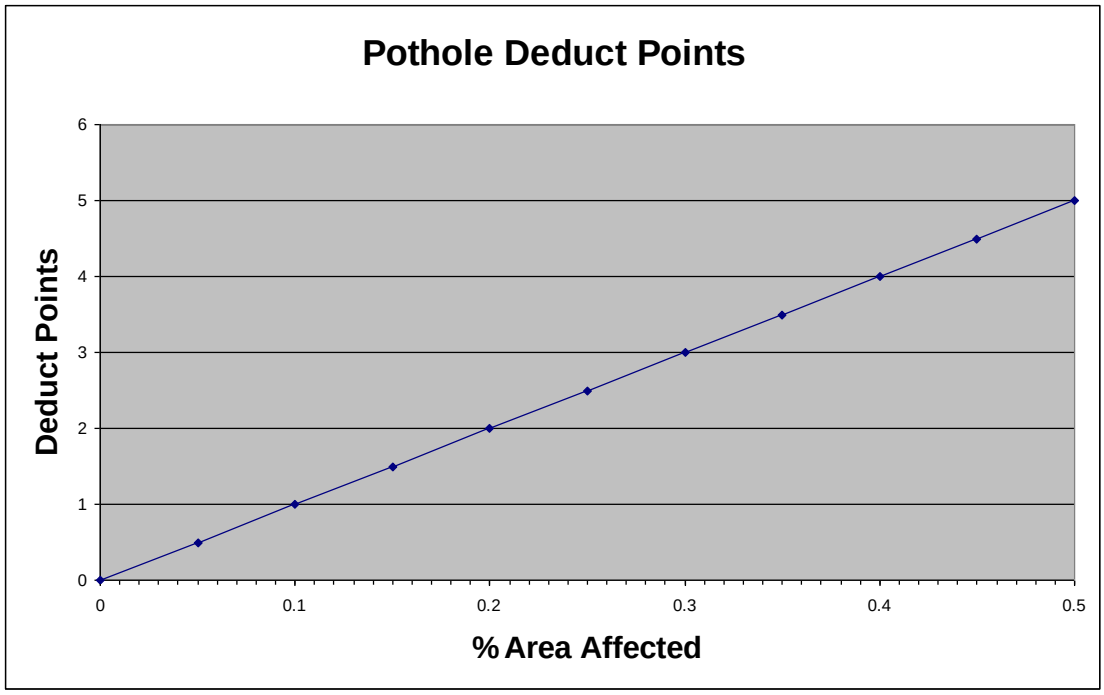


Figure 6.5: SMEC PCI Deduct Points based on Potholing

Example:

Take a road section with the following information:

Parameter	Value	Deduct Code	Deduct Value
AADT	535 ADT		n/a
Roughness	120 NRM	D_1	0.720
All cracking	2.5%	D_2	0.430
Wide cracking	0.1%	D_3	0.005
Potholes	0.1%	D_4	1.000
Rutting	2.3mm	D_5	0.288
Ravelling	6.5%	D_6	0.13

The PCI is then:

PCI = 10 – 0.720 – 0.430 – 0.005 – 1.000 – 0.288 – 0.13

= 7.4

APPENDIX C ROBERTS / JAMESON EQUATION

The adjusted structural number, SNP, is determined by the sum of the structural number, SN, and the structural contribution of the subgrade, SNsg (refer to Equation A1.1).

$$\mathbf{SNP = SN + SN_{sg}} \qquad \textbf{Equation A1.1}$$

The structural number, SN, was developed by Roberts (1995) based on the deflection data collected in Australia and Philippines (refer to Equation A1.2).

$$\mathbf{SN = 12.992 - 4.167 \times Log_{10}(D_0) + 0.936 \times Log_{10}(D_{900})} \qquad \textbf{Equation A1.2}$$

The structural contribution of the subgrade, SN_{sg} (refer to Equation A1.3), is calculate using the California Bearing Ratio (CBR) of the subgrade developed by Jameson (1993) (refer to Equation A1.4).

$$\mathbf{SN_{sg} = 3.51 \times Log_{10}(CBR) - 0.85 \times (Log_{10}(CBR))^2 - 1.43} \qquad \textbf{Equation A1.3}$$

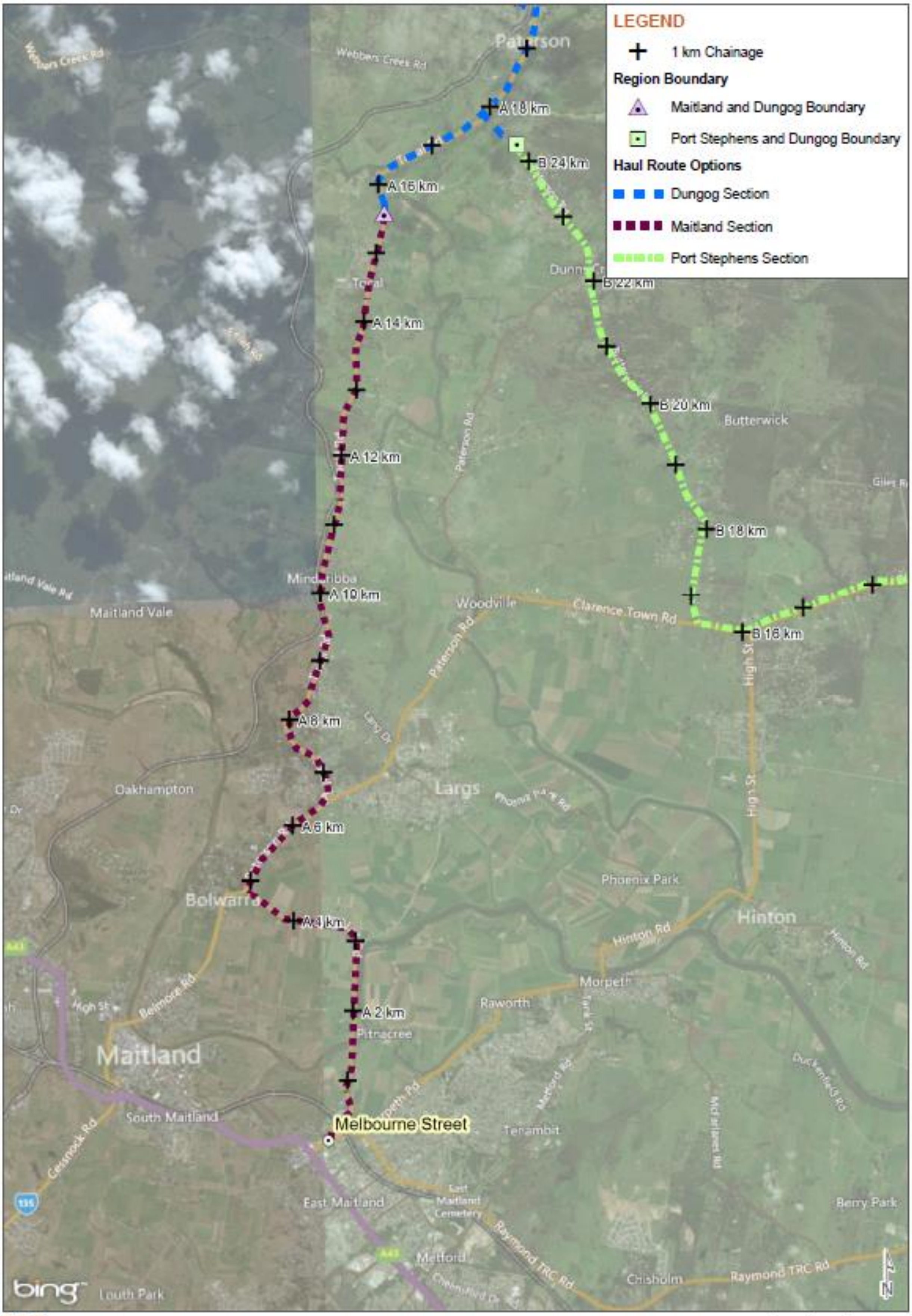
$$\mathbf{Log_{10}(CBR) = 3.264 - 1.018 \times Log_{10}(D_{900})} \qquad \textbf{Equation A1.4}$$

Note: The D_0 and D_{900} in the above equations were normalised to a surface stress of 700 kPa.

APPENDIX D DETAILED CONDITION BY SEGMENT

This appendix contains a detailed of listing of the south bound segments along with the condition information captured during the 2015 road survey. Haul Route A and Haul Route B have been listed separately and the chainages for both routes originate from the southern end of the roads.

Three reference maps are also provided showing the chainages marked at one kilometre intervals along the route.



SOURCES
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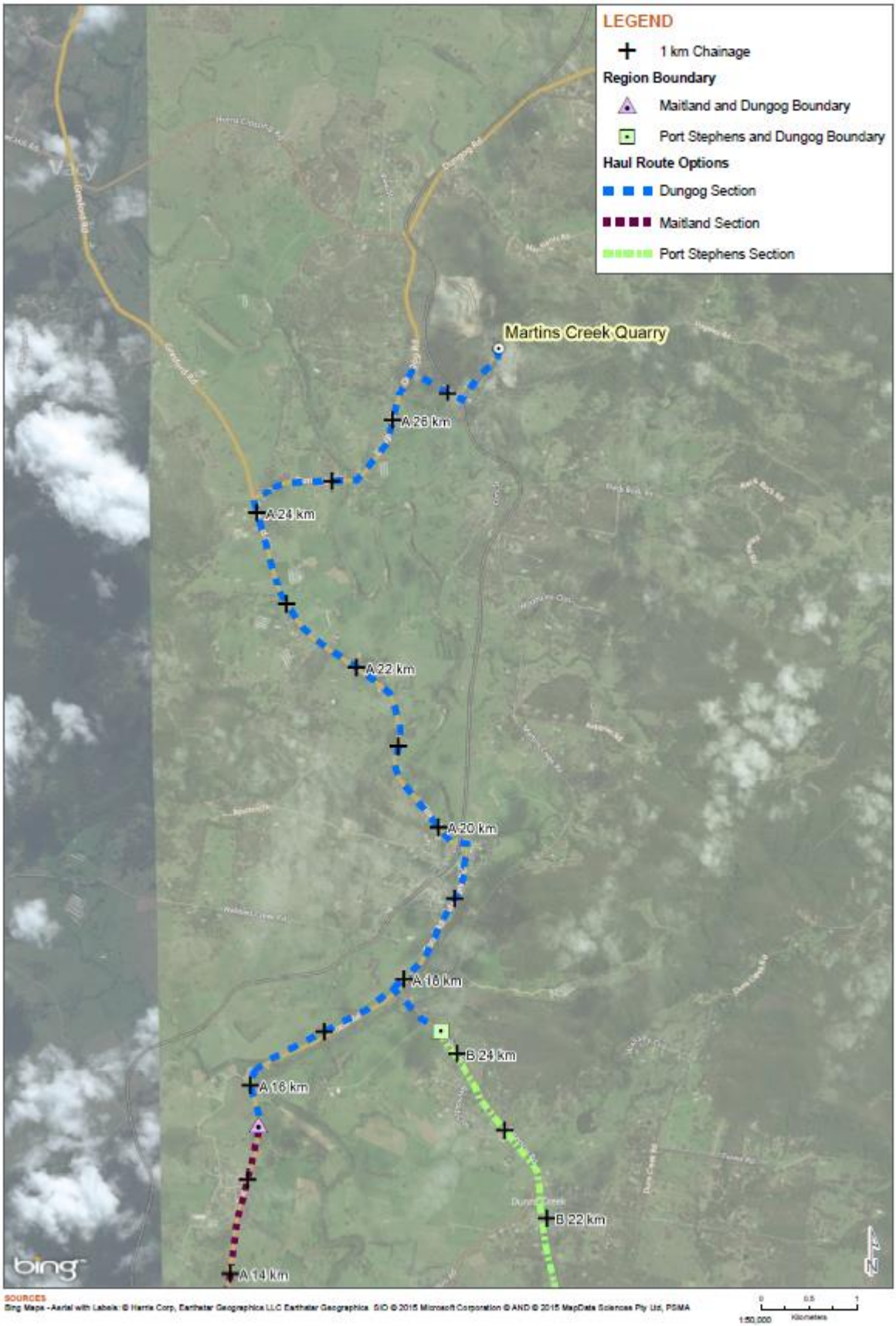
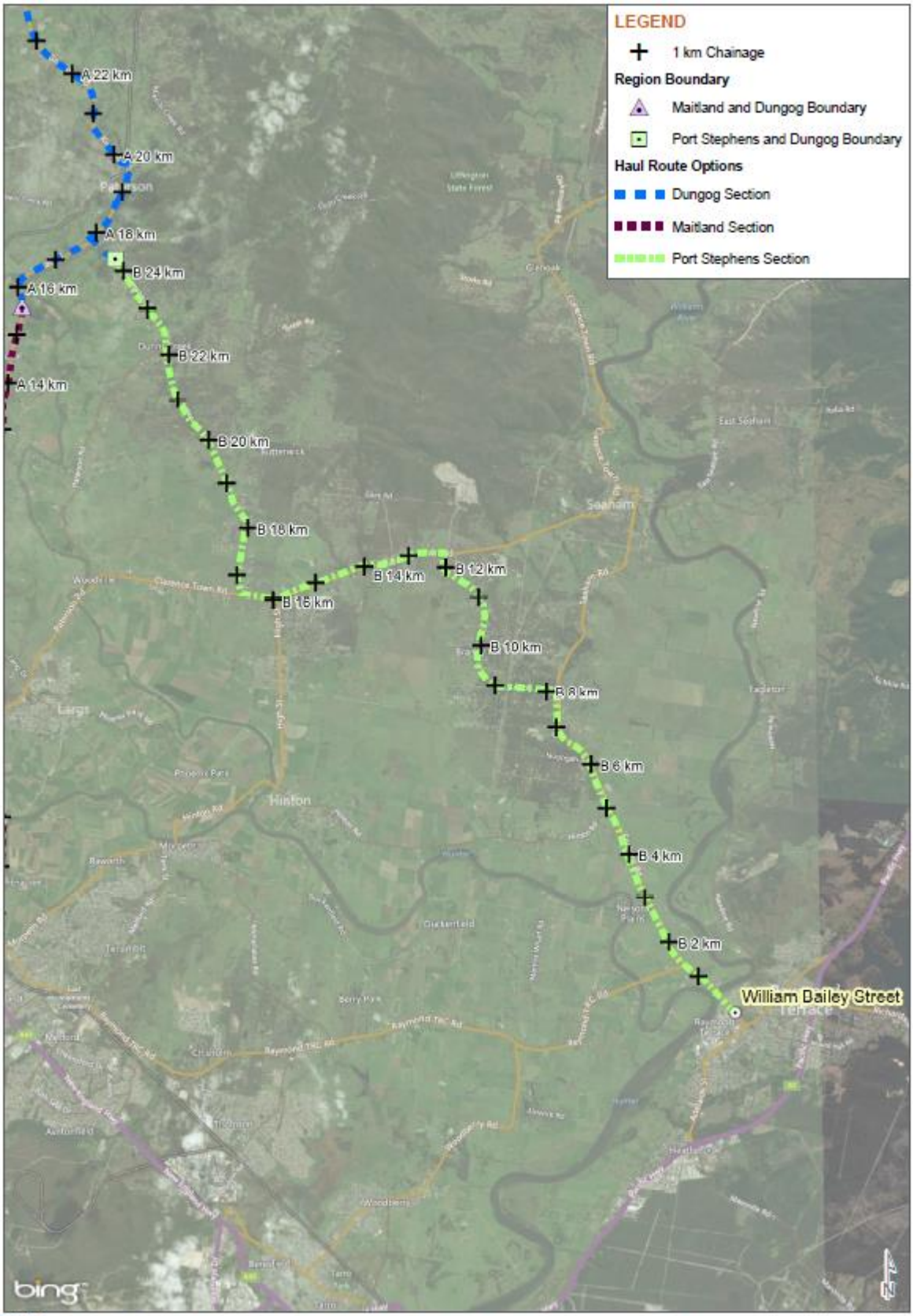
0 0.5 1 2
1:70,000 Kilometers


LEGEND
1 km Chainage
Region Boundary
Maitland and Dungog Boundary
Port Stephens and Dungog Boundary
Haul Route Options
Dungog Section
Maitland Section
Port Stephens Section
Martins Creek Quarry
A 26 km
A 24 km
A 22 km
A 20 km
A 18 km
B 24 km
A 16 km
B 22 km
A 14 km
bing



SOURCES
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1:100,000

Haul Route A (Chainages start from New England Highway)

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B MELBOURNE STREET	991.2	102.00	0	100	4054	100	7.8	35.0	6	5	0	6.3	6.3	7.86	MAITLAND CITY
S/B MELBOURNE STREET	991.2	102.01	100	200	4054	100	12.5	54.8	4	1	0	28	28	3.34	MAITLAND CITY
S/B MELBOURNE STREET	991.2	102.02	200	300	4054	100	13.6	58.8	7	3	0	7.5	7.5	7.48	MAITLAND CITY
S/B MELBOURNE STREET	991.2	102.03	300	359	4054	59	12.2	158.7	9	4	0	3	3	4.49	MAITLAND CITY
S/B PITNACREE ROAD	466.2	1.00	359	459	4054	100	8.3	57.8	4	2	0	2.5	2.5	8.95	MAITLAND CITY
S/B PITNACREE ROAD	466.2	1.01	459	559	4054	100	8.7	46.5	5	2	0	0	0	9.38	MAITLAND CITY
S/B PITNACREE ROAD	466.2	1.02	559	621	4054	62	8.5	82.9	5	2	0	0	0	8.7	MAITLAND CITY
S/B PITNACREE ROAD	466.2	2.00	621	721	4054	100	8.4	51.6	5	2	0	2	2	8.94	MAITLAND CITY
S/B PITNACREE ROAD	466.2	2.01	721	821	4054	100	8.5	35.0	6	1	0	1	1	9.03	MAITLAND CITY
S/B PITNACREE ROAD	466.2	2.02	821	921	4054	100	8.4	35.0	5	1	0	2.3	2.3	8.87	MAITLAND CITY
S/B PITNACREE ROAD	466.2	2.03	921	1,021	4054	100	7.9	35.0	5	1	0	1.3	1.3	9.09	MAITLAND CITY
S/B PITNACREE ROAD	466.2	2.04	1,021	1,029	4054	8	5.4	49.0	4	1	0	1.3	1.3	9.21	MAITLAND CITY
S/B PITNACREE ROAD	466.2	3.00	1,029	1,129	4054	100	6.8	36.9	3	1	0	1.1	1.1	9.38	MAITLAND CITY
S/B PITNACREE ROAD	466.2	3.01	1,129	1,229	4054	100	7.2	35.0	3	0	0	1.1	1.1	9.38	MAITLAND CITY
S/B PITNACREE ROAD	466.2	3.02	1,229	1,329	4054	100	7.5	35.0	4	1	0	1.5	1.5	9.17	MAITLAND CITY
S/B PITNACREE ROAD	466.2	3.03	1,329	1,410	4054	81	7.9	35.4	5	1	0	3.8	3.8	8.54	MAITLAND CITY
S/B FLAT ROAD	208.2	4.00	1,410	1,510	4054	100	8.5	35.0	5	1	0	2	2	8.94	MAITLAND CITY
S/B FLAT ROAD	208.2	4.01	1,510	1,610	4054	100	8.5	35.0	5	1	0	3.3	3.3	8.65	MAITLAND CITY
S/B FLAT ROAD	208.2	4.02	1,610	1,641	4054	31	9.1	110.1	6	1	0	0	0	7.48	MAITLAND CITY
S/B FLAT ROAD	208.2	5.00	1,641	1,741	4054	100	5.4	35.0	5	0	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	5.01	1,741	1,841	4054	100	5.4	39.4	5	2	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	5.02	1,841	1,941	4054	100	5.4	35.0	5	1	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	5.03	1,941	1,992	4054	51	5.4	68.9	5	2	0	0	0	9.26	MAITLAND CITY
S/B FLAT ROAD	208.2	6.00	1,992	2,092	4054	100	4.7	45.9	5	1	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	6.01	2,092	2,192	4054	100	4.3	41.1	6	1	0	0	0	9.25	MAITLAND CITY
S/B FLAT ROAD	208.2	6.02	2,192	2,292	4054	100	5.7	55.3	5	1	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	6.03	2,292	2,392	4054	100	5.4	41.7	4	1	0	0	0	9.5	MAITLAND CITY
S/B FLAT ROAD	208.2	6.04	2,392	2,492	4054	100	5.3	40.9	4	1	1	0	0	9.48	MAITLAND CITY
S/B FLAT ROAD	208.2	6.05	2,492	2,592	4054	100	5.4	47.6	5	1	1	0	0	9.36	MAITLAND CITY
S/B FLAT ROAD	208.2	6.06	2,592	2,612	4054	20	5.4	45.3	6	1	0	0	0	9.25	MAITLAND CITY
S/B FLAT ROAD	208.2	7.00	2,612	2,712	4054	100	4.5	35.0	5	1	0	0	0	9.38	MAITLAND CITY

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B FLAT ROAD	208.2	7.01	2,712	2,812	4054	100	5	43.9	5	1	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	7.02	2,812	2,912	4054	100	5.4	40.3	5	1	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	7.03	2,912	3,012	4054	100	5.7	51.9	5	1	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	7.04	3,012	3,112	4054	100	5.4	35.2	5	1	0	3	3	8.72	MAITLAND CITY
S/B FLAT ROAD	208.2	7.05	3,112	3,212	4054	100	5.3	45.2	5	1	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	7.06	3,212	3,228	4054	16	8.3	35.0	5	1	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	8.00	3,228	3,328	4054	100	8.1	35.0	5	1	0	3.3	3.3	8.65	MAITLAND CITY
S/B FLAT ROAD	208.2	8.01	3,328	3,428	4054	100	8.5	36.9	5	1	0	1	1	9.15	MAITLAND CITY
S/B FLAT ROAD	208.2	8.02	3,428	3,528	4054	100	7.6	35.0	5	1	0	0	0	9.38	MAITLAND CITY
S/B FLAT ROAD	208.2	8.03	3,528	3,628	4054	100	8.3	35.0	5	1	0	3	3	8.72	MAITLAND CITY
S/B FLAT ROAD	208.2	8.04	3,628	3,728	4054	100	8.4	35.0	4	1	0	1	1	9.28	MAITLAND CITY
S/B FLAT ROAD	208.2	8.05	3,728	3,802	4054	74	5.4	35.0	3	0	0	1.4	1.4	9.32	MAITLAND CITY
S/B FLAT ROAD	208.2	9.00	3,802	3,902	4054	100	8	35.0	4	0	0	0	0	9.5	MAITLAND CITY
S/B FLAT ROAD	208.2	9.01	3,902	4,002	4054	100	8.1	35.0	4	0	0	1	1	9.28	MAITLAND CITY
S/B FLAT ROAD	208.2	9.02	4,002	4,102	4054	100	8.3	35.0	4	1	0	1	1	9.28	MAITLAND CITY
S/B FLAT ROAD	208.2	9.03	4,102	4,202	4054	100	8.1	36.3	4	1	0	2.3	2.3	8.99	MAITLAND CITY
S/B FLAT ROAD	208.2	9.04	4,202	4,302	4054	100	8.1	35.0	4	1	0	3.5	3.5	8.73	MAITLAND CITY
S/B FLAT ROAD	208.2	9.05	4,302	4,308	4054	6	7.8	35.0	3	0	0	2	2	9.18	MAITLAND CITY
S/B FLAT ROAD	208.2	10.00	4,308	4,408	4054	100	8.4	35.0	3	1	0	2	2	9.18	MAITLAND CITY
S/B FLAT ROAD	208.2	10.01	4,408	4,508	4054	100	8.4	35.0	2	0	0	2	2	9.31	MAITLAND CITY
S/B FLAT ROAD	208.2	10.02	4,508	4,608	4054	100	8.2	35.0	3	1	0	0.5	0.5	9.51	MAITLAND CITY
S/B FLAT ROAD	208.2	10.03	4,608	4,708	4054	100	7.9	35.0	4	1	0	0	0	9.5	MAITLAND CITY
S/B FLAT ROAD	208.2	10.04	4,708	4,786	4054	78	5.4	35.0	4	0	0	0	0	9.5	MAITLAND CITY
S/B FLAT ROAD	208.2	11.00	4,786	4,886	4054	100	8	35.0	5	1	0	1.3	1	9.1	MAITLAND CITY
S/B FLAT ROAD	208.2	11.01	4,886	4,986	4054	100	8.2	35.0	4	1	0	6	6	8.18	MAITLAND CITY
S/B FLAT ROAD	208.2	11.02	4,986	5,086	4054	100	8.1	36.3	4	1	0	2	2	9.06	MAITLAND CITY
S/B FLAT ROAD	208.2	11.03	5,086	5,117	4054	31	8.1	81.3	3	1	0	0	0	9.01	MAITLAND CITY
S/B PATERSON ROAD	993.2	13.00	5,117	5,217	5526	100	7.7	47.3	4	1	0	1	1	9.28	MAITLAND CITY
S/B PATERSON ROAD	993.2	13.01	5,217	5,317	5526	100	8.1	62.5	4	1	0	0	0	9.38	MAITLAND CITY
S/B PATERSON ROAD	993.2	13.02	5,317	5,378	5526	61	14.5	77.9	4	1	0	0	0	8.69	MAITLAND CITY
S/B PATERSON ROAD	993.2	14.00	5,378	5,478	5526	100	8.3	46.1	4	1	0	0	0	9.5	MAITLAND CITY
S/B PATERSON ROAD	993.2	14.01	5,478	5,578	5526	100	8.4	41.8	3	1	0	1.3	1.3	9.34	MAITLAND CITY
S/B PATERSON ROAD	993.2	14.02	5,578	5,678	5526	100	7.7	65.1	3	1	0	2	2	8.95	MAITLAND CITY
S/B PATERSON ROAD	993.2	14.03	5,678	5,702	5526	24	7.7	49.5	4	1	0	10	10	7.3	MAITLAND CITY

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B PATERSON ROAD	993.2	15.00	5,702	5,802	5526	100	7.7	75.5	4	1	0	2.3	2.3	8.3	MAITLAND CITY
S/B PATERSON ROAD	993.2	15.01	5,802	5,902	5526	100	8.2	46.1	4	1	0	17	17	5.76	MAITLAND CITY
S/B PATERSON ROAD	993.2	15.02	5,902	6,002	5526	100	4.4	84.4	4	2	0	3.5	3.5	7.64	MAITLAND CITY
S/B PATERSON ROAD	993.2	15.03	6,002	6,042	5526	40	5.7	38.2	5	1	0	1.2	1.2	9.11	MAITLAND CITY
S/B PATERSON ROAD	993.2	16.00	6,042	6,142	5526	100	4.2	43.8	5	1	0	13.5	13.5	6.4	MAITLAND CITY
S/B PATERSON ROAD	993.2	16.01	6,142	6,242	5526	100	5.7	35.0	3	1	0	5	5	8.52	MAITLAND CITY
S/B PATERSON ROAD	993.2	16.02	6,242	6,342	5526	100	4.6	63.4	4	2	0	8.3	8.3	7.51	MAITLAND CITY
S/B PATERSON ROAD	993.2	16.03	6,342	6,442	5526	100	5.1	78.1	5	1	0	0	0	8.56	MAITLAND CITY
S/B PATERSON ROAD	993.2	16.04	6,442	6,460	5526	18	6.7	64.0	4	1	0	10	10	7.11	MAITLAND CITY
S/B PATERSON ROAD	993.2	17.00	6,460	6,560	5526	100	4.4	80.6	4	1	0	0	0	8.57	MAITLAND CITY
S/B PATERSON ROAD	993.2	17.01	6,560	6,660	5526	100	5.5	62.2	5	1	0	0	0	9.27	MAITLAND CITY
S/B PATERSON ROAD	993.2	17.02	6,660	6,710	5526	50	5.2	88.2	5	2	0	0	0	8.11	MAITLAND CITY
S/B PATERSON ROAD	993.2	18.00	6,710	6,802	5526	92	4.3	71.5	5	2	0	2.5	2.5	8.3	MAITLAND CITY
S/B TOCAL ROAD	994.2	19.00	6,802	6,902	1730	100	6	100.0	5	2	0	0	0	8.73	MAITLAND CITY
S/B TOCAL ROAD	994.2	19.01	6,902	7,002	1730	100	4.8	63.0	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	19.02	7,002	7,102	1730	100	5.4	66.7	6	2	0	0	0	9.25	MAITLAND CITY
S/B TOCAL ROAD	994.2	19.03	7,102	7,199	1730	97	5.5	97.2	4	2	0	0	0	8.95	MAITLAND CITY
S/B TOCAL ROAD	994.2	20.00	7,199	7,299	1730	100	5	97.6	7	4	0	0	0	8.56	MAITLAND CITY
S/B TOCAL ROAD	994.2	20.01	7,299	7,399	1730	100	4.4	105.1	9	3	0	0	0	8.06	MAITLAND CITY
S/B TOCAL ROAD	994.2	20.02	7,399	7,499	1730	100	4.4	137.3	9	4	0	0.6	0.6	6.87	MAITLAND CITY
S/B TOCAL ROAD	994.2	20.03	7,499	7,524	1730	25	6.2	217.4	11	4	1.3	2.6	2.6	3.51	MAITLAND CITY
S/B TOCAL ROAD	994.2	21.00	7,524	7,624	1730	100	5.7	133.2	11	3	0	2	2	6.45	MAITLAND CITY
S/B TOCAL ROAD	994.2	21.01	7,624	7,724	1730	100	4.1	103.0	7	4	0	2.5	2.5	7.83	MAITLAND CITY
S/B TOCAL ROAD	994.2	21.02	7,724	7,824	1730	100	4.4	109.4	9	6	1	0	0	7.9	MAITLAND CITY
S/B TOCAL ROAD	994.2	21.03	7,824	7,924	1730	100	5.6	96.3	5	2	0	0	0	8.85	MAITLAND CITY
S/B TOCAL ROAD	994.2	21.04	7,924	8,024	1730	100	4.2	102.0	6	3	0	0	0	8.54	MAITLAND CITY
S/B TOCAL ROAD	994.2	21.05	8,024	8,053	1730	29	5.6	131.4	7	4	0	0	0	2.45	MAITLAND CITY
S/B TOCAL ROAD	994.2	22.00	8,053	8,153	1730	100	4.5	107.9	9	3	0	0	0	7.97	MAITLAND CITY
S/B TOCAL ROAD	994.2	22.01	8,153	8,253	1730	100	4.6	92.0	10	5	0	0	0	8.37	MAITLAND CITY
S/B TOCAL ROAD	994.2	22.02	8,253	8,353	1730	100	5.6	121.1	7	2	0	0	0	7.79	MAITLAND CITY
S/B TOCAL ROAD	994.2	22.03	8,353	8,453	1730	100	4.5	67.2	6	2	0	0.6	0.6	9.12	MAITLAND CITY
S/B TOCAL ROAD	994.2	22.04	8,453	8,509	1730	56	4.7	59.0	6	2	0	0	0	9.25	MAITLAND CITY
S/B TOCAL ROAD	994.2	23.00	8,509	8,609	1730	100	5.2	67.2	7	4	1.3	0	0	9.1	MAITLAND CITY
S/B TOCAL ROAD	994.2	23.01	8,609	8,709	1730	100	4.9	86.0	7	3	0	0	0	8.94	MAITLAND CITY

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B TOCAL ROAD	994.2	23.02	8,709	8,809	1730	100	4.9	47.9	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	23.03	8,809	8,909	1730	100	4.7	38.4	4	1	0	0	0	9.5	MAITLAND CITY
S/B TOCAL ROAD	994.2	23.04	8,909	9,009	1730	100	5.1	55.5	5	5	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	23.05	9,009	9,109	1730	100	4.6	54.0	6	2	0	0	0	9.25	MAITLAND CITY
S/B TOCAL ROAD	994.2	23.06	9,109	9,183	1730	74	6.4	87.6	6	4	0	0	0	9.01	MAITLAND CITY
S/B TOCAL ROAD	994.2	24.00	9,183	9,283	1730	100	5.5	101.5	6	3	0	0	0	8.56	MAITLAND CITY
S/B TOCAL ROAD	994.2	24.01	9,283	9,383	1730	100	4.4	122.2	8	5	0	0	0	7.62	MAITLAND CITY
S/B TOCAL ROAD	994.2	24.02	9,383	9,483	1730	100	4.2	149.8	11	8	1.5	5.3	5	5.16	MAITLAND CITY
S/B TOCAL ROAD	994.2	24.03	9,483	9,583	1730	100	4.3	88.5	6	2	1.8	0	0	3.95	MAITLAND CITY
S/B TOCAL ROAD	994.2	24.04	9,583	9,676	1730	93	6.6	67.8	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	25.00	9,676	9,776	1730	100	6.5	35.0	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	25.01	9,776	9,876	1730	100	7.2	35.0	5	1	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	25.02	9,876	9,976	1730	100	7	35.0	5	1	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	25.03	9,976	10,076	1730	100	4.1	89.9	6	3	0	0.5	0	8.85	MAITLAND CITY
S/B TOCAL ROAD	994.2	25.04	10,076	10,176	1730	100	4.3	100.7	7	3	0	2.3	0	8.07	MAITLAND CITY
S/B TOCAL ROAD	994.2	25.05	10,176	10,276	1730	100	3.9	63.5	5	2	0	0.6	0	9.27	MAITLAND CITY
S/B TOCAL ROAD	994.2	25.06	10,276	10,332	1730	56	5	98.9	6	3	0	0	0	8.64	MAITLAND CITY
S/B TOCAL ROAD	994.2	26.00	10,332	10,432	1730	100	3.6	58.6	5	1	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	26.01	10,432	10,532	1730	100	4	54.7	6	2	0	0	0	9.25	MAITLAND CITY
S/B TOCAL ROAD	994.2	26.02	10,532	10,632	1730	100	5.2	60.7	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	26.03	10,632	10,663	1730	31	4.6	47.1	6	1	0	0	0	9.25	MAITLAND CITY
S/B TOCAL ROAD	994.2	27.00	10,663	10,763	1730	100	7.2	77.8	6	2	0	6.5	6.5	7.82	MAITLAND CITY
S/B TOCAL ROAD	994.2	27.01	10,763	10,863	1730	100	7.5	51.1	7	2	0	30.5	30.5	2.41	MAITLAND CITY
S/B TOCAL ROAD	994.2	27.02	10,863	10,963	1730	100	8	55.0	5	2	0	4	4	8.5	MAITLAND CITY
S/B TOCAL ROAD	994.2	27.03	10,963	11,063	1730	100	7.5	47.7	6	2	0	5	5	8.15	MAITLAND CITY
S/B TOCAL ROAD	994.2	27.04	11,063	11,155	1730	92	7.3	41.6	4	2	0	3.3	3.3	8.77	MAITLAND CITY
S/B TOCAL ROAD	994.2	28.00	11,155	11,255	1730	100	7.3	40.0	3	2	0	1	1	9.4	MAITLAND CITY
S/B TOCAL ROAD	994.2	28.01	11,255	11,355	1730	100	7.9	35.0	4	1	0	7.8	7.8	7.78	MAITLAND CITY
S/B TOCAL ROAD	994.2	28.02	11,355	11,455	1730	100	7.3	36.1	4	1	0	6.8	6.8	8	MAITLAND CITY
S/B TOCAL ROAD	994.2	28.03	11,455	11,555	1730	100	8.1	48.8	5	2	1	12.8	12.8	1.54	MAITLAND CITY
S/B TOCAL ROAD	994.2	28.04	11,555	11,652	1730	97	7.4	36.6	5	1	0	10.3	10.3	7.11	MAITLAND CITY
S/B TOCAL ROAD	994.2	29.00	11,652	11,752	1730	100	7.6	58.5	5	2	0	11.3	11.3	6.89	MAITLAND CITY
S/B TOCAL ROAD	994.2	29.01	11,752	11,852	1730	100	7.5	56.9	5	3	0	7.3	7.3	7.77	MAITLAND CITY
S/B TOCAL ROAD	994.2	29.02	11,852	11,952	1730	100	7.7	39.5	4	1	0	4.3	4.3	8.55	MAITLAND CITY

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B TOCAL ROAD	994.2	29.03	11,952	12,052	1730	100	7.4	44.3	3	1	0	6	6	8.3	MAITLAND CITY
S/B TOCAL ROAD	994.2	29.04	12,052	12,152	1730	100	7.1	57.0	5	2	1.3	3.5	3.5	8.58	MAITLAND CITY
S/B TOCAL ROAD	994.2	29.05	12,152	12,157	1730	5	6.9	58.2	8	1	1.3	3.5	3.5	8.2	MAITLAND CITY
S/B TOCAL ROAD	994.2	30.00	12,157	12,257	1730	100	4.3	100.2	6	2	1	1	1	8.36	MAITLAND CITY
S/B TOCAL ROAD	994.2	30.01	12,257	12,357	1730	100	3.7	88.9	9	3	0	0	0	8.6	MAITLAND CITY
S/B TOCAL ROAD	994.2	30.02	12,357	12,457	1730	100	4.2	98.2	7	3	0	0.5	0.5	8.43	MAITLAND CITY
S/B TOCAL ROAD	994.2	30.03	12,457	12,557	1730	100	3.5	87.7	7	3	1.3	0	0	8.86	MAITLAND CITY
S/B TOCAL ROAD	994.2	30.04	12,557	12,657	1730	100	3.7	143.7	8	3	3.3	0	0	6.85	MAITLAND CITY
S/B TOCAL ROAD	994.2	30.05	12,657	12,665	1730	8	5.1	81.5	7	2	3.3	0	0	9.02	MAITLAND CITY
S/B TOCAL ROAD	994.2	31.00	12,665	12,765	1730	100	4.9	62.1	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	31.01	12,765	12,865	1730	100	4.8	86.0	7	2	1.5	4.1	4.1	8.01	MAITLAND CITY
S/B TOCAL ROAD	994.2	31.02	12,865	12,965	1730	100	4.1	70.2	7	2	1.8	0.6	0.6	8.96	MAITLAND CITY
S/B TOCAL ROAD	994.2	31.03	12,965	13,065	1730	100	4.2	82.1	5	3	3.3	3.8	3.8	8.42	MAITLAND CITY
S/B TOCAL ROAD	994.2	31.04	13,065	13,165	1730	100	4	76.2	6	3	4.3	1.8	1.8	8.77	MAITLAND CITY
S/B TOCAL ROAD	994.2	31.05	13,165	13,168	1730	3	5.4	125.8	8	1	4.3	1.8	1.8	7.02	MAITLAND CITY
S/B TOCAL ROAD	994.2	32.00	13,168	13,268	1730	100	3.5	86.0	7	3	1.1	23.9	23.9	3.66	MAITLAND CITY
S/B TOCAL ROAD	994.2	32.01	13,268	13,368	1730	100	3.8	160.6	8	5	0	14	14	3.28	MAITLAND CITY
S/B TOCAL ROAD	994.2	32.02	13,368	13,468	1730	100	3.6	122.9	6	3	1.8	9.8	9.8	0.66	MAITLAND CITY
S/B TOCAL ROAD	994.2	32.03	13,468	13,492	1730	24	4.6	102.4	5	3	5	0	0	3.55	MAITLAND CITY
S/B TOCAL ROAD	994.2	33.00	13,492	13,592	1730	100	3.3	49.9	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	33.01	13,592	13,692	1730	100	3.8	65.3	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	33.02	13,692	13,792	1730	100	4.5	54.6	6	3	0	0	0	9.25	MAITLAND CITY
S/B TOCAL ROAD	994.2	33.03	13,792	13,892	1730	100	4.4	53.1	4	2	0	0	0	9.5	MAITLAND CITY
S/B TOCAL ROAD	994.2	33.04	13,892	13,992	1730	100	4	71.9	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	33.05	13,992	14,000	1730	8	5.5	49.0	5	1	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	34.00	14,000	14,100	1730	100	4.2	90.4	9	4	0	2.2	2.2	8.06	MAITLAND CITY
S/B TOCAL ROAD	994.2	34.01	14,100	14,200	1730	100	4.5	64.4	7	2	0	0	0	9.12	MAITLAND CITY
S/B TOCAL ROAD	994.2	34.02	14,200	14,271	1730	71	4.4	35.0	4	1	0	0	0	9.5	MAITLAND CITY
S/B TOCAL ROAD	994.2	35.00	14,271	14,371	1730	100	4.6	54.9	4	1	0	0	0	9.5	MAITLAND CITY
S/B TOCAL ROAD	994.2	35.01	14,371	14,471	1730	100	4.5	35.5	5	1	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	35.02	14,471	14,571	1730	100	3.9	70.1	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	35.03	14,571	14,671	1730	100	4.4	46.8	5	2	0	0	0	9.38	MAITLAND CITY
S/B TOCAL ROAD	994.2	35.04	14,671	14,680	1730	9	5.4	80.7	5	2	0	0	0	9.37	MAITLAND CITY
S/B TOCAL ROAD	994.2	37.00	14,680	14,780	1730	100	4.4	53.7	6	2	0	0	0	9.25	MAITLAND CITY

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B TOCAL ROAD	994.2	37.01	14,780	14,880	1730	100	4.7	35.0	6	6	0	0	0	9.25	MAITLAND CITY
S/B TOCAL ROAD	994.2	37.02	14,880	14,980	1730	100	4.5	35.1	4	1	0	0	0	9.5	MAITLAND CITY
S/B TOCAL ROAD	994.2	37.03	14,980	15,080	1730	100	5.1	55.3	5	3	0	1	1	9.15	MAITLAND CITY
S/B TOCAL ROAD	994.2	37.04	15,080	15,180	1730	100	6.4	52.9	6	3	0	6.3	6.3	7.86	MAITLAND CITY
S/B TOCAL ROAD	994.2	37.05	15,180	15,188	1730	8	8.8	64.8	5	1	0	6.3	6.3	7.99	MAITLAND CITY
S/B TOCAL ROAD	994.2	38.00	15,188	15,288	1730	100	7.9	40.1	5	1	0	3.4	3.1	8.64	MAITLAND CITY
S/B TOCAL ROAD	994.2	38.01	15,288	15,388	1730	100	7.9	48.7	4	1	0	1.8	1.8	9.1	MAITLAND CITY
S/B TOCAL ROAD	994.2	38.02	15,388	15,488	1730	100	8	46.1	4	1	0	6.9	6.6	8	MAITLAND CITY
S/B TOCAL ROAD	994.2	38.03	15,488	15,563	1730	75	7.5	74.4	4	1	0	7.1	7.1	7.94	MAITLAND CITY
S/B TOCAL ROAD	994.2	39.00	15,563	15,663	1730	100	4.5	99.0	6	3	0	0	0	8.64	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	39.01	15,663	15,763	1730	100	3.8	78.9	6	4	0	0	0	9.25	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	39.02	15,763	15,863	1730	100	4.8	91.5	7	4	0	0	0	8.76	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	39.03	15,863	15,963	1730	100	4.6	67.5	5	2	0	0	0	9.38	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	39.04	15,963	16,063	1730	100	3.9	107.4	7	3	0	0	0	8.24	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	39.05	16,063	16,073	1730	10	3.9	102.6	6	1	0	0	0	8.52	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	40.00	16,073	16,173	1730	100	4.9	64.5	9	4	0	0	0	8.88	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	40.01	16,173	16,273	1730	100	4.5	113.0	6	3	0	0	0	8.18	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	40.02	16,273	16,373	1730	100	4.5	79.3	11	4	0	0	0	8.62	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	40.03	16,373	16,473	1730	100	4.7	68.8	6	3	0	0.5	0.5	9.14	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	40.04	16,473	16,520	1730	47	4.1	110.0	9	7	0	0	0	7.9	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.00	16,520	16,620	1730	100	4.1	116.8	6	3	0	0	0	8.05	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.01	16,620	16,720	1730	100	4.3	69.2	9	3	0	0	0	8.88	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.02	16,720	16,820	1730	100	4.8	56.3	4	1	0	0	0	9.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.03	16,820	16,920	1730	100	4.2	49.8	5	2	0	0	0	9.38	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.04	16,920	17,020	1730	100	4.5	52.1	5	2	0	0	0	9.38	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.05	17,020	17,120	1730	100	4.5	43.3	4	2	0	0	0	9.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.06	17,120	17,220	1730	100	4.5	38.2	4	1	0	0	0	9.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.07	17,220	17,320	1730	100	4.2	45.9	5	2	0	0	0	9.38	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.08	17,320	17,420	1730	100	3.9	52.3	4	2	0	0	0	9.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.09	17,420	17,520	1730	100	4.5	52.8	4	1	0	0	0	9.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.10	17,520	17,620	1730	100	4.2	50.1	4	1	0	0	0	9.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	41.11	17,620	17,679	1730	59	4.2	46.0	7	2	0	0	0	9.12	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	42.00	17,679	17,779	1730	100	4.8	66.5	4	1	0	0	0	9.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	42.01	17,779	17,879	1730	100	4.2	56.7	4	3	0	0	0	9.5	DUNGOG SHIRE

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B TOCAL ROAD	994.2	42.02	17,879	17,979	1730	100	4.7	47.0	5	2	0	0	0	9.38	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	42.03	17,979	18,079	1730	100	4.8	64.0	3	1	0	2	2	9.18	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	42.04	18,079	18,089	1730	10	7.2	47.1	2	1	0	2	2	9.31	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	43.00	18,089	18,189	1485	100	7.8	35.0	0	0	0	0	0	10	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	43.01	18,189	18,289	1485	100	7.6	35.0	0	0	0	0	0	10	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	43.02	18,289	18,389	1485	100	7.5	35.0	0	0	0	0	0	10	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	43.03	18,389	18,489	1485	100	7.9	35.0	0	0	0	0	0	10	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	43.04	18,489	18,589	1485	100	7.4	35.0	0	0	0	0	0	10	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	43.05	18,589	18,672	1485	83	7.4	35.0	0	0	0	0	0	10	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	44.00	18,672	18,772	1485	100	7	35.0	0	0	0	0	0	10	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	44.01	18,772	18,872	1485	100	6.4	35.0	0	0	0	5.3	5.3	8.83	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	44.02	18,872	18,972	1485	100	6.8	35.0	12	7	0	0	0	8.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	44.03	18,972	19,059	1485	87	4.4	167.3	6	3	0	5.3	5.3	5.36	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	45.00	19,059	19,159	1485	100	4.5	190.8	7	3	1.5	6.4	5.1	-0.73	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	45.01	19,159	19,183	1485	24	3.8	139.2	9	2	0	18.8	18.8	2.91	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	46.00	19,183	19,283	1485	100	3.4	246.1	13	5	0	2.8	2.8	2.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	46.01	19,283	19,348	1485	65	3.4	98.7	8	4	0	0	0	8.48	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	47.00	19,348	19,448	1485	100	5.3	50.5	4	2	0	0	0	9.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	47.01	19,448	19,548	1485	100	6	61.4	6	2	0	0	0	9.25	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	47.02	19,548	19,603	1485	55	4.6	150.7	7	3	0	0	0	6.93	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	48.00	19,603	19,703	1485	100	7.2	64.5	5	2	0	0	0	9.38	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	48.01	19,703	19,803	1485	100	7.1	92.9	6	2	0	0	0	8.91	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	48.02	19,803	19,818	1485	15	7.1	238.1	9	3	0	0	0	3.87	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	1.00	19,818	19,918	1485	100	7	169.7	7	4	0	1.3	1.3	6.03	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	1.01	19,918	19,971	1485	53	3.7	113.8	6	3	0	32.5	32.5	-3.91	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	2.00	19,971	20,071	1485	100	5	77.8	4	3	0	6.3	6.3	8.11	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	2.01	20,071	20,171	1485	100	4.5	42.3	8	4	0	0	0	9	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	2.02	20,171	20,271	1485	100	4.3	37.3	7	2	0	0	0	9.12	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	2.03	20,271	20,371	1485	100	4.3	131.4	9	4	1.8	11.5	11.5	4.73	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	2.04	20,371	20,471	1485	100	4.6	57.4	7	3	0	0	0	9.12	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	2.05	20,471	20,571	1485	100	4.7	65.1	5	2	0	0	0	4.38	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	2.06	20,571	20,648	1485	77	4.7	42.5	5	1	0	0	0	9.38	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	3.00	20,648	20,748	1485	100	4.1	123.1	7	4	0	6.6	6.6	6.37	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	3.01	20,748	20,848	1485	100	4.2	42.1	4	2	0	0	0	9.5	DUNGOG SHIRE

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B GRESFORD ROAD	995.2	3.02	20,848	20,948	1485	100	4.6	35.0	3	1	0	0	0	9.62	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	3.03	20,948	21,048	1485	100	5.7	53.6	4	2	0	0	0	9.5	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	3.04	21,048	21,148	1485	100	4.9	48.5	4	1	0	0	0	9.5	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	3.05	21,148	21,248	1485	100	4.3	101.1	8	3	0	0.6	0.6	3.27	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	3.06	21,248	21,260	1485	12	5.6	35.0	4	1	0	0	0	9.5	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	4.00	21,260	21,360	1485	100	5.8	66.3	5	3	0	0	0	9.38	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	4.01	21,360	21,460	1485	100	4.7	52.7	8	3	0	0	0	9	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	4.02	21,460	21,560	1485	100	6.1	35.0	4	1	0	0	0	9.5	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	4.03	21,560	21,660	1485	100	5.7	39.1	5	1	0	0	0	9.38	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	4.04	21,660	21,760	1485	100	5.9	44.4	5	1	0	0	0	9.38	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	4.05	21,760	21,785	1485	25	5.9	35.1	4	1	0	0	0	9.5	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	5.00	21,785	21,885	1485	100	4.5	57.3	4	2	0	1.3	1.3	9.21	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	5.01	21,885	21,985	1485	100	5.1	115.2	6	4	2	2.5	2.5	7.61	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	5.02	21,985	22,085	1485	100	4.8	64.8	3	2	0	0	0	9.62	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	5.03	22,085	22,185	1485	100	4.5	70.4	5	3	1.3	0	0	9.35	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	5.04	22,185	22,235	1485	50	4.5	77.6	4	2	0	0	0	9.5	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	6.00	22,235	22,335	1485	100	5.8	169.6	10	6	1	3.4	3.1	5.19	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	6.01	22,335	22,435	1485	100	4.5	115.8	9	4	0	0	0	7.8	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	6.02	22,435	22,535	1485	100	4.5	70.2	5	2	1.8	0	0	9.34	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	6.03	22,535	22,635	1485	100	4.5	115.1	5	3	1.8	3.6	3.3	7.51	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	6.04	22,635	22,653	1485	18	3.7	119.2	3	1	0	0	0	8.44	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	7.00	22,653	22,753	1485	100	4.5	129.2	7	3	0	1	1	7.4	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	7.01	22,753	22,853	1485	100	2.7	72.2	4	3	0	2	2	9.06	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	7.02	22,853	22,953	1485	100	4.5	128.3	14	5	0	0	0	6.78	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	7.03	22,953	23,053	1485	100	3.9	80.4	10	6	1	0	0	8.73	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	7.04	23,053	23,152	1485	99	3.5	68.1	10	5	0	0	0	8.75	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	8.00	23,152	23,252	1485	100	3.2	67.7	11	5	0	0	0	8.62	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	8.01	23,252	23,352	1485	100	3.7	77.4	12	3	0	0	0	8.5	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	8.02	23,352	23,452	1485	100	3.5	88.9	6	3	0	0	0	9.04	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	9.00	23,452	23,552	1485	100	3.8	80.3	8	4	0	0	0	9	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	9.01	23,552	23,652	1485	100	3.6	51.7	3	1	0	0	0	9.62	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	9.02	23,652	23,752	1485	100	4.5	45.2	4	2	0	0	0	9.5	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	9.03	23,752	23,852	1485	100	4.2	67.4	4	3	1	0.5	0.5	9.37	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	9.04	23,852	23,952	1485	100	4.5	65.3	4	3	0	0.6	0.6	9.37	DUNGOG SHIRE

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B GRESFORD ROAD	995.2	9.05	23,952	24,052	1485	100	4.6	57.0	4	2	0	0	0	9.5	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	9.06	24,052	24,080	1485	28	4.6	62.2	5	1	0	0	0	9.38	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	10.00	24,080	24,180	1485	100	4	63.8	6	2	0	2.8	2.8	8.63	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	10.01	24,180	24,280	1485	100	4.7	68.6	6	2	1	0	0	9.23	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	10.02	24,280	24,316	1485	36	4.7	169.5	3	2	0	0	0	6.83	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	1.00	24,316	24,416	673	100	5.4	57.1	3	1	0	0	0	9.62	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	1.01	24,416	24,516	673	100	5.4	47.6	5	2	0	0	0	9.38	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	1.02	24,516	24,616	673	100	4.7	75.1	4	2	0	4.8	4.8	8.44	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	1.03	24,616	24,716	673	100	4.4	79.1	4	2	1	11	11	7.06	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	1.04	24,716	24,816	673	100	3.5	145.4	6	4	0	3.8	2.8	6.83	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	1.05	24,816	24,819	673	3	3	35.0	10	3	0	3.8	2.8	7.96	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	2.00	24,819	24,919	673	100	4.2	84.7	5	4	0	1.3	1.3	9.09	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	2.01	24,919	25,019	673	100	4.1	75.7	5	2	0	0	0	9.38	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	2.02	25,019	25,119	673	100	4.2	91.8	5	2	0	0	0	9.32	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	2.03	25,119	25,219	673	100	4	105.4	7	5	0	1	1	3.45	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	2.04	25,219	25,243	673	24	8.6	161.5	7	3	1.3	0	0	6.99	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	3.00	25,243	25,343	673	100	6.2	262.1	8	4	2	1	1	-1.33	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	3.01	25,343	25,443	673	100	6	97.7	6	2	0	0.6	0	8.92	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	3.02	25,443	25,543	673	100	5.7	139.2	12	8	0	5.9	5.3	5.78	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	3.03	25,543	25,643	673	100	5.8	126.0	11	6	0	2.6	2.3	7.01	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	3.04	25,643	25,743	673	100	7.8	85.2	9	3	0	6.3	3.3	7.64	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	3.05	25,743	25,788	673	45	7.8	67.7	5	2	0	10.6	7.5	7.2	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	4.00	25,788	25,888	673	100	5.1	73.5	6	2	0	6.3	4.3	7.96	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	4.01	25,888	25,988	673	100	6.3	98.5	7	2	0	6	5.5	7.58	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	4.02	25,988	26,088	673	100	6.5	91.6	7	2	0	0	0	9.08	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	4.03	26,088	26,188	673	100	7.5	71.1	8	2	0	0	0	9	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	4.04	26,188	26,288	673	100	6.3	89.1	7	2	0	4.8	3.8	8.12	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	4.05	26,288	26,388	673	100	6.7	70.6	8	3	0	3.8	3.8	8.16	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	4.06	26,388	26,488	673	100	7.6	97.5	7	2	0	0.6	0	8.8	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	4.07	26,488	26,588	673	100	7	81.9	8	3	0	2.4	0	8.59	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	4.08	26,588	26,678	673	90	8.1	91.2	4	2	0	0	0	9.46	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	5.00	26,678	26,778	673	100	8.1	89.0	4	3	48	11	11	6.12	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	5.01	26,778	26,878	673	100	8.1	80.1	4	3	30.6	7.1	7.1	7.33	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	5.02	26,878	26,978	673	100	8.1	65.7	3	2	12.1	5.5	5.5	8.17	DUNGOG SHIRE

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B DUNGOG ROAD	996.2	5.03	26,978	27,078	673	100	8.1	152.2	3	3	11.4	0	0	7.56	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	5.04	27,078	27,178	673	100	8.1	142.7	0	0	14.1	4	4	7.29	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	5.05	27,178	27,278	673	100	8.1	148.0	5	5	10.8	3	3	6.79	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	5.06	27,278	27,378	673	100	8.1	172.1	3	3	22.8	1	1	6.53	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	5.07	27,378	27,478	673	100	8.1	112.1	4	3	4.8	0.5	0.5	8.64	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	5.08	27,478	27,578	673	100	8.1	122.9	3	3	4.4	1.5	1.5	8.24	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	5.09	27,578	27,611	673	33	8.1	100.0	11	5	8.3	0	0	8.16	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	1.00	27,611	27,711	673	100	7.7	151.0	4	2	0	1.4	1.1	7.41	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	1.01	27,711	27,811	673	100	7.1	72.5	5	2	0	0	0	9.38	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	1.02	27,811	27,911	673	100	7	72.8	7	2	0	0	0	9.12	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	1.03	27,911	28,011	673	100	6.9	95.6	6	3	0	0	0	9.08	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	1.04	28,011	28,111	673	100	8.1	73.0	8	3	0	0	0	9	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	1.05	28,111	28,211	673	100	7.6	148.9	7	7	0	3	3	6.73	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	1.06	28,211	28,221	673	10	4.8	228.8	9	9	10	5	5	3.49	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	2.00	28,221	28,321	673	100	4.3	223.9	14	10	0	3.4	2.8	3.59	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	2.01	28,321	28,347	673	26	4.3	174.8	6	3	2.5	0	0	1.7	DUNGOG SHIRE

Haul Route B (Chainages start from Raymond Terrace Road)

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B SEAHAM ROAD	570.2	10.00	0	100	3080	100	4.1	77.6	7	4	0	9.3	9.3	6.84	PORT STEPHENS
S/B SEAHAM ROAD	570.2	10.01	100	125	3080	25	4.1	70.2	8	3	0	15	15	5.7	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.00	125	225	3080	100	4.1	46.2	4	1	0	0	0	9.5	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.01	225	325	3080	100	6.3	50.7	4	1	0	0	0	9.5	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.02	325	425	3080	100	5.7	43.7	6	2	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.03	425	525	3080	100	5.8	70	6	1	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.04	525	625	3080	100	6.5	45.4	6	1	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.05	625	725	3080	100	6	54.2	5	1	0	0	0	9.38	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.06	725	825	3080	100	4.9	63.3	6	2	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.07	825	925	3080	100	6.7	60	6	2	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.08	925	1025	3080	100	6.7	62.1	6	1	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.09	1025	1125	3080	100	6.3	63.8	7	2	0	21	21	4.5	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.10	1125	1225	3080	100	6.6	57.9	7	2	0	25.3	25.3	3.56	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.11	1225	1278	3080	53	6.6	63.6	5	2	0	26.3	26.3	3.59	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.00	1278	1378	3080	100	6.6	57.9	6	2	0	32	32	2.21	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.01	1378	1478	3080	100	5.5	41.9	7	2	0	42.8	42.8	-0.29	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.02	1478	1578	3080	100	6.3	49.9	5	2	0	58.1	58.1	-3.41	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.03	1578	1678	3080	100	6.5	91.4	5	2	1	43	43	-0.86	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.04	1678	1778	3080	100	5.8	47.1	4	1	0	30.3	30.3	2.83	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.05	1778	1878	3080	100	5.9	47.6	6	2	0	26.5	26.5	3.42	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.06	1878	1978	3080	100	6.1	68.9	6	2	0	25	25	3.75	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.07	1978	2078	3080	100	6.6	44.5	5	1	0	53	53	-2.28	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.08	2078	2178	3080	100	6	48.2	4	2	0	57.3	57.3	-3.11	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.09	2178	2278	3080	100	6	72.7	5	2	0	56.5	56.5	-3.11	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.10	2278	2378	3080	100	6.2	48.1	7	2	0	60.5	60.5	-3.9	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.11	2378	2478	3080	100	5.3	49.9	7	2	0	61.8	61.8	-3.96	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.12	2478	2578	3080	100	6.4	60.1	6	1	0	14	14	6.17	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.13	2578	2678	3080	100	5.6	41.7	6	1	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.14	2678	2778	3080	100	5.9	49.7	5	1	0	0	0	9.38	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.15	2778	2878	3080	100	6.4	69.9	5	2	0	0	0	9.38	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.16	2878	2978	3080	100	6.6	73	4	2	0	0	0	9.43	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.17	2978	3026	3080	48	4.4	39.9	7	2	0	0	0	9.12	PORT STEPHENS

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B SEAHAM ROAD	570.2	40.00	3026	3126	3080	100	6.1	56.1	5	2	0	0	0	9.38	PORT STEPHENS
S/B SEAHAM ROAD	570.2	40.01	3126	3226	3080	100	6.9	65.2	7	2	0	0	0	9.12	PORT STEPHENS
S/B SEAHAM ROAD	570.2	40.02	3226	3292	3080	66	4.5	92	7	3	0	0	0	8.35	PORT STEPHENS
S/B SEAHAM ROAD	570.2	50.00	3292	3392	3080	100	5.3	76.8	7	2	0	0	0	8.92	PORT STEPHENS
S/B SEAHAM ROAD	570.2	50.01	3392	3492	3080	100	6.8	108.3	10	5	0	16	16	3.85	PORT STEPHENS
S/B SEAHAM ROAD	570.2	50.02	3492	3533	3080	41	5.9	40.9	5	1	0	0	0	9.38	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.00	3533	3633	3080	100	4.8	93.6	8	4	1.3	0	0	8.14	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.01	3633	3733	3080	100	2.9	35	6	1	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.02	3733	3833	3080	100	3.3	35	6	1	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.03	3833	3933	3080	100	2.9	65.6	7	2	0	3.8	3.8	8.29	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.04	3933	4033	3080	100	2.7	43.5	7	1	0	0	0	9.12	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.05	4033	4133	3080	100	4.4	56.2	7	2	0	0	0	9.12	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.06	4133	4233	3080	100	3.6	35	6	1	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.07	4233	4333	3080	100	3	35.4	7	1	0	0	0	9.12	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.08	4333	4433	3080	100	3.1	44.1	6	2	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.09	4433	4533	3080	100	4.1	47.7	6	2	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.10	4533	4633	3080	100	3.2	55.5	6	2	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.11	4633	4733	3080	100	3.4	77.1	8	2	0	0	0	8.78	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.12	4733	4833	3080	100	4.1	44.2	5	2	0	0	0	9.38	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.13	4833	4933	3080	100	4.1	39.8	4	2	0	0	0	9.5	PORT STEPHENS
S/B SEAHAM ROAD	570.2	60.14	4933	4977	3080	44	4.1	52.2	7	2	0	0	0	9.12	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.00	4977	5077	3080	100	4.1	81.1	7	3	0	1.6	1.6	8.41	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.01	5077	5177	3080	100	4.1	46.8	5	2	0	2.6	2.6	8.8	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.02	5177	5277	3080	100	4.9	45.2	4	1	0	3.8	3.8	8.66	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.03	5277	5377	3080	100	6.6	65.8	5	3	0	0.5	0.5	9.26	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.04	5377	5477	3080	100	6.1	57.6	4	1	0	0	0	9.5	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.05	5477	5577	3080	100	5.5	61.1	5	3	0	0	0	9.38	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.06	5577	5677	3080	100	5.8	58.5	10	3	0	0.6	0.6	8.62	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.07	5677	5777	3080	100	6.1	61.2	6	2	0	0.8	0.8	9.07	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.08	5777	5877	3080	100	6.1	53.4	6	2	0	0	0	9.25	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.09	5877	5977	3080	100	6.1	77.9	6	2	0	1	1	8.78	PORT STEPHENS
S/B SEAHAM ROAD	570.2	70.10	5977	6074	3080	97	6.1	87.6	5	2	0	15	15	5.47	PORT STEPHENS
S/B SEAHAM ROAD	570.2	80.00	6074	6174	3080	100	3.2	55.2	5	1	0	11.3	11.3	6.89	PORT STEPHENS
S/B SEAHAM ROAD	570.2	80.01	6174	6274	3080	100	5.8	61.7	7	2	0	16	16	5.6	PORT STEPHENS
S/B SEAHAM ROAD	570.2	80.02	6274	6289	3080	15	5.5	35	10	3	0	0	0	8.75	PORT STEPHENS

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B BRANDY HILL DRIVE	848.2	10.00	6289	6356	815	67	2.7	35	5	5	0	6.6	6.6	7.92	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	20.00	6356	6456	815	100	7.5	92.6	5	2	0	2.8	2.8	8.64	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	20.01	6456	6501	815	45	5.1	169.7	9	6	0	0	0	6.45	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	30.00	6501	6601	815	100	6.3	53.1	6	2	0	3.5	3.5	8.48	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	30.01	6601	6701	815	100	6.4	37.3	4	1	0	0	0	9.5	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	30.02	6701	6801	815	100	7.2	58.6	5	2	0	0	0	9.38	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	30.03	6801	6901	815	100	5.5	55.1	4	1	0	0	0	9.5	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	30.04	6901	7001	815	100	6.3	48.6	5	2	0	0	0	9.38	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	30.05	7001	7101	815	100	8.3	52	4	1	0	0	0	9.5	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	30.06	7101	7155	815	54	7	66.5	5	2	0	0	0	9.38	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	40.00	7155	7255	815	100	3.8	66.1	7	3	0	0	0	9.12	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	40.01	7255	7355	815	100	4.2	127.7	8	4	1	3.5	3.5	7.04	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	40.02	7355	7438	815	83	4.6	94.4	6	2	0	0	0	9.07	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	50.00	7438	7538	815	100	7.8	66.6	8	2	0	0	0	9	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	50.01	7538	7638	815	100	8.1	49.1	4	2	0	0.6	0.6	9.37	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	50.02	7638	7738	815	100	8.9	61.4	9	3	0	0	0	8.88	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	50.03	7738	7838	815	100	7.5	47.8	9	2	0	0	0	8.88	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	50.04	7838	7938	815	100	6.5	47.4	9	2	0	0	0	8.88	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	50.05	7938	8022	815	84	6.5	72.6	8	3	0	0	0	9	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	60.00	8022	8122	815	100	5.1	102.3	10	4	2.8	40.8	40.8	-0.69	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	60.01	8122	8222	815	100	4.5	88.4	10	4	1.5	38.8	38.8	0.18	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	60.02	8222	8258	815	36	2.7	117.8	8	2	10	20	20	3.52	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	70.00	8258	8358	815	100	5.6	59.5	8	2	0	0	0	9	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	70.01	8358	8458	815	100	6.2	57.9	9	3	2.5	0	0	8.82	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	70.02	8458	8558	815	100	7	123.2	10	7	2.8	2	2	7.22	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	70.03	8558	8658	815	100	6	74.7	5	2	0	0.6	0.6	9.24	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	70.04	8658	8758	815	100	5.1	100.4	6	3	0	3.3	3.3	8.17	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	70.05	8758	8858	815	100	6.4	72.2	5	2	0	1.3	1.3	9.09	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	70.06	8858	8958	815	100	4.7	71.8	8	3	0	0	0	9	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	70.07	8958	9058	815	100	5.9	67.4	11	6	0	5	5	7.52	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	70.08	9058	9137	815	79	6.8	85.7	10	5	0	6.8	6.8	7.25	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	80.00	9137	9237	815	100	7.6	55.5	5	1	0	13	13	6.52	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	80.01	9237	9337	815	100	8.1	62.9	5	2	0	14.6	14.6	6.16	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	80.02	9337	9437	815	100	7.5	41.5	5	1	0	4.8	4.8	8.32	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	80.03	9437	9537	815	100	7.7	46	6	2	0	3	3	8.59	PORT STEPHENS

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B BRANDY HILL DRIVE	848.2	80.04	9537	9637	815	100	7.4	38.9	6	2	0	10.6	10.6	6.92	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	80.05	9637	9691	815	54	7.2	35.5	7	2	0	3	3	8.46	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	85.00	9691	9791	815	100	5.9	67.2	9	4	2	3.5	3.5	8.06	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	85.01	9791	9891	815	100	5.3	50.5	12	3	0	0.5	0.5	8.39	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	85.02	9891	9991	815	100	6.3	45.7	6	2	0	0	0	9.25	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	85.03	9991	10091	815	100	6	46.3	7	4	0	0	0	9.12	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	85.04	10091	10124	815	33	2.7	52.8	10	3	0	0.8	0.8	8.57	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	90.00	10124	10224	815	100	4.6	88.7	5	2	1.3	2.3	2.3	8.84	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	90.01	10224	10324	815	100	4.4	151.5	8	4	0	13	13	4.26	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	90.02	10324	10424	815	100	5.8	133.5	8	3	1.5	14.1	14.1	4.52	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	90.03	10424	10445	815	21	2.7	182.4	9	4	1.3	2.6	2.6	5.47	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	100.00	10445	10545	815	100	3.4	104.6	9	3	0	13.6	13.6	5.4	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	100.01	10545	10645	815	100	3.4	138.4	10	7	0	17.3	17.3	3.45	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	100.02	10645	10720	815	75	6.6	245.6	7	4	1.1	15	15	1.1	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	70.00	10720	10820	1558	100	6	47.5	6	3	0	0	0	9.25	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	70.01	10820	10843	1558	23	3.7	60.8	4	1	0	0	0	9.5	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	80.00	10843	10943	1558	100	4.9	79.4	8	3	0	0	0	9	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	80.01	10943	11043	1558	100	3.7	83.6	5	3	0	0	0	9.32	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	80.02	11043	11143	1558	100	4.7	98.3	7	4	0	0	0	8.59	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	80.03	11143	11243	1558	100	4.7	64.2	6	4	0	0	0	9.25	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	80.04	11243	11343	1558	100	3.6	53.9	5	3	0	0	0	9.38	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	80.05	11343	11443	1558	100	4.9	50.8	4	1	0	0	0	9.5	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	80.06	11443	11543	1558	100	4.3	53.8	7	2	0	0	0	9.12	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	80.07	11543	11559	1558	16	3.5	74.5	6	1	0	2.5	2.5	8.7	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	90.00	11559	11659	1558	100	4.1	62.9	5	2	0	0	0	9.38	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	90.01	11659	11759	1558	100	4.9	71.1	5	3	0	0	0	9.38	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	90.02	11759	11859	1558	100	5.1	94.1	10	3	0	0	0	8.35	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	90.03	11859	11862	1558	3	2.5	76	10	2	0	0	0	8.75	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	100.00	11862	11962	1558	100	3.9	60	8	2	0	0	0	9	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	100.01	11962	12062	1558	100	4.1	39.2	7	2	0	0	0	9.12	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	100.02	12062	12162	1558	100	4.1	52.6	8	3	0	0	0	9	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	100.03	12162	12262	1558	100	3.9	52.5	10	4	0	0	0	8.75	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	100.04	12262	12362	1558	100	2.6	52.8	13	6	0	0	0	3.38	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	100.05	12362	12462	1558	100	3.2	62.8	11	3	0	0	0	8.62	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	100.06	12462	12496	1558	34	2.5	59.7	9	3	0	0	0	8.88	PORT STEPHENS

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B CLARENCETOWN ROAD	603.2	110.00	12496	12596	1558	100	3.6	42.6	6	2	0	0	0	9.25	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	110.01	12596	12696	1558	100	4	52.9	7	2	0	0	0	9.12	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	110.02	12696	12796	1558	100	3.9	66.4	7	2	1.3	0	0	9.1	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	110.03	12796	12896	1558	100	3.9	80.1	8	3	0	0	0	9	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	110.04	12896	12996	1558	100	3.8	59.5	7	2	0	0	0	9.12	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	110.05	12996	13096	1558	100	5.5	42.7	7	2	0	0	0	9.12	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	110.06	13096	13119	1558	23	2.5	46.1	7	1	0	0	0	9.12	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	120.00	13119	13219	1558	100	4.8	45.5	5	2	0	0	0	9.38	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	120.01	13219	13319	1558	100	4.8	44.8	9	4	0	0	0	8.88	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	120.02	13319	13419	1558	100	5.5	41.8	7	3	0	0	0	9.12	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	120.03	13419	13519	1558	100	6.5	40.4	6	2	0	0	0	9.25	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	120.04	13519	13554	1558	35	4.9	61.7	6	2	0	0	0	9.25	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	130.00	13554	13654	1558	100	5.3	69.6	6	2	0	0	0	9.25	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	130.01	13654	13754	1558	100	4.6	64.1	6	2	0	0	0	9.25	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	130.02	13754	13854	1558	100	4.6	38.1	6	2	0	0	0	9.25	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	130.03	13854	13954	1558	100	4.2	52.7	5	2	0	0	0	9.38	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	130.04	13954	14054	1558	100	5	42.3	4	2	0	0	0	9.5	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	130.05	14054	14154	1558	100	5.1	50	6	4	0	0	0	9.25	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	130.06	14154	14246	1558	92	3.6	79	7	3	0	0	0	9.12	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	140.00	14246	14346	1558	100	3.6	168	10	5	1.8	28.1	28.1	-0.26	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	140.01	14346	14446	1558	100	4.9	137.5	8	6	1.3	4.6	4.6	6.16	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	140.02	14446	14546	1558	100	5.2	69.6	6	5	1.5	0	0	9.22	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	140.03	14546	14646	1558	100	5.3	53.8	5	2	0	0	0	9.38	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	140.04	14646	14746	1558	100	3.3	57.2	7	3	0	0	0	9.12	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	140.05	14746	14846	1558	100	3.5	49.4	7	2	0	0	0	9.12	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	140.06	14846	14946	1558	100	4.3	73.2	8	3	0	0	0	9	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	140.07	14946	14973	1558	27	2.5	39.2	5	1	0	0	0	9.38	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.00	14973	15073	645	100	3.9	156.1	6	3	1.3	0.6	0.6	7.16	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.01	15073	15173	645	100	4.4	48.5	4	2	0	0	0	9.5	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.02	15173	15273	645	100	3.6	36.7	5	3	0	0	0	9.38	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.03	15273	15373	645	100	3.9	70.3	6	3	0	0.6	0.6	9.12	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.04	15373	15473	645	100	4.7	59	5	2	0	0	0	9.38	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.05	15473	15573	645	100	4.7	55.9	8	2	0	2.5	2.5	8.45	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.06	15573	15673	645	100	4.8	43.3	5	1	0	0	0	9.38	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.07	15673	15773	645	100	3.6	39.3	5	2	0	0	0	9.38	PORT STEPHENS

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B BUTTERWICK ROAD	812.2	10.08	15773	15873	645	100	4.7	42.4	3	1	0	0	0	9.62	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.09	15873	15973	645	100	4.1	64.8	8	4	0	2.5	2.5	8.45	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.10	15973	16073	645	100	5	53.9	6	2	0	0	0	9.25	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.11	16073	16173	645	100	4.6	49.5	4	2	0	0	0	9.5	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.12	16173	16273	645	100	5.3	35	3	1	0	0	0	9.62	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.13	16273	16373	645	100	4.7	35	4	2	0	0	0	9.5	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.14	16373	16473	645	100	5.1	76.8	8	3	0	0	0	9	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	10.15	16473	16557	645	84	4	47.9	9	2	0	0	0	8.88	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.00	16557	16657	645	100	4.1	38.4	6	2	0	0	0	9.25	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.01	16657	16757	645	100	3.7	60.3	6	3	0	5	5	8.15	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.02	16757	16857	645	100	3.9	50.5	8	4	0	1	1	8.78	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.03	16857	16957	645	100	4.7	64.8	4	3	0	1.3	1.3	9.21	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.04	16957	17057	645	100	3.5	115.1	11	6	0	3.8	3.8	7.06	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.05	17057	17157	645	100	4	108.3	8	5	1.3	0.8	0.8	8.27	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.06	17157	17257	645	100	4.1	46.6	3	3	0	0	0	9.62	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.07	17257	17357	645	100	4.5	40.5	3	1	0	0	0	9.62	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.08	17357	17457	645	100	4.4	58.5	4	2	0	0	0	9.5	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.09	17457	17557	645	100	5.2	57.5	5	2	0	0	0	9.38	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.10	17557	17657	645	100	4.3	52.8	3	2	0	0	0	4.62	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.11	17657	17757	645	100	5.1	58.6	4	2	0	0	0	9.5	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.12	17757	17857	645	100	3.9	106.4	9	6	0	0	0	8.4	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.13	17857	17957	645	100	4.4	52.3	4	2	0	0	0	9.5	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.14	17957	18057	645	100	4	52.4	4	1	0	0	0	9.5	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.15	18057	18157	645	100	4.4	46.7	3	1	0	0	0	9.62	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.16	18157	18257	645	100	3.5	68.4	5	2	0	0	0	9.38	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.17	18257	18346	645	89	4.4	75.3	4	2	0	0	0	9.5	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	30.00	18346	18446	645	100	3.9	97.4	8	6	0	2.3	2.3	8.28	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	30.01	18446	18546	645	100	3.9	97.3	7	3	0	0	0	8.92	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	30.02	18546	18646	645	100	3.8	112.3	7	4	3.3	1	1	8.19	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	30.03	18646	18746	645	100	3.8	113	6	3	1	6.5	6.5	7.13	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	30.04	18746	18846	645	100	4.4	120.2	10	5	0	0.6	0.6	7.74	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	30.05	18846	18946	645	100	4.6	105	4	2	0	0	0	9.07	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	30.06	18946	19046	645	100	3.7	66.3	3	1	0	0	0	9.62	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	30.07	19046	19107	645	61	4.9	103.7	6	3	0	0	0	8.86	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	40.00	19107	19207	645	100	3.7	74.9	6	2	0	2	2	8.81	PORT STEPHENS

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B BUTTERWICK ROAD	812.2	40.01	19207	19307	645	100	4.2	60.4	5	2	0	0	0	9.38	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	40.02	19307	19407	645	100	4	67.1	6	3	0	0	0	9.25	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	40.03	19407	19425	645	18	2.8	182.3	5	3	0	0	0	6.67	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.00	19425	19525	645	100	4.1	95.6	6	3	0	0	0	9.09	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.01	19525	19625	645	100	4.3	89.7	6	5	0	0	0	9.25	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.02	19625	19725	645	100	3.9	70.5	4	2	0	0	0	9.5	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.03	19725	19825	645	100	3.5	77.1	4	2	0	0	0	9.5	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.04	19825	19925	645	100	3.7	100.5	6	3	0	0	0	8.95	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.05	19925	20025	645	100	4.1	72.8	6	3	0	0	0	9.25	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.06	20025	20125	645	100	4.5	67.3	5	4	0	0	0	9.38	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.07	20125	20225	645	100	4.1	66.3	3	1	0	0	0	9.62	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.08	20225	20325	645	100	4.5	59.9	6	5	0	0	0	9.25	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.09	20325	20425	645	100	4.2	103.2	7	5	0	0	0	8.75	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	50.10	20425	20525	645	100	4.9	140.7	5	3	0	0	0	7.89	PORT STEPHENS
S/B DUNS CREEK ROAD	621.2	10.00	20525	20625	645	100	3.9	83.5	4	2	0	1	1	9.28	PORT STEPHENS
S/B DUNS CREEK ROAD	621.2	10.01	20625	20640	645	15	2.7	80.1	7	2	0	0	0	9.12	PORT STEPHENS
S/B PATERSON ROAD	604.2	120.00	20640	20661	645	21	3.8	35	4	2	0	0	0	9.5	PORT STEPHENS
S/B PATERSON ROAD	604.2	130.00	20661	20761	645	100	2.8	71.3	4	1	0	1	1	9.28	PORT STEPHENS
S/B PATERSON ROAD	604.2	130.01	20761	20861	645	100	3.2	53.3	4	2	0	1	1	9.28	PORT STEPHENS
S/B PATERSON ROAD	604.2	130.02	20861	20884	645	23	4.1	49.8	7	1	0	0	0	9.12	PORT STEPHENS
S/B PATERSON ROAD	604.2	140.00	20884	20984	645	100	4.1	94	11	5	1	1.4	1.4	3.19	PORT STEPHENS
S/B PATERSON ROAD	604.2	140.01	20984	21084	645	100	2.5	78.2	9	8	0	1.1	1.1	8.63	PORT STEPHENS
S/B PATERSON ROAD	604.2	140.02	21084	21177	645	93	3.5	152.4	9	6	0	6.7	6.7	5.58	PORT STEPHENS
S/B PATERSON ROAD	604.2	150.00	21177	21277	645	100	3.1	62.7	8	4	0	0	0	9	PORT STEPHENS
S/B PATERSON ROAD	604.2	150.01	21277	21377	645	100	1.7	89.3	8	3	0	0	0	9	PORT STEPHENS
S/B PATERSON ROAD	604.2	150.02	21377	21477	645	100	1.7	88.4	10	6	0	0	0	8.75	PORT STEPHENS
S/B PATERSON ROAD	604.2	150.03	21477	21577	645	100	3.2	71.6	7	3	0	0	0	9.12	PORT STEPHENS
S/B PATERSON ROAD	604.2	150.04	21577	21677	645	100	1.9	81.4	8	2	0	0	0	9	PORT STEPHENS
S/B PATERSON ROAD	604.2	150.05	21677	21777	645	100	3.4	59	7	3	0	0	0	9.12	PORT STEPHENS
S/B PATERSON ROAD	604.2	150.06	21777	21877	645	100	3.6	54.1	6	2	0	0	0	9.25	PORT STEPHENS
S/B PATERSON ROAD	604.2	150.07	21877	21956	645	79	4.1	82.7	7	5	0	0	0	4.12	PORT STEPHENS
S/B PATERSON ROAD	604.2	160.00	21956	22056	645	100	3.3	56.3	4	2	0	0	0	9.5	PORT STEPHENS
S/B PATERSON ROAD	604.2	160.01	22056	22152	645	96	3.9	40.1	4	1	0	0	0	9.5	PORT STEPHENS
S/B PATERSON ROAD	604.2	170.00	22152	22252	645	100	4	59.7	5	2	0	0	0	9.38	PORT STEPHENS
S/B PATERSON ROAD	604.2	170.01	22252	22352	645	100	3.8	47.3	5	2	0	0	0	9.38	PORT STEPHENS

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Structural Number	Roughness	Rutting	Std. Dev. Rutting	Stripping Ravelling	All Cracking	Wide Cracking	PCI	Council
S/B PATERSON ROAD	604.2	170.02	22352	22452	645	100	3.1	45.9	5	2	0	0	0	9.38	PORT STEPHENS
S/B PATERSON ROAD	604.2	170.03	22452	22542	645	90	3.2	51.6	4	1	0	0	0	9.5	PORT STEPHENS
S/B PATERSON ROAD	604.2	180.00	22542	22642	645	100	3.3	67.8	9	4	0	0	0	8.88	PORT STEPHENS
S/B PATERSON ROAD	604.2	180.01	22642	22742	645	100	3.2	56.1	7	2	0	0	0	9.12	PORT STEPHENS
S/B PATERSON ROAD	604.2	180.02	22742	22842	645	100	3.5	59.9	7	3	0	0	0	9.12	PORT STEPHENS
S/B PATERSON ROAD	604.2	180.03	22842	22908	645	66	3.9	51.7	4	2	0	0	0	9.5	PORT STEPHENS
S/B PATERSON ROAD	604.2	190.00	22908	23008	645	100	4.9	44.1	7	4	0	0	0	4.12	DUNGOG SHIRE
S/B PATERSON ROAD	604.2	190.01	23008	23108	645	100	3.9	46.6	12	6	0	0.5	0.5	8.39	DUNGOG SHIRE
S/B PATERSON ROAD	604.2	190.02	23108	23208	645	100	3.5	35	7	4	1.5	1	1	8.88	DUNGOG SHIRE
S/B PATERSON ROAD	604.2	190.03	23208	23308	645	100	3.1	35	12	12	0	0	0	8.5	DUNGOG SHIRE
S/B PATERSON ROAD	604.2	190.04	23308	23343	645	35	3.4	35	9	5	0	4.1	4.1	7.97	DUNGOG SHIRE

APPENDIX E LIST OF ROAD SEGMENTS HAVING PCI LESS THAN 5

Following the complete segment list, a sub-set of the segments is presented listing all of those road segments in a poor to very poor condition where poor is defined as segments with a PCI of 5 or less. The listing is colour coded with roads in the Dungog jurisdiction shaded blue, Maitland roads shaded red and Port Stephens roads shaded green.

Haul Route A - Segment Listing

Road Name	Road Number	Segment Number	Chainage From	Chainage To	Lane AADT	Length	Modified Struct. No.	Roughness	Rutting	Std. Dev. Rutting	Strip / Ravel	All Cracking	Wide Cracking	PCI	Council
S/B MELBOURNE STREET	991.2	102.01	100	200	4054	100	12.5	54.8	4	1	0	28	28	3.34	MAITLAND CITY
S/B MELBOURNE STREET	991.2	102.03	300	359	4054	59	12.2	158.7	9	4	0	3	3	4.49	MAITLAND CITY
S/B TOCAL ROAD	994.2	20.03	7,499	7,524	1730	25	6.2	217.4	11	4	1.3	2.6	2.6	3.51	MAITLAND CITY
S/B TOCAL ROAD	994.2	21.05	8,024	8,053	1730	29	5.6	131.4	7	4	0	0	0	2.45	MAITLAND CITY
S/B TOCAL ROAD	994.2	24.03	9,483	9,583	1730	100	4.3	88.5	6	2	1.8	0	0	3.95	MAITLAND CITY
S/B TOCAL ROAD	994.2	27.01	10,763	10,863	1730	100	7.5	51.1	7	2	0	30.5	30.5	2.41	MAITLAND CITY
S/B TOCAL ROAD	994.2	28.03	11,455	11,555	1730	100	8.1	48.8	5	2	1	12.8	12.8	1.54	MAITLAND CITY
S/B TOCAL ROAD	994.2	32.00	13,168	13,268	1730	100	3.5	86.0	7	3	1.1	23.9	23.9	3.66	MAITLAND CITY
S/B TOCAL ROAD	994.2	32.01	13,268	13,368	1730	100	3.8	160.6	8	5	0	14	14	3.28	MAITLAND CITY
S/B TOCAL ROAD	994.2	32.02	13,368	13,468	1730	100	3.6	122.9	6	3	1.8	9.8	9.8	0.66	MAITLAND CITY
S/B TOCAL ROAD	994.2	32.03	13,468	13,492	1730	24	4.6	102.4	5	3	5	0	0	3.55	MAITLAND CITY
S/B TOCAL ROAD	994.2	45.00	19,059	19,159	1485	100	4.5	190.8	7	3	1.5	6.4	5.1	-0.73	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	45.01	19,159	19,183	1485	24	3.8	139.2	9	2	0	18.8	18.8	2.91	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	46.00	19,183	19,283	1485	100	3.4	246.1	13	5	0	2.8	2.8	2.5	DUNGOG SHIRE
S/B TOCAL ROAD	994.2	48.02	19,803	19,818	1485	15	7.1	238.1	9	3	0	0	0	3.87	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	1.01	19,918	19,971	1485	53	3.7	113.8	6	3	0	32.5	32.5	-3.91	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	2.03	20,271	20,371	1485	100	4.3	131.4	9	4	1.8	11.5	11.5	4.73	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	2.05	20,471	20,571	1485	100	4.7	65.1	5	2	0	0	0	4.38	DUNGOG SHIRE
S/B GRESFORD ROAD	995.2	3.05	21,148	21,248	1485	100	4.3	101.1	8	3	0	0.6	0.6	3.27	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	2.03	25,119	25,219	673	100	4	105.4	7	5	0	1	1	3.45	DUNGOG SHIRE
S/B DUNGOG ROAD	996.2	3.00	25,243	25,343	673	100	6.2	262.1	8	4	2	1	1	-1.33	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	1.06	28,211	28,221	673	10	4.8	228.8	9	9	10	5	5	3.49	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	2.00	28,221	28,321	673	100	4.3	223.9	14	10	0	3.4	2.8	3.59	DUNGOG SHIRE
S/B GRACE AVENUE	997.2	2.01	28,321	28,347	673	26	4.3	174.8	6	3	2.5	0	0	1.7	DUNGOG SHIRE

Haul Route B - Segment Listing

S/B SEAHAM ROAD	570.2	20.09	1,025	1,125	3080	100	6.3	63.8	7	2	0	21	21	4.5	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.10	1,125	1,225	3080	100	6.6	57.9	7	2	0	25.3	25.3	3.56	PORT STEPHENS
S/B SEAHAM ROAD	570.2	20.11	1,225	1,278	3080	53	6.6	63.6	5	2	0	26.3	26.3	3.59	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.00	1,278	1,378	3080	100	6.6	57.9	6	2	0	32	32	2.21	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.01	1,378	1,478	3080	100	5.5	41.9	7	2	0	42.8	42.8	-0.29	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.02	1,478	1,578	3080	100	6.3	49.9	5	2	0	58.1	58.1	-3.41	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.03	1,578	1,678	3080	100	6.5	91.4	5	2	1	43	43	-0.86	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.04	1,678	1,778	3080	100	5.8	47.1	4	1	0	30.3	30.3	2.83	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.05	1,778	1,878	3080	100	5.9	47.6	6	2	0	26.5	26.5	3.42	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.06	1,878	1,978	3080	100	6.1	68.9	6	2	0	25	25	3.75	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.07	1,978	2,078	3080	100	6.6	44.5	5	1	0	53	53	-2.28	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.08	2,078	2,178	3080	100	6	48.2	4	2	0	57.3	57.3	-3.11	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.09	2,178	2,278	3080	100	6	72.7	5	2	0	56.5	56.5	-3.11	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.10	2,278	2,378	3080	100	6.2	48.1	7	2	0	60.5	60.5	-3.9	PORT STEPHENS
S/B SEAHAM ROAD	570.2	30.11	2,378	2,478	3080	100	5.3	49.9	7	2	0	61.8	61.8	-3.96	PORT STEPHENS
S/B SEAHAM ROAD	570.2	50.01	3,392	3,492	3080	100	6.8	108.3	10	5	0	16	16	3.85	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	60.00	8,022	8,122	815	100	5.1	102.3	10	4	2.8	40.8	40.8	-0.69	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	60.01	8,122	8,222	815	100	4.5	88.4	10	4	1.5	38.8	38.8	0.18	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	60.02	8,222	8,258	815	36	2.7	117.8	8	2	10	20	20	3.52	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	90.01	10,224	10,324	815	100	4.4	151.5	8	4	0	13	13	4.26	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	90.02	10,324	10,424	815	100	5.8	133.5	8	3	1.5	14.1	14.1	4.52	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	100.01	10,545	10,645	815	100	3.4	138.4	10	7	0	17.3	17.3	3.45	PORT STEPHENS
S/B BRANDY HILL DRIVE	848.2	100.02	10,645	10,720	815	75	6.6	245.6	7	4	1.1	15	15	1.1	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	100.04	12,262	12,362	1558	100	2.6	52.8	13	6	0	0	0	3.38	PORT STEPHENS
S/B CLARENCETOWN ROAD	603.2	140.00	14,246	14,346	1558	100	3.6	168	10	5	1.8	28.1	28.1	-0.26	PORT STEPHENS
S/B BUTTERWICK ROAD	812.2	20.10	17,557	17,657	645	100	4.3	52.8	3	2	0	0	0	4.62	PORT STEPHENS
S/B PATERSON ROAD	604.2	140.00	20,884	20,984	645	100	4.1	94	11	5	1	1.4	1.4	3.19	PORT STEPHENS
S/B PATERSON ROAD	604.2	150.07	21,877	21,956	645	79	4.1	82.7	7	5	0	0	0	4.12	PORT STEPHENS
S/B PATERSON ROAD	604.2	190.00	22,908	23,008	645	100	4.9	44.1	7	4	0	0	0	4.12	DUNGOG SHIRE

DOCUMENT/REPORT CONTROL FORM

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