

Moloney Asset Management Systems MAMS



Report Following the Survey of
Road Assets
for Sample Council
Undertaken in May-19

Report produced by Moloney Asset Management Systems
exclusively for Sample Council

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1.0 Report Summary - Major Findings

This report provides a summary of the major findings coming out of the condition survey of Sample Council's road assets undertaken by Moloney Asset Management Systems (MAMS) in May-2019

1.1 Major Findings

- 1. The road assets within Sample Council were found to be in good to excellent overall condition when benchmarked against all 69 councils assessed by Moloney Asset Management Systems (MAMS).*
- 2. There was a strong condition improvement found with the sealed road pavement assets since our last survey in 2014.*
- 3. There was a small overall condition decline with the sealed surfaces and kerb assets with footpaths and unsealed pavements experiencing a modest condition improvement.*
- 4. The long term trend in condition movement over our five surveys since 2001 indicate a modest to strong overall condition improvement for all sub asset classes other than the sealed road pavements. The sealed road pavements experienced a very strong improvement since our last survey but tend to have been held steady over the long term. This is considered to be a very strong overall outcome.*
- 5. The total present renewal shortfall or backlog of over intervention assets for the whole roads group is estimated at \$3,964,220 representing 1.71% of the total road asset valuation. This equates to 100% of one full year's annual liability for the renewal of the assets and as such is considered to be within the "Excellent" Condition range (see Appendix D - Figure D 1 for details).*
- 6. Council is currently funding road network renewals at \$2,868,748 pa while the consumption rate (Average annual liability) is estimated at \$3,973,819 pa. Hence, the assets are currently being consumed at around \$1,105,071 pa. This is in no way meant as a criticism, as the present excellent condition of the assets dictates that renewal demand has not yet reached the estimated level of the full annual liability (annual consumption).*
- 7. The current total renewal funding level of \$2,868,748 pa is considered to be at an appropriate level. Modelling suggests that this total renewal funding level will be at an appropriate level for the next 10 - 12 year. (Subject to annual CPI increases).*
- 8. A recommended funding strategy has been developed that is predicted to deliver a slightly lower level of OIA's after 12 years than presently exists.*
- 9. It is recommended that the total renewal funding on the road network continue at a flat \$2,868,000 pa for the next 5 - 10 years before being reviewed again following the next condition survey.*
- 10. The recommended funding strategy is just one available option. With all data now within the Moloney model, different funding scenarios can be examined quite easily. Council is encouraged to use the model to deliver a funding strategy that best meets their needs.*
- 11. All financial reporting within this document is based in today's values with no allowance for any CPI movement. The Moloney software has the capacity to adjust all outputs for an adopted annual CPI increase at the touch of a button. But it is felt that reporting with CPI included can present some very difficult to interpret results.*
- 12. Council has done an exceptionally good job in managing it's road assets over recent years with very good to excellent condition across all assets and a generally strong improvement in condition since our last survey in 2014.*
- 13. There is strong evidence building up over the long term that the adopted accounting asset lives may be understated. The evidence for this comes from two areas. Firstly the unique degradation curve analysis and secondly the asset condition performance measures against the level of renewal expenditure.*

1.1.2 Other Important findings

1. *Unique degradation curves have been produced based on actual condition change between five surveys undertaken between 2001 and 2019. This has greatly enhanced the financial modelling results.*
2. *Key performance indicators have been developed at a sub asset level that accurately benchmark asset condition change since the last survey*
3. *The same key performance indicators have been used to benchmark Sample Council against all 69 councils assessed by MAMS.*

2.0 Report Summary - Condition Findings

2.1 Overall condition at Sub Asset level

This section provides a summary of the condition findings at road sub asset level for each of the sub assets that were inspected.

2.1.2 Condition Findings for road sub assets

Sub Asset Description	Indicator 1 - Overall Condition		Ind. 2 - Ext of poor Cond Assets		Indicator 3 - Ext of Isolated Failures	
	Present Overall Condition Descriptor	Change since last survey	Extent of Poor Cond Assets	Change since last survey	Extent of Isolated Failures	Change since last survey
Sealed Rd Pavements	Very Good	Strong Improvement	Very Low	Strong Improvement	Very Low	Modest Decline
Sealed Surfaces	Very Good to Excellent	Small Decline	Very Low	Strong Improvement	N/A	N/A
Unsealed Rd Pavements	Good	Improved	Low	Improved	Very Low	Large Increase
Kerbs	Excellent	Small Decline	Very Low	Modest Improvement	Very Low	Large Increase in Non Urgent
Footpaths	Excellent	Modest Improvement	Low	Modest Improvement	Urgent very low Non Urgent High	Large Increase in Non Urgent

Figure 2.1 Summary of sub asset condition findings

Figure 2.1 provides a summary of the overall condition findings for each of the sub asset classes that were inspected. There are three indicators that are examined. Each has a descriptor in the first column that ranks you against all 69 councils assessed by MAMS. The second column for each indicator provides a description of how your condition has changed since our last survey.

1. **Overall Condition** - Derived by benchmarking your weighted average asset condition against that of all 69 councils inspected by MAMS.
2. **Extent of poor condition Assets** - This is the extent of the asset base, near or above the recommended industry intervention level and again measures your performance against all 69 councils assessed.
3. **Extent of Isolated Failures** - For all sub assets other than sealed surfaces we record the extent of any isolated asset failures. These can occur within otherwise good condition asset and your base ranking is delivered by comparing your results to those of the full 69 councils assessed.

All sub assets were found to be in the Good to Excellent overall condition range with low to very low levels of poor condition assets and mostly low to very low levels of isolated failures. So in summary Figure 2.1 indicates that council's road assets are in good to excellent overall condition when benchmarked externally and have generally improved in condition since our last survey

2.2 Full Road Network Condition Findings

This section will look at the condition and performance of the whole road network. It can be difficult to report on the performance of the whole road network when dealing with sub assets that have quite different life cycles and different unit renewal rates between different councils. We have developed a single reporting indicator that is independent of both asset life and unit renewal rates.

The total level of the Over Intervention Assets (OIA's) within a road network provides a very strong indicator of overall condition performance. The best measure of the level of OIA's is considered to be the OIA's expressed as the number of years value of the average annual liability (similar to annual depreciation in accounting terms). See Appendix D for a detailed explanation. But in brief the backlog of OIA's expressed in this way provides a really solid condition benchmark that is independent of asset service life and unit renewal rates.

Present extent of OIA's expressed in three ways			Your overall road asset condition based in the extent of OIA's	
Current % of OIA's expresses in years worth of average annual liability	Your present value of OIA's in \$	Your OIA's as a % of your total asset base valuation	Moloney standardised condition description	Additional comments on standardised condition descriptor
100%	\$3,964,220	1.71%	Excellent	Very low level of over intervention assets

Figure 2.2 The present overall road network condition

Figure 2.2 summarises the present level of OIA's for the whole road network in terms of the number of year's worth of annual liability that it represents. The present figure of 100% of one full years annual liability, equates to a Moloney standardised condition description of excellent. See Appendix D, Figure D 1 for details of the standardised descriptors.

In summary Figure 2.2 presents the condition of your road assets in terms of the backlog that exists in year's worth of unmet annual liability. Your figure of 100% of one years annual liability is considered to represent an excellent position.

2.2.3 Long term condition trend

Asset Class	Condition Indicator Descriptor	Year of Condition Survey					Comments
		Jan-01	Apr-05	Jan-09	Jun-14	May-19	
Sealed Pavements	% at and Above Cond 8	0.22%	0.55%	1.05%	1.10%	0.28%	Declined in early years but continual improvement since 2009
Sealed Pavements	% at and Above Cond 7	1.12%	1.63%	3.54%	2.62%	1.42%	Declined in early years but continual improvement since 2009
Sealed Pavements	% at and Above Cond 6	5.25%	7.40%	11.97%	9.88%	6.94%	Declined in early years but continual improvement since 2009
Sealed Surfaces	% at and Above Cond 8	2.84%	3.00%	3.64%	1.04%	0.50%	General improvement in condition over the long term
Sealed Surfaces	% at and Above Cond 7	9.37%	7.00%	6.87%	2.89%	1.37%	General improvement in condition over the long term
Sealed Surfaces	% at and Above Cond 6	18.59%	15.00%	17.99%	7.43%	9.31%	General improvement in condition over the long term
Unsealed Pavements	% at and Above Cond 8	6.92%	2.74%	1.02%	1.95%	1.93%	Very Strong Improvement over long term
Unsealed Pavements	% at and Above Cond 7	15.26%	6.63%	6.61%	2.91%	2.94%	Very Strong Improvement over long term
Unsealed Pavements	% at and Above Cond 6	27.83%	18.85%	16.73%	10.07%	7.58%	Strong Improvement over long term
Unsealed Pavements	Average depth of Imported Pavement Material	71	97	104	117	120	Very Strong Improvement over long term. This is the single most reliable indicator
Kerbs	% at and Above Cond 8	0.08%	0.07%	0.07%	0.05%	0.00%	Strong Improvement over long term
Kerbs	% at and Above Cond 7	1.83%	0.54%	1.00%	0.50%	0.28%	Strong Improvement over long term
Kerbs	% at and Above Cond 6	3.63%	2.40%	2.00%	2.11%	1.63%	Strong Improvement over long term
Footpaths	% at and Above Cond 8	0.37%	0.30%	0.27%	0.12%	0.00%	Strong Improvement over long term
Footpaths	% at and Above Cond 7	0.93%	0.43%	0.30%	0.22%	0.27%	Strong Improvement over long term
Footpaths	% at and Above Cond 6	5.30%	3.71%	2.22%	0.95%	0.65%	Strong Improvement over long term

Figure 2.3 Long term condition trend

MAMS has undertaken 5 condition surveys of Sample Council's road assets since 2001. All surveys have been undertaken broadly upon the same basis, so we are now able to present the longer term condition trends for each sub asset set.

When reporting on the financial requirements within later sections of this report we tend to use the extent of "Over Intervention Assets" OIA's as the measure of asset condition performance. There are several indicators of overall condition performance, but it is felt that the extent of OIA's represents the best single indicator.

Figure 2.3 below tracks the extent of poor condition assets within the normal range that would cover where the retreatment intervention level was set and hence is indicative of the extent of the OIA's.

For the unsealed pavement assets we have added in one additional indicator that details the average depth of imported pavement material that was found to be present. This is considered to be the strongest and most consistent indicator for these assets.

Figure 2.3 details the extent of the asset base that was found to be at and above conditions 6, 7 and 8 over the five surveys since 2001. These are the very poor condition assets that tend to be at or around the condition where they require rehabilitation. The long term position for Sample Council is quite interesting and is summarised below.

In broad terms the position is summarised as detailed below.

- Sealed road Pavements - Decline in early years but continual improvement since 2009
- Sealed surfaces - General improvement in condition over the long term
- Unsealed Pavements - Very strong improvement over the long term
- Kerbs - Strong improvement over the long term
- Footpaths - Strong improvement over the long term

The long term condition performance is considered to be very good to excellent. All sub assets other than the sealed road pavements have experienced good to very good improvements over the long term. While the sealed road pavements declined in early years but have been recovering since 2009

This does suggest two things. Firstly councils targeting of the reconstruction and major patches programs have been excellent. Secondly the performance suggests that asset service lives will be far greater than those adopted for accounting purposes. This second outcome ties in strongly with the findings coming out of the degradation curve analysis within appendix B.

*While figure 2.3 provides sound information relating to the long term condition performance of the assets the array of numbers can be a little confusing. **Your are referred to Appendix G where a far more detailed graphical representation of asset performance against time is provided.***

3.0 Report Summary - Financial Findings

The Moloney financial modelling software was used to deliver the following three reports for each of the sub asset sets and to then combine the results into a whole of roads group single report.

1. Prediction of renewal demand to treat all over intervention assets - Column E within Figure 3.1 (and series 5 graphs in sub asset sections). Note that the figure in column E has been averaged over the first 5 years to better reflect how the model is structured.
2. Prediction of future asset condition based on the continuation of the planned renewal expenditure level (series 6 graphs in sub asset sections)
3. Delivery of a recommended funding profile - Column G (series 7 graphs in sub asset sections). Note that within Column G the recommended funding strategy can include in some cases a recommended annual compounding increase in funding (see column heading).

The individual modelling results for the above three reports can be found within each of the sub asset sections 5 - 9 below. Figure 3.1 provides an overall financial summary in a table rather than graphical form.

	A	B	C	D	E	F	G	H	I
Sub Asset Description	Present Annual Expenditure on Upgrades and New Assets	Average Planned renewal expenditure next 5 Years	Average Annual Liability (Based upon modelling lives and valuations)	Annual Depreciation based on Accounting valuations and lives	Average Capital Renewal Demand for next 5-years to eliminate all over intervention assets	Year of Condition Inspection	Recommended Commencing Year 1 funding level with no annual compounding increase	Planned renewal expenditure (Column B) as a % of the Annual Liability	Recommended Funding level (Column G) as a % of the Annual Liability Rate
Sealed Pavements	\$0	\$968,650	\$1,834,147	\$2,001,450	\$1,385,000	2019	\$1,247,000	53%	68%
Sealed Surfaces	\$0	\$1,180,379	\$1,242,115	\$1,056,447	\$1,330,000	2019	\$1,110,000	95%	89%
Unsealed Pavements	\$0	\$460,000	\$472,391	\$571,092	\$238,000	2019	\$352,000	97%	75%
Kerbs	\$0	\$167,174	\$182,873	\$172,719	\$73,000	2019	\$45,000	91%	25%
Footpaths	\$0	\$92,545	\$242,293	\$231,830	\$127,000	2019	\$114,000	38%	47%
Totals	\$0	\$2,868,748	\$3,973,819	\$4,033,537	\$3,026,000		\$2,868,000	72%	72%
C - G Value being consumed annually		\$1,105,071							

Figure 3.1 Recommended and other funding profiles

Figure 3.1 contains a lot of information but it is a very important table that summarises the financial position relating to the road assets in a number of different ways.

A - This is the planned upgrade or new asset expenditure. You may or may not have this data, but it is often very important to consider and perhaps re-allocate some of this expenditure to the renewal program if you are under funding the renewals in Column B

B - The planned average renewal expenditure over the next 5 years. Note also that Column H provides your planned expenditure expressed as a percentage of the annual liability rate in Column C.

C - "Average annual liability" is the average annual renewal expenditure needed over the long term in order to maintain your asset base. The figure is similar to the accounting term "Annual Depreciation", but is calculated in a different way by directly linking it to the unit renewal rates and life cycles as used within the financial model. It can differ quite markedly from "Annual depreciation" because of the requirement for annual depreciation to comply with Australian and international accounting standards, which promote the delivery a tax deductible figure for "Annual depreciation", often with little regard to what your actual future annual liability is.

D - "Annual Depreciation" - This is similar to C above, but is designed to deliver a figure that a business can claim as a tax deduction rather than providing an estimate of your ongoing liability to maintain the capital value of your assets.

E - "Average capital renewal demand over the first 5 years". This figure comes from the Moloney "Predicted Capital Requirement" model. It is the estimated renewal expenditure necessary to eliminate all over intervention assets within five years. The average figure over the first 5 years is used because in some cases where early renew demand is high the model eases in the demand over a 5 year period. In all cases if this average figure was allocated then all over intervention assets would be eliminated after 5 years.

F - This is a record of the year that the condition data was collected. It may vary between the asset sets if not all inspected at the same time.

G - The year one recommended commencing funding level. This comes from the Moloney funding scenario finder and mostly aims at a total commencing expenditure that is the same or close to your current expenditure in column B. Note that within the title row there may be an annual compounding future percentage increase that is used to bring down the year one expenditure to more closely match your current total expenditure.

If the current renewal funding level is very low there may be a recommendation to lift the year one spend to a level above the planned total spend in column B. This would be done to avoid excessively high annual compounding percentage increases.

For Sample Council it was found that no annual compounding percentage increase in expenditure was required and that the planned total renewal expenditure within column B was at an appropriate total level.

H + I - Two useful comparisons figures relating to the percentage of the annual liability rate being met by the planned renewal expenditure in Column B and the recommended in column G.

The recommended funding strategy is to maintain the total planned renewal expenditure of \$2,868,748 pa for the next 5 years before reviewing it again following the next condition survey. Note that the recommended future funding strategy has also optimised the funding split between the road sub asset sets to achieve the best overall condition outcome for the whole roads group.

Road Sub Asset Set Description	Criteria 1. Extent of OIA's		Criteria 2.	Criteria 3
	Desired extent of Over intervention assets as a % of one Years Annual Liability	Desired Over Intervention Assets as a % of total asset base	Years to achieve Desired Condition outcome	Annual % of Compounding funding increase (if required)
Sealed Rd Pavements	90%	0.97%	12	0.00%
Sealed Surfaces	90%	5.40%	12	0.00%
Unsealed Rd Pavements	90%	3.33%	20	0.00%
Kerbs	90%	0.97%	20	0.00%
Footpaths	90%	2.09%	12	0.00%
All Assets	90%	1.54%	Variable	0.00%

Figure 3.2 Funding scenario finder modelling criteria for road sub assets

Figure 3.2 contains the details of the three input criteria for the Moloney funding scenario finder which was used to deliver the recommended funding strategy as reported within column G of Figure 3.1 above.

The extent of over intervention assets (OIA's) was set at 90% of the level of one year's annual liability after 12 years for sealed road pavements, sealed surfaces and footpath assets and after 20 years for UN sealed road pavements and kerb assets. It was found that this could be achieved by maintaining the current planned renewal expenditure over the next 12 years with no annual compounding increase.

Scenario Finder Results

Desired extent of OIA's expressed in 3 ways			Commencing year one renewal expenditure requirement (from scenario finder)	Desired Condition outcome for road network	
				Standardised Moloney condition description	Additional Comments on condition descriptor
As a % of one years average annual liability	As its replacement value in \$	As a % of the total asset base valuation			
90%	\$3,576,437	1.54%	\$2,868,000	Excellent	Very low level of over intervention assets

Figure 3.3 Projected condition outcome from recommended funding strategy

Figure 3.3 provides a summary of the Moloney funding scenario finder results for the whole roads group. The individual sub asset inputs are as detailed within Figure 3.2 while Figure 3.3 shows the overall results for the whole roads group.

The overall desired condition outcome for the whole roads group as set within the scenario finder is to deliver 90% of one years level of annual liability as the extent of over intervention assets after 12 years (See Appendix D Figure D 1 for details of the Moloney standardised descriptors as well as further details relating to the scenario finder operation).

3.1 Summary of recommended future funding strategy

The Moloney financial modelling "Funding Scenario finder" was used to deliver the following results:

- *All assets will be delivered within "Excellent" Overall condition after 12 years*
- *The commencing annual renewal expenditure requirement is \$2,868,000 pa*
- *There is no requirement for an annual compounding increase in funding.*
- *All figures are in today's values but can be adjusted for CPI within the model if required.*

Section 4: Sealed Road Pavement Sub Assets

This section deals with the Sealed Road Pavement Sub assets. It will look at both internal and external benchmarking of asset condition as well as providing financial forecasting of future renewal demand and projected asset condition.

4.1 Condition and Performance of Sealed Road Pavements

MAMS have developed a series of eight key condition indicators that can be applied to all road sub asset sets. They are used to measure condition movement between the two most recent field surveys as well as providing external benchmarking against other council districts assessed by MAMS on the same basis.

The same key condition indicators are used for all road sub asset sets. However for some assets certain indicators are not applicable and as such are omitted. Detailed below is a brief explanation of the eight key condition indicators. The explanation here is also applicable to their use with other road sub asset sets beyond the sealed road pavements.

4.1.1 Weighted Average Asset Condition

The weighted average asset condition is a single condition indicator that represents the condition of the whole asset set in one single figure. It is derived by weighting the raw asset condition scale 0 - 10 for the extent of the assets within each condition rating and so provides a basic single figure summary of the overall condition of the asset set. It is a very useful figure as a condition movement indicator.

4.1.2 Percentage of Urgent Failures

The percentage of urgent failures is a measure of the isolated failures identified during the survey as needing immediate repair. The figure is expressed as a percentage of the total asset group quantity.

4.1.3 Percentage of Other Failures

The percentage of other failures represents those isolated failures which, while present on the ground, do not require urgent attention. The figure is expressed as a percentage of the total asset group quantity.

4.1.4 Average Roughness

Average roughness only relates to pavement assets. For sealed road pavements, it is a key capital condition indicator of longitudinal pavement shape, while for unsealed pavements it is a key maintenance indicator. It is based on a 0 – 10 scale with 0 being perfect and 10 un-driveable.

4.1.5 Average Profile

Average pavement profile is similar to the roughness rating and can be seen as the pavement cross sectional shape indicator. Profile is all about the efficient shedding of water from the road pavement. Profile 0 would have enough slope to shed water easily, while profile 10 would retain vast amounts of water within the road pavement.

4.1.6 Extent of Poor Condition Assets above a given Condition

The percentage of the asset base at and above a given condition rating is an excellent way of expressing the extent of poor condition assets present. This figure is expressed as a percentage of the total asset base and is reported at several different condition levels from condition 5 to 8 depending upon the asset set in question. For example sealed road pavements at and above condition 7 would represent the extent of the asset base that would be likely to require rehabilitation over the next 1 – 10 years.

Note that it is not the extent of the asset base within a given condition rating, but rather the extent at and above that condition rating.

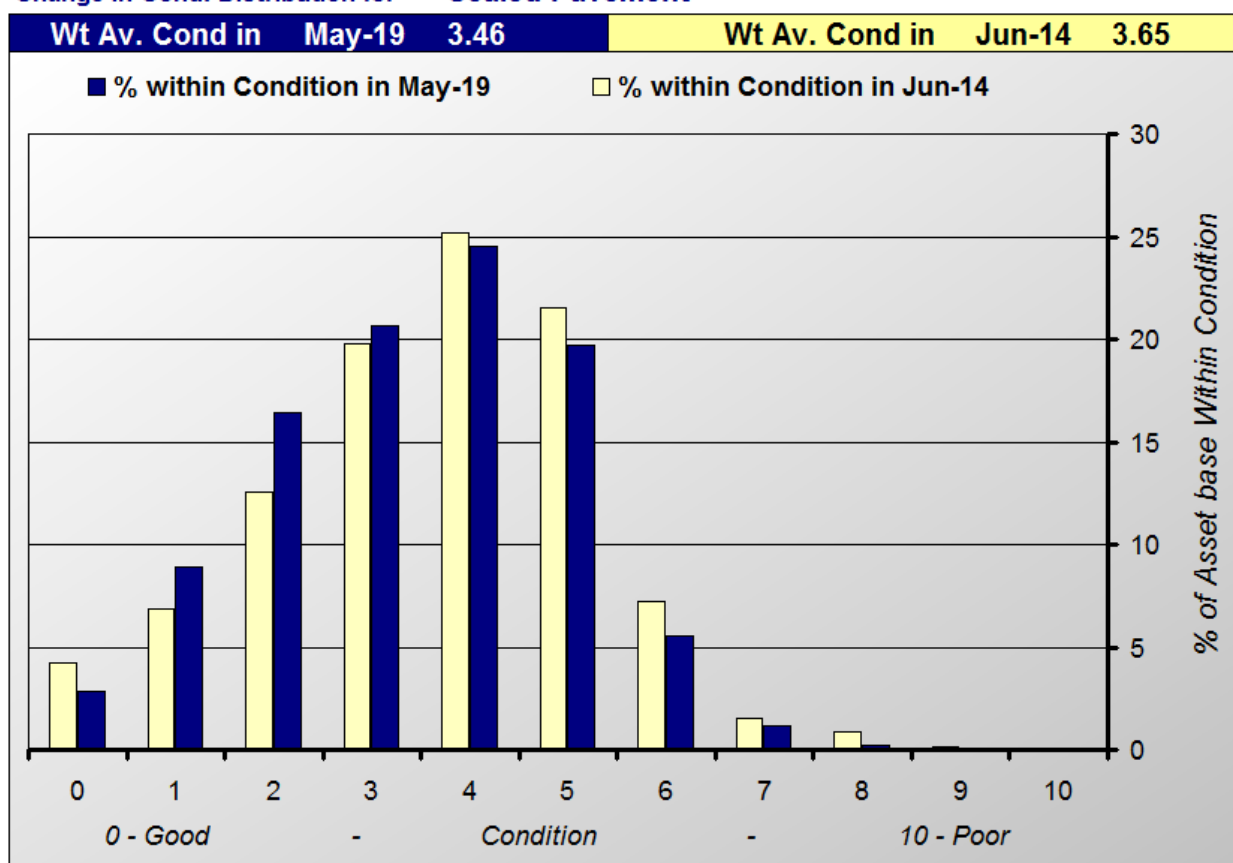
Change in Cond. Distribution for **Sealed Pavement**

Figure P1 Condition Distribution Comparison Graph – Between Surveys

Key Cond. Indic. No.	Sealed Pavement Condition Indicator	Figures from Last Survey in Jun-14	Figures from Current Survey in May-19	Change between Surveys New Minus Old	% Change Between Surveys	Better or Worse Since last Survey
1	Weighted Average Asset Condition	3.65	3.46	0.193	2.4%	Better
2	% of Urgent Failures	0.081	0.082	-0.001	-1.6%	Worse
3	% of Other Failures	1.28	0.73	0.548	42.9%	Better
4	Average Pavement Roughness	3.01	2.98	0.038	1.2%	Better
5	Average Pavement Profile	2.58	2.53	0.052	2.0%	Better
6	% of Asset Base above Condition 6	9.88	6.94	2.942	29.8%	Better
7	% of Asset Base above Condition 7	2.62	1.42	1.202	45.8%	Better
8	% of Asset Base above Condition 8	1.10	0.28	0.815	74.2%	Better
Renewal Demand Being Met For:		% of Annual Liability expenditure Planned in Future years		% of Annual Liability expenditure Since the time of the last survey		
Sealed Rd Pavement Asset Group		53%		50%		

Figure P2 Table of Key Condition Indicator Change since the last Survey

The above 2 figures provide internal benchmarking that details how asset condition has changed since the last survey. Figure P1 provides the condition distribution for each survey along with the first of the key condition indicators, the weighted average asset condition.

Figure P2 contains the eight key condition indicators and also shows how they have changed since the previous survey. At the bottom of the table are two very important figures. These indicate the percentage of the annual liability rate that has been met since the last survey, along with the percentage planned for future years.

Figures P1 and P2 demonstrate that overall asset condition has improved by 2.4%. Seven of the eight performance indicators were found to have improved quite measurably with only the extent of urgent isolated failures having increased. However this was coming off a very low base and figure P3 indicates that Sample Council remains within the best 30% of the councils assessed for this important condition indicator.

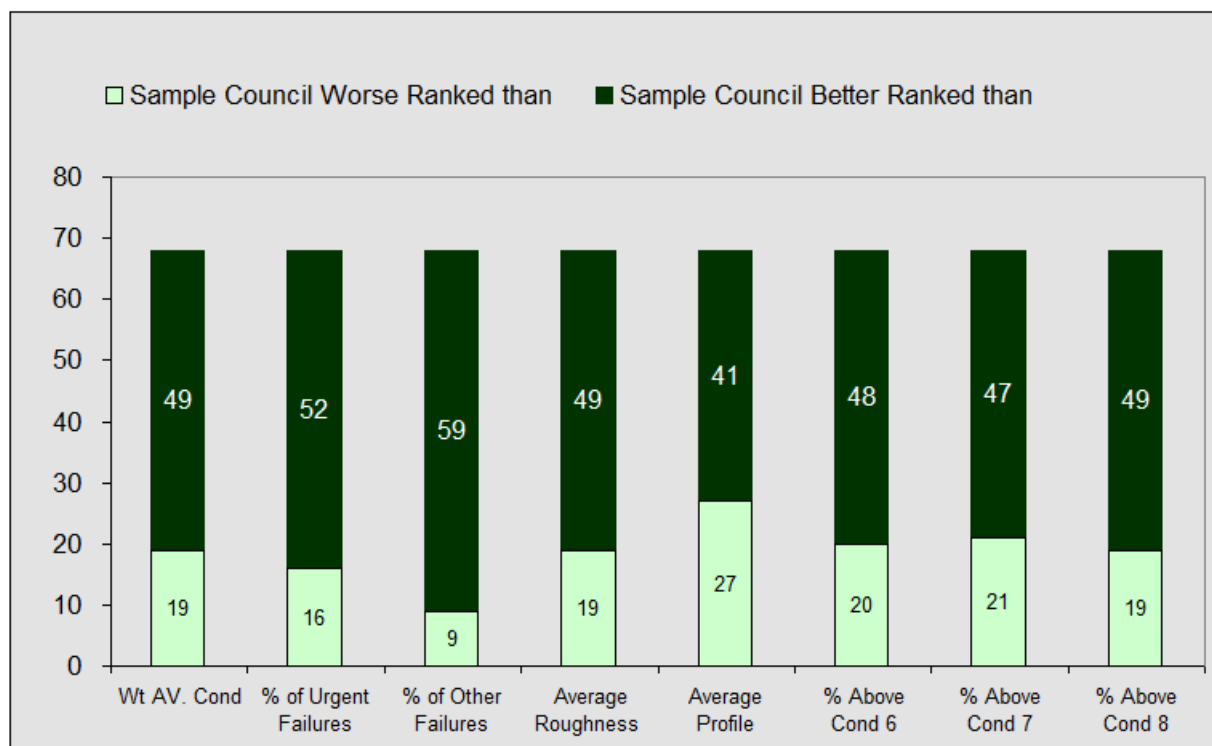


Figure P3 Key Condition Indicators as Compared with other Councils surveyed

Figure P3 provides external benchmarking based on the same key performance indicators as used internally in figure P2. The total number of councils assessed by MAMS on exactly the same basis is 69 for this sub asset class. The graph then displays the number of councils ranked better and worse than Sample Council for each of the eight performance indicators. The dark green bars represent the number of councils that Sample Council is ranked better than, while the light green is the number that Sample Council is ranked worse than.

The comparison with other councils in Figure P3 indicates a set of excellent condition assets with council sitting within the best 25 - 30% of the councils assessed for all indicators.

In summary the external benchmarking indicates that the sealed road pavements are in excellent overall condition while the internal benchmarking demonstrates a very strong condition improvement across all but one of the eight performance indicators since the time of our last survey.





4.2 Sealed Road Pavement Financial Modelling Analysis

The Sealed road pavement assets will be modelled in like performing data sets with the results aggregated into one presentation for the whole sub asset group

4.2.1 Sealed Road Pavement – Selection of Retreatment Intervention Level

The point at which you choose to intervene to renew or replace an asset will have a big impact on the predicted future renewal demand. The intervention level can be seen as the level of service associated with the asset set. High intervention level equates to a low level of service while low intervention level relates to a high level of service.

Detailed below are a series of photographs illustrating various sealed road pavement condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of an acceptable retreatment intervention level.

	
Condition 0 – 1 No Failures no shape loss	Condition 6 Moderate failures and shape loss
	
Condition 7 Ext shape loss and failures	Condition 8 – 9 Bad shape loss and ext failures

It is very difficult to cover pavement condition in such a limited range of photographs but hopefully they will provide some idea of asset condition in the 6 – 9 condition range where most interventions will take place. Pavements can be within this condition range for a number of different reasons and the photos will cover only a limited range of these situations. They should be seen as one possible condition situation and not the only situation for that condition rating.

4.2.2 Sealed Road Pavement Financial Modeling

Modelling Parameter	Urban Link Road Pavements	Urban Collector Road Pavements	Urban Access Road Pavements	Rural Link Road Pavements	Rural Collector Road Pavements	Rural Access Road Pavements
Asset Quantity in sqm	138,790	40,596	728,751	654,129	1,462,998	636,757
Unit Renewal Rate	\$70.00	\$70.00	\$69.79	\$39.00	\$39.00	\$39.00
Total Asset Group Renewal Cost	\$9,715,265	\$2,841,727	\$50,859,110	\$25,511,015	\$57,056,922	\$24,833,519
Annual Renewal Exp.	\$20,000	\$4,000	\$140,000	\$190,000	\$486,000	\$130,000
Retreat. Intervention Condition	7.0	7.0	7.5	7.0	7.0	7.5
Life to Condition 10 in Years	100.0	100.0	120.0	90.0	100.0	110.0
Life in years to Intervention	89.1	89.1	111.0	77.9	86.6	99.8

Figure P4 – Summary of Modelling Input Parameters for sealed road pavement assets

Sealed road pavement modelling has been undertaken within six groups as detailed in P4 above.

Retreatment intervention levels have been set to reflect the current standard that council is achieving and tend to be towards the lower mid end of the industry range (High level of service).

Life cycles have been raised a little since our last report. However the degradation curve analysis undertaken within appendix B suggest that these lives remain below the total life that could be expected. This is further reinforced by the very strong condition improvement as shown within figure P2 while the renewal expenditure has been at only 50% of the total level of annual liability.

The total sub asset group has been broken down into several individual data sets in order to refine the modelling result based on the most appropriate intervention levels and life cycles for each.

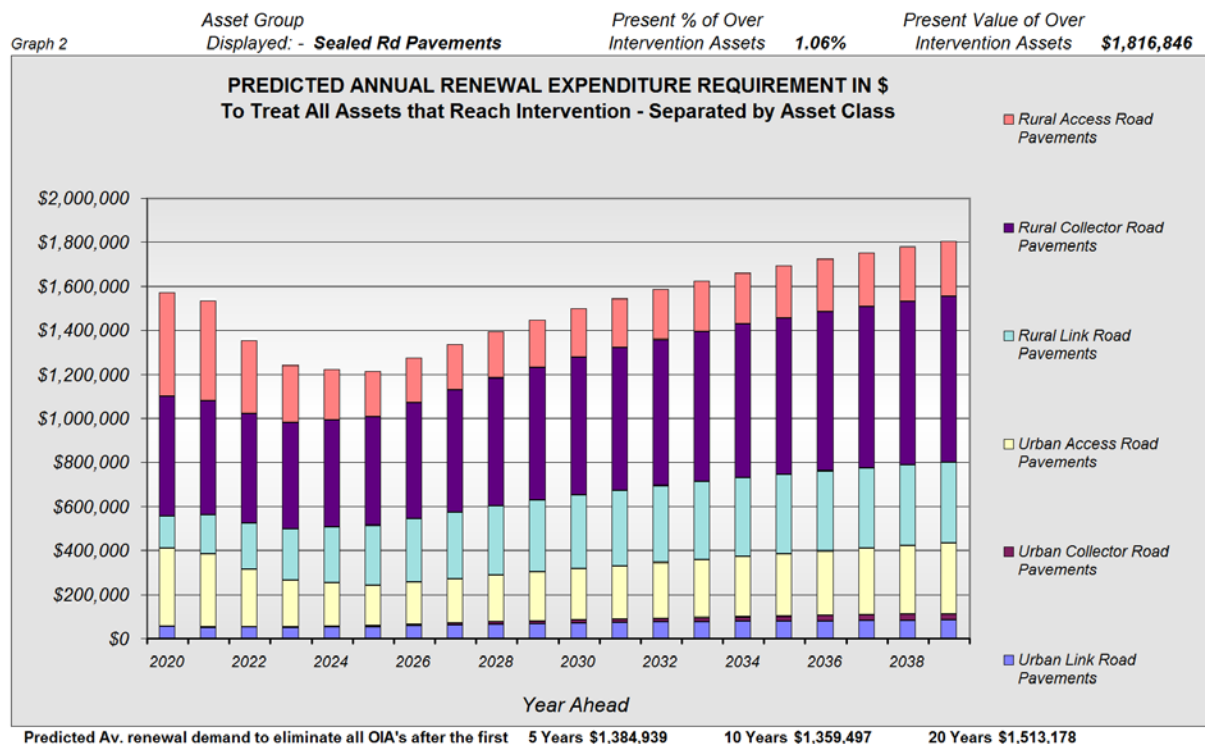


Figure P5 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

Figure P5 plots the annual funding profile required to eliminate all over intervention assets. If there is a large backlog of over intervention assets such that the raw year one demand is 30% or greater than the year two demand then the Moloney model eases the difference in over the first five years (this will show up as a reducing demand over the first five years). For this reason we prefer to quote the present renewal demand as the average figure for the first 5 years. In this case the first 5 year average renewal demand is estimated at \$1,385,000 pa. If this expenditure is maintained all OIA's will be eliminated within 5 years.

Figure P5 indicates that the capital renewal demand pattern to treat all assets that are predicted to reach the retreatment intervention level has an average demand figure of \$1,385,000 pa over the first 5-years. The peak demand over the next 20 years being \$1,803,000 pa by the year 2039.

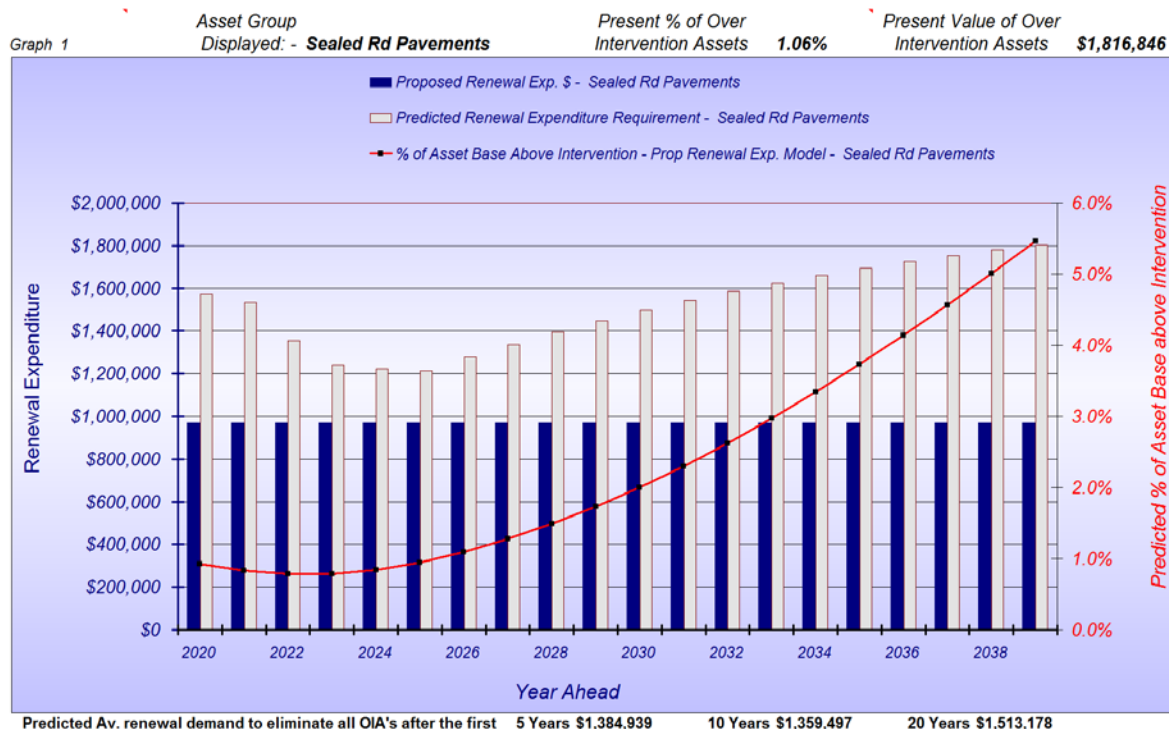


Figure P6 Future Predicted Condition Based on adoption of planned expenditure profile

Figure P6 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the continuation of the planned level of renewal expenditure (in blue bars). It also plots the predicted renewal demand to treat all over intervention assets within the grey bars (Same aggregate figures as within Figure P5 but not split into the individual modelling sets).

Figure P6 indicates that the planned renewal expenditure of \$968,650 pa is a little below the longer term demand. The model predicts a relatively steady extent of OIA's over the next 7 years thus it could be said that the planned renewal expenditure is at an appropriate total level for the next 5 - 7 years and is predicted to deliver close to the present level of OIA's at 1.06% after 7 years.

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of over intervention assets within a selected time frame. A global outcome can be set for the whole roads group. In this way the model can also be used to allocate funding between the sub asset classes on a needs basis, to deliver the best overall condition outcome for the whole road network.

Please refer to Appendix D which explains why and how we set the desired extent of over intervention assets in terms of the number of year's worth of annual liability that it represents. Appendix D4 also provides an explanation of the Moloney funding scenario finder along with its three basic input criteria requirements. The three input criteria adopted for the sealed road pavement assets are as detailed within figure P7 below with the results of the funding scenario finder operation contained within figure P8.

Road Sub Asset Set Description	Criteria 1. Extent of OIA's		Criteria 2. Years to achieve Desired Condition outcome	Criteria 3 Annual % of Compounding funding increase (if required)
	Expressed as the % of One Years Annual Liability	Expressed as a % of The Total Asset Set Replacement Valuation		
Sealed Rd Pavements	90%	0.97%	12	0.0%

Figure P7 Modelling scenario finder inputs - Sealed Pavement Assets

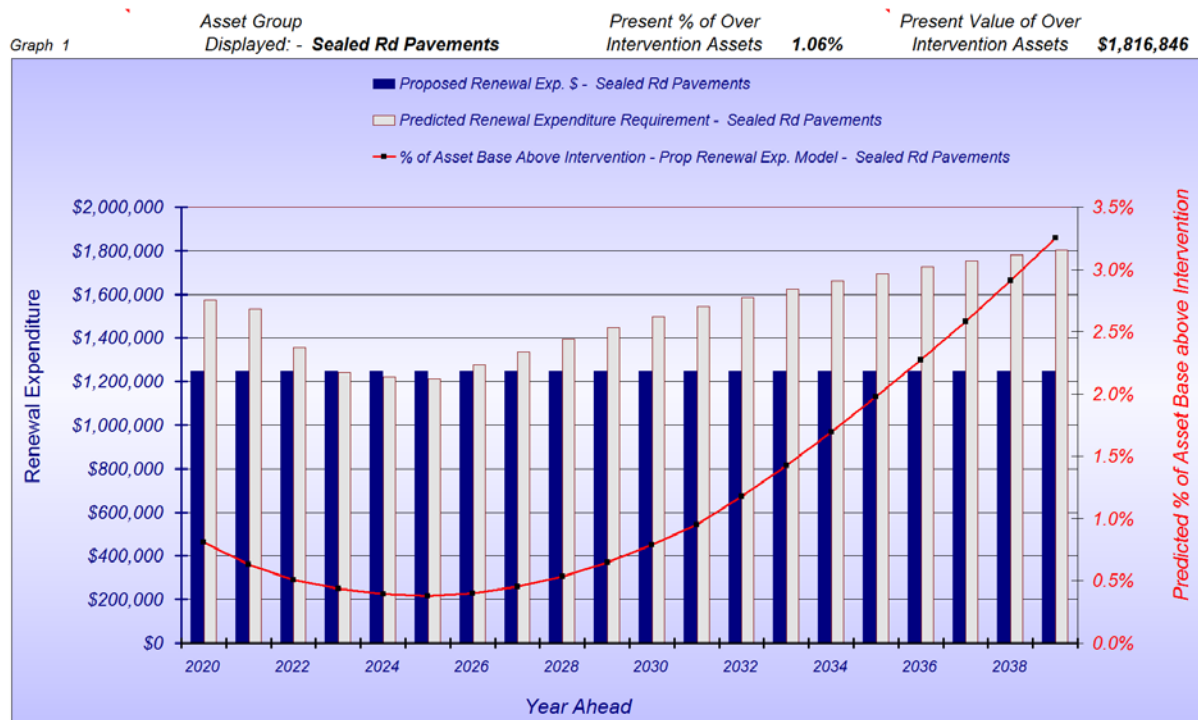


Figure P8 Recommended Renewal funding Strategy

For the Sealed Road Pavements we have set the level of over intervention assets at 90% of one year's annual liability after 12 years. This equates to 0.97% of the network, the current level being 1.06%. We have set the desired extent of over intervention assets towards the top of the Excellent Range (See Appendix D Figure D 1 for details relating to this classification range).

The recommended renewal expenditure level over the next 5 years is a flat \$1,247,000 pa.

4.3 Sealed Road Pavement Summary

The sealed road pavement assets were found to be in very good to excellent overall condition with very minimal levels of both poor condition assets and isolated pavement failures. There had also been a strong condition improvement across all but one of the performance indicators since our last survey in 2014

It is recommended that the renewal funding level be set at a flat \$1,247,000 for the next 5 years and that the funding be reviewed again following the next condition survey.

Section 5: Sealed Surface Sub Assets

This section will deal with the Sealed Surface Sub assets. It will look at both internal and external benchmarking of asset condition as well as providing financial forecasting of future renewal demand and projected asset condition.

5.1 Condition and Performance of Sealed Surfaces

The same eight common key performance indicators are used for all road sub assets. An explanation for each is available within sections 4.1 to 4.1.6 above rather than duplicating those details here. Five of the eight condition indicators that were appropriate to the sealed surface assets are detailed here.

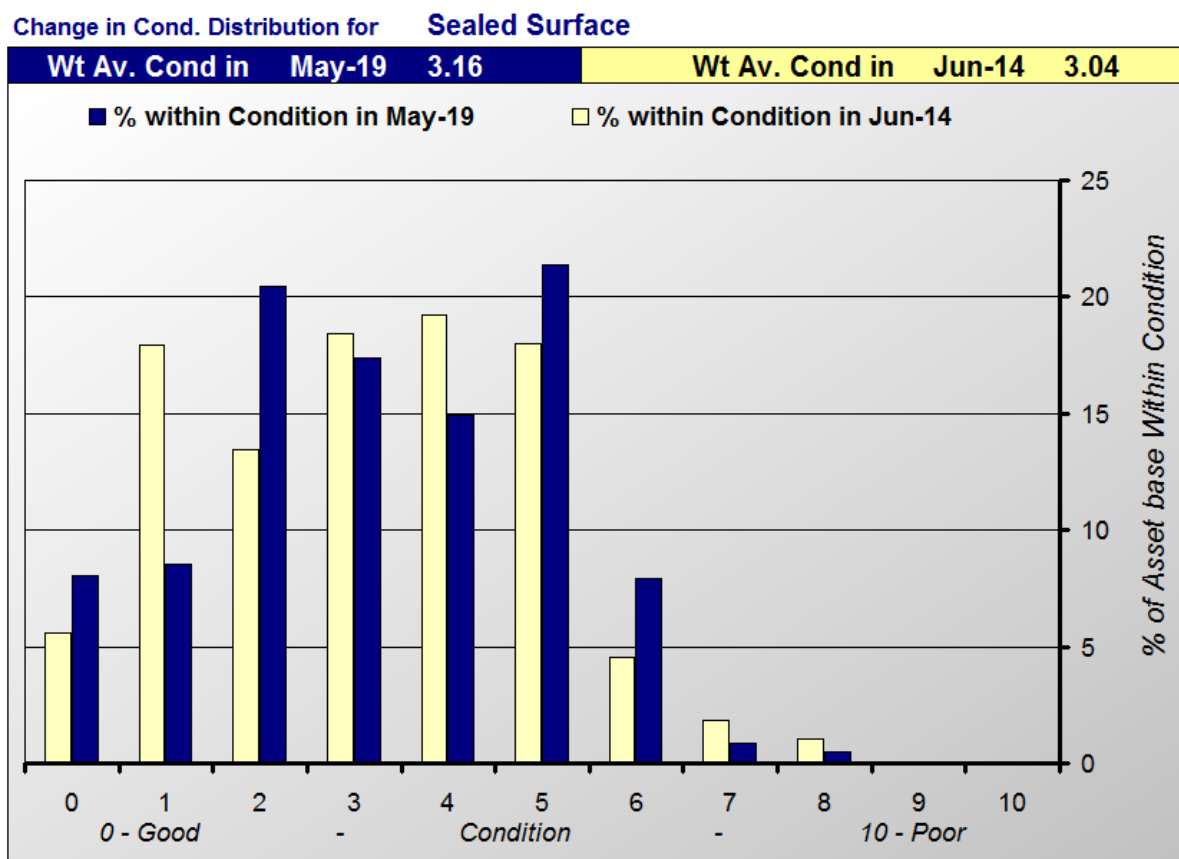


Figure S1 Condition Distribution Comparison Graph – Between Surveys all Sealed Surfaces

Key Cond. Indic. No.	Sealed Surface Condition Indicator	Figures from Last Survey in Jun-14	Figures from Current Survey in May-19	Change between Surveys New Minus Old	% Change Between Surveys	Better or Worse Since last Survey
1	Weighted Average Asset Condition	3.035	3.163	-0.127	-1.8%	Worse
2	% of Asset Base above Condition 5	25.401	30.688	-5.287	-20.8%	Worse
3	% of Asset Base above Condition 6	7.427	9.310	-1.883	-25.3%	Worse
4	% of Asset Base above Condition 7	2.887	1.367	1.520	52.7%	Better
5	% of Asset Base above Condition 8	1.040	0.500	0.540	51.9%	Better
Renewal Demand Being Met For:		% of Annual Liability expenditure Planned in Future years		% of Annual Liability expenditure Since the time of the last survey		
Sealed Surface Asset Group		95%		69%		

Figure S2 Condition Change since last survey & Renewal demand being met

The above 2 figures provide internal benchmarking that details how asset condition has changed since the last survey. Figure S1 provides the condition distribution for each survey along with the first of the key condition indicators, the weighted average asset condition.

Figure S2 contains five of the eight possible key performance indicators that relate to this asset class. See section 4.2 above for a detailed explanation of each indicator. Figure S2 also shows how the indicators have changed since the previous survey. At the bottom of the table are two very important figures. These indicate the percentage of the annual liability rate that has been met since the last survey, along with the percentage planned for future years.

Figure S2 indicates that overall condition (weighted average asset condition) has declined by -1.8% since 2014. The extent of poor condition assets at and above condition 8 has improved by 51.9% , along with those at and above condition 7 experiencing an improvement of 52.7%. This is considered to be an outstanding achievement given that the average annual renewal expenditure since 2014 has been at only 69% of the estimated consumption rate.

Council is clearly managing the resurfacing program very well and the present adopted services lives may be a little under stated as suggested by both asset performance since 2014 and the developed unique degradation curves.

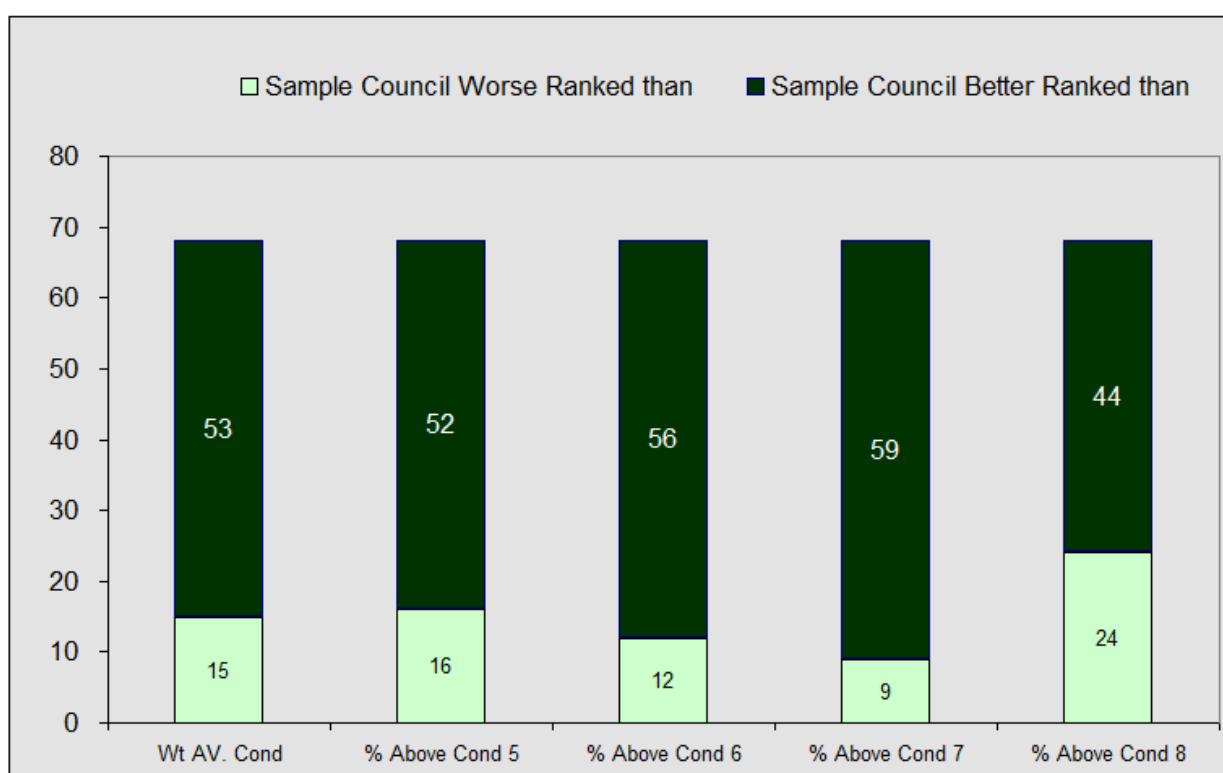


Figure S3 Key Condition Indicators as Compared with other Councils surveyed

Figure S3 provides external benchmarking based on the same key performance indicators as used internally in figure S2. The total number of councils assessed by MAMS on exactly the same basis is 69 for this sub asset class. The graph then displays the number of councils ranked better and worse than Sample Council for each of the five performance indicators. The dark green bars represent the number of councils that Sample Council is ranked better than, while the light green is the number that Sample Council is ranked worse than.

Figure S3 indicates that Sample Council compare very well with the 69 councils assessed by MAMS. Sample Council is within the best 20% of all councils assessed for most of the key performance indicators.





5.2 Sealed Surface Financial Modelling Analysis

The Sealed surface assets will be modelled in like performing data sets with the results aggregated into one presentation for the whole sub asset group

5.2.1 Sealed Surface – Selection of Retreatment Intervention Level

The point at which you choose to intervene to renew or replace an asset will have a big impact on the predicted future renewal demand. The intervention level can be seen as the level of service for the asset set. High intervention level equates to low level of service while low intervention level relates to a high level of service.

Detailed below are a series of photographs illustrating various sealed surface condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of an acceptable retreatment intervention level.

	
<p>Condition 0 – 1 Seal in excellent near new condition</p>	<p>Condition 5 Cracking but seal not too oxidized</p>
	
<p>Condition 6.5 - 7 Oxidized and stripping</p>	<p>Condition 8 Fully Oxidized and falling apart</p>

It is very difficult to cover sealed surface condition in such a limited range of photographs but hopefully they will provide some idea of asset condition in the 6 – 9 condition range where most interventions will take place. Sealed surfaces can be within this condition range for a number of different reasons and the photos will cover only a limited range of these situations. They should be seen as one possible condition situation and not the only situation for that condition rating.

5.2.2 Sealed Surfaces – Financial Modeling Results

Modelling Parameter	All Asphalt Surfaces	Spray Seals on Link Roads	Spray Seals on Coll Roads	Spray Seals on Access Roads
Asset Quantity in sqm	228,326	696,229	1,408,409	1,089,902
Unit Renewal Rate	\$21.00	\$5.13	\$4.90	\$4.98
Total Asset Group Renewal Cost	\$4,794,846	\$3,573,818	\$6,899,937	\$5,432,506
Annual Renewal Exp.	\$90,000	\$270,000	\$500,000	\$320,000
Retreat. Intervention Condition	7.0	6.5	6.5	6.5
Life to Condition 10 in Years	30.0	16.0	18.0	20.0
Life in years to Intervention	26.3	13.3	14.9	16.6

Figure S4 – Summary of Modelling Input Parameters for Sealed Surface Assets

The sealed surfaces will be modelled within four like performing data sets as detailed within Figure S4 above. Retreatment intervention levels have been set to reflect the current level of service that council is delivering and are considered to be towards the lower end of the industry standard range (delivering a high level of service). Life cycles have been set at what are considered to be low levels by industry standards. The unique degradation curves also suggest that the lives could be extended a little but they have been left at the same levels as per our last report.

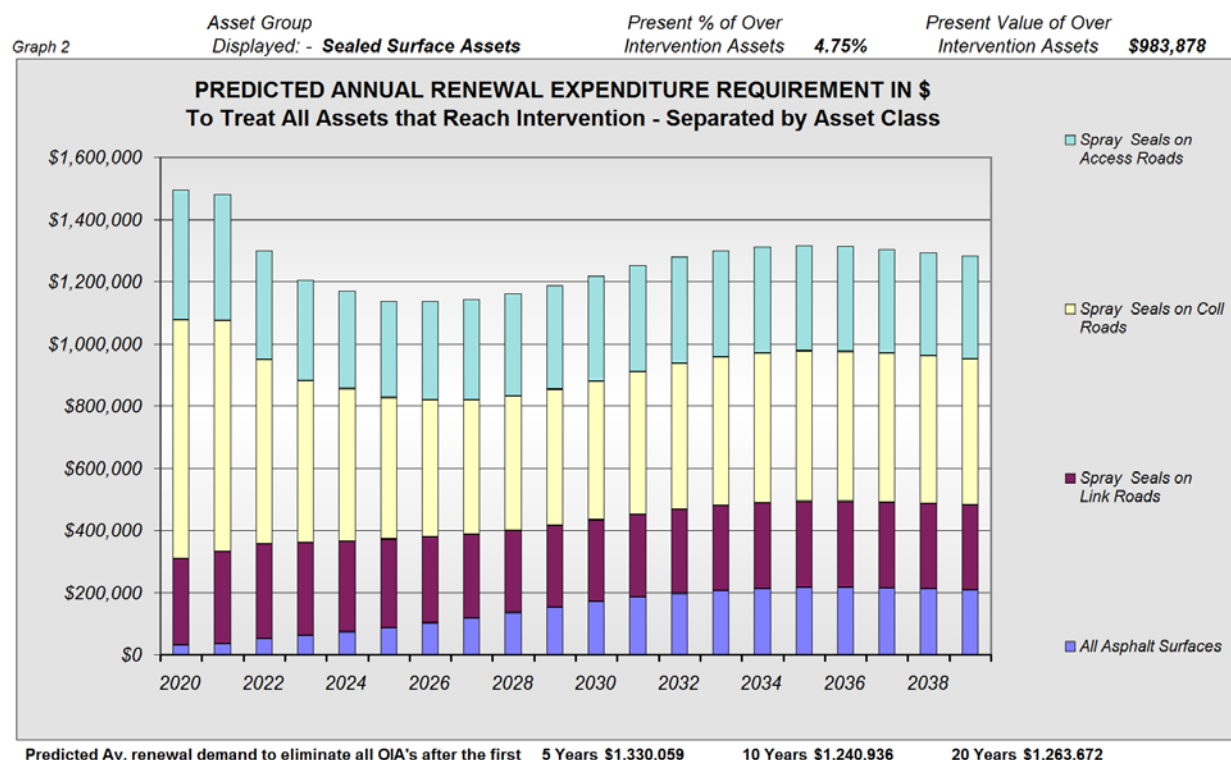


Figure S5 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

Figure S5 plots the annual funding profile required to eliminate all over intervention assets. If there is a large backlog of over intervention assets such that the raw year one demand is 30% or greater than the year two demand then the Moloney model eases the difference in over the first five years (this will show up as a reducing demand over the first five years). For this reason we prefer to quote the present renewal demand as the average figure for the first 5 years. In this case the first 5 year average renewal demand is estimated at \$1,330,000 pa. If this expenditure is maintained all OIA's will be eliminated within 5 years.

Figure S5 indicates that the capital renewal demand to treat all assets that are predicted to reach the retreatment intervention level over the next 20 years has an average figure for the first 5 - years of \$1,330,000 pa. This also represents the estimated peak demand over the next 20 years.

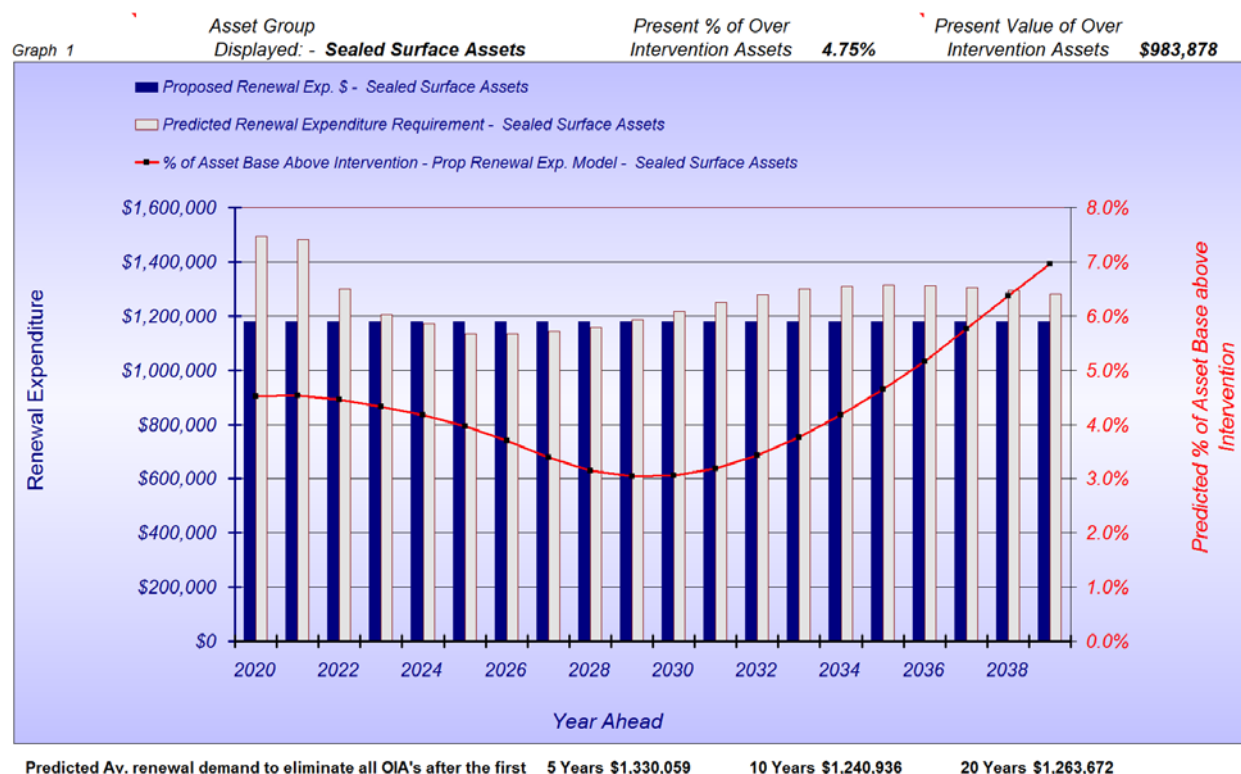


Figure S6 Future Predicted Condition Based on planned expenditure profile

Figure S6 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the continuation of the planned level of renewal expenditure (in blue bars). It also plots the predicted renewal demand to treat all over intervention assets within the grey bars (Same aggregate figures as within Figure S5 but not split into the individual modelling sets).

The planned renewal expenditure profile in figure S6 is a flat \$1,180,379 pa. The extent of over intervention assets is currently at 4.75% which is around 0.8 years of annual liability and as such falls within the "Excellent" range as per Appendix D. The planned expenditure is predicted to result in a lowering of the OIA's after 10 years down to 3.04%.

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of over intervention assets within a selected time frame. A global outcome can be set for the whole roads group. In this way the model can also be used to allocate funding between the sub asset groups to deliver the best overall condition outcome for all road assets.

Please refer to Appendix D which explains why and how we set the desired extent of over intervention assets in terms of the number of year's worth of annual liability that it represents. Appendix D4 also provides an explanation of the Moloney funding scenario finder along with its three basic input criteria requirements. The three input criteria adopted for the sealed surface assets are as detailed within figure S7 below with the results of the funding scenario finder operation contained within figure S8.

Road Sub Asset Set Description	Criteria 1. Extent of OIA's		Criteria 2. Years to achieve Desired Condition outcome	Criteria 3 Annual % of Compounding funding increase (if required)
	Expressed as the % of One Years Annual Liability	Expressed as a % of The Total Asset Set Replacement Valuation		
Sealed Surfaces	90%	5.40%	12	0.0%

Figure S7 Modelling scenario finder inputs - Sealed Surface Assets

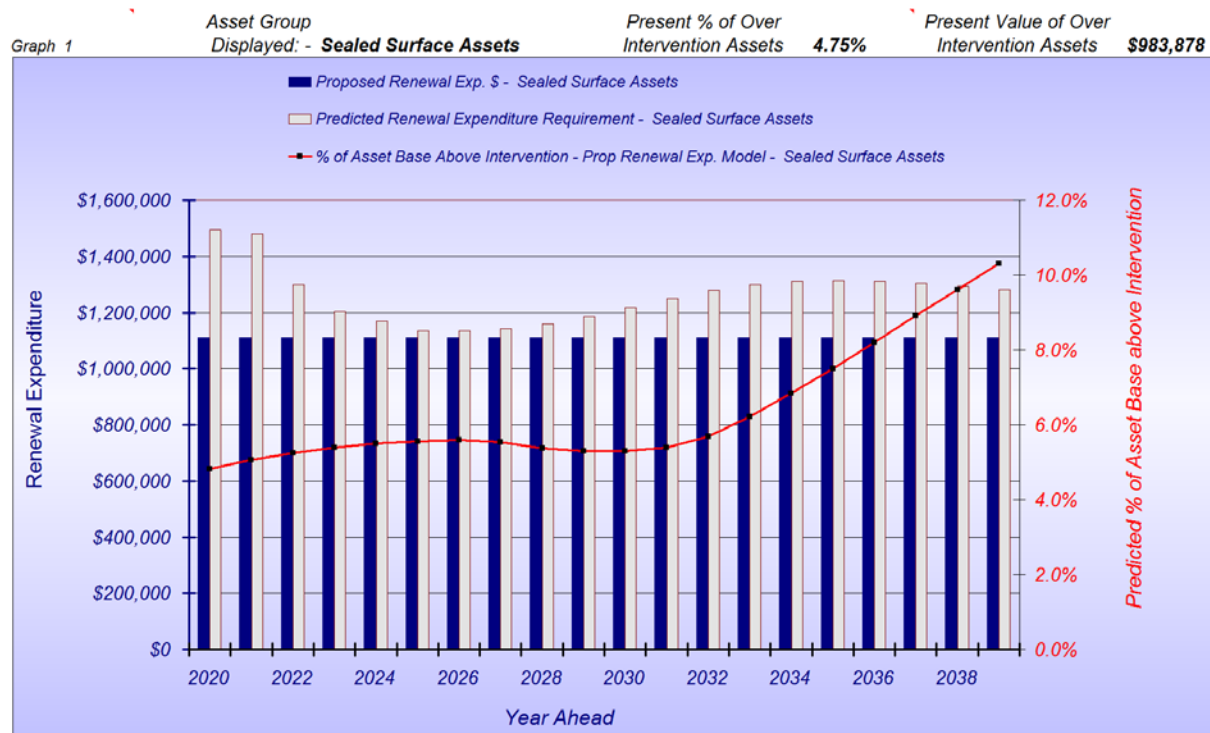


Figure S8 Recommended Renewal funding Strategy

For the sealed surfaces we have set the level of over intervention assets at 90% of one year's annual liability, which equates to 5.40% of the network. The current level being 4.75%. We have set the desired extent of over intervention assets to the top of the "Excellent" Range (See Appendix D Figure D 1 for details relating to this classification range).

The model predicts an average renewal demand of \$1,110,000 pa over the next 12 years will deliver the required condition outcome as detailed within figure S7 above.

The recommended renewal expenditure on this sub asset class is a flat \$1,110,000 pa for the next 5 -10 years.

5.3 Sealed Surface Summary

The sealed surface assets were found to be in excellent overall condition but had experienced a small decline in overall condition since our last survey in 2014. However the extent of poor condition assets had declined by in excess of 50% suggesting very good targeting of the reseal program.

It is recommended that the renewal funding level be set at a flat \$1,110,000 pa for the next 5 years and to be reviewed again following the next condition survey.

Section 6: Unsealed Road Pavement Sub - Assets

This section will deal with the Unsealed Road Pavement Sub assets. It will look at both internal and external benchmarking of asset condition as well as providing financial forecasting of future renewal demand and projected asset condition.

6.1 Condition and Performance of Unsealed Road Pavement assets

The same eight common key performance indicators are used for all road sub assets. An explanation for each is available within sections 4.1 to 4.1.6 above rather than duplicating those details here. Seven of the eight condition indicators that are appropriate to the unsealed pavement assets have been used here. There is one additional indicator for the unsealed road pavements and that is the measured depth of imported pavement material in mm. It is the most important indicator for this asset class.

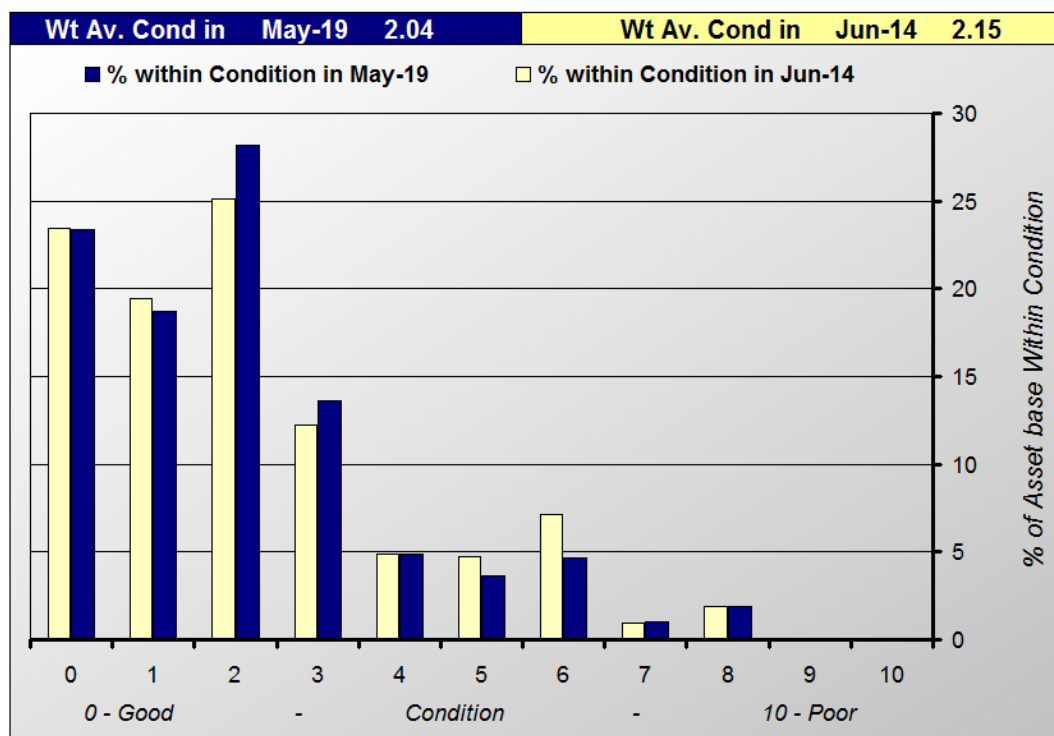


Figure U1 Condition Distribution Comparison Graph – Between Surveys

Key Cond. Indic. No.	Unsealed Pavement Condition Indicator	Figures from Last Survey in Jun-14	Figures from Current Survey in May-19	Change between Surveys New Minus Old	% Change Between Surveys	Better or Worse Since last Survey
1	Weighted Average Asset Condition	2.15	2.04	0.112	1.6%	Better
2	% of Pavement Failures	0.86	1.15	-0.289	-33.7%	Worse
3	Average Pavement Roughness	3.63	3.70	-0.067	-1.8%	Worse
4	Average Pavement Profile	2.66	3.02	-0.356	-13.4%	Worse
5	Average Pavement Depth in mm	117	120	2.932	2.5%	Better
6	% of Asset Base above Condition 6	10.07	7.58	2.487	24.7%	Better
7	% of Asset Base above Condition 7	2.91	2.94	-0.033	-1.1%	Worse
8	% of Asset Base above Condition 8	1.95	1.93	0.020	1.0%	Better
Renewal Demand Being Met For:		% of Annual Liability expenditure Planned in Future years		% of Annual Liability expenditure Since the time of the last survey		
UnSealed Rd Pavement Asset Group		97.4%		63.7%		

Figure U2 Table of Key Condition Indicator Change since the last Survey

The above 2 figures provide internal benchmarking that details how asset condition has changed since the last survey. Figure U1 provides the condition distribution for each survey along with the first of the key condition indicators, the weighted average asset condition.

Figure U2 contains seven of the eight standard key condition indicators (see section 4.1 for details) and also shows how they have changed since the previous survey. There is one additional indicator unique to the unsealed pavements and that is the measured depth of imported pavement material. At the bottom of the table are two very important figures. These indicate the percentage of the annual liability rate that has been met since the last survey, along with the percentage planned for future years.

Figure U1 contains a graphical representation of the two condition distributions for the current and the 2014 condition survey based on the same condition criteria as used in 2014. Weighted average asset condition has improved a little.

Figures U2 demonstrate that the weighted average asset condition has improved by 1.6% and the average depth of imported pavement material by 2.5%. Localised pavement failures and the shape characteristics of roughness and profile have all declined in condition. However these are more related to the maintenance condition of the assets rather than it's capital condition.

The condition outcome is considered to be a very strong result given that the average renewal expenditure since 2014 has been at only 64% of the estimated level of annual liability.

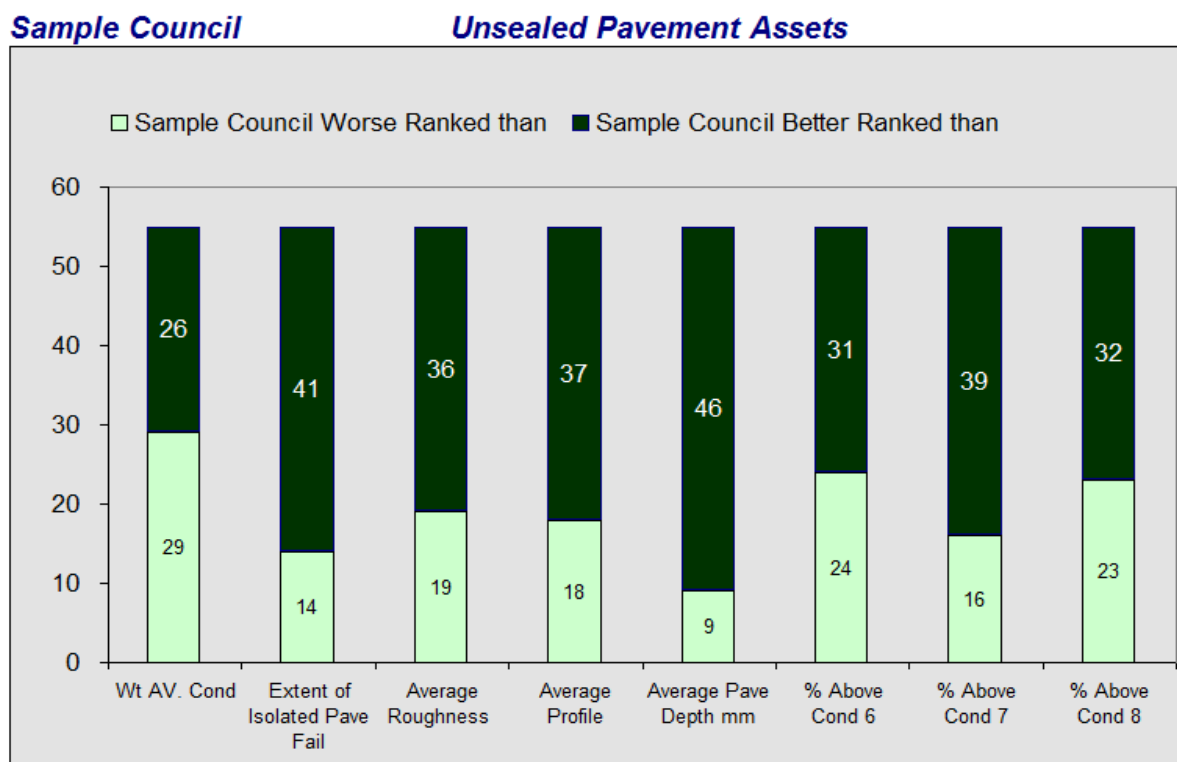


Figure U3 Key Condition Indicators as Compared with other Councils surveyed

Figure U3 provides external benchmarking based on the same key performance indicators as used internally in figure U2. The total number of councils assessed by MAMS on exactly the same basis is 56 for this sub asset class. The graph then displays the number of councils ranked better and worse than Sample Council for each of the eight performance indicators. The dark green bars represent the number of councils that Sample Council is ranked better than, while the light green is the number that Sample Council is ranked worse than.

The comparison with other councils in Figure U3 indicates that the unsealed pavements within Sample Council are in good overall condition and compare quite favourably with the 56 councils assessed.




6.2 Unsealed Road Pavement Financial Modelling Analysis

The Unsealed road pavement assets will be modelled in like performing data sets with the results aggregated into one presentation for the whole sub asset group

6.2.1 Unsealed Road Pavement – Selection of Retreatment Intervention Level

The point at which you choose to intervene to renew or replace an asset will have a big impact on the predicted future renewal demand. The intervention level can be seen as the level of service associated with the asset set. High intervention level equates to low level of service while low intervention level relates to a high level of service.

Detailed below are a series of photographs illustrating various unsealed road pavement condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of an acceptable retreatment intervention level.

	
Condition 0 – 1 Average Depth 150 mm	Condition 7 – Average depth 20 – 30 mm only
	
Condition 8 Av Depth 20 mm & Ext Bare Patches	Condition 9 Scattered patched of Pave Material only

It is very difficult to cover unsealed pavement condition in such a limited range of photographs but hopefully they will provide some idea of asset condition in the 6 – 9 condition range, where most interventions will take place. Un sealed pavements can be within this condition range for a number of different reasons and the photos will cover only a limited range of these situations. They should be seen as one possible condition situation and not the only situation for that condition rating.

6.2.2 Unsealed Road Pavement Financial Modeling

Modelling Parameter	Unsealed Pavement Collector	Unsealed Pavement Primary Access	Unsealed Pavement Secondary Access
Asset Quantity in sqm	67,046	610,467	739,476
Unit Renewal Rate	\$9.00	\$9.00	\$9.00
Total Asset Group Renewal Cost	\$603,410	\$5,494,203	\$6,655,284
Annual Renewal Exp.	\$45,000	\$200,000	\$215,000
Retreat. Intervention Condition	5.0	6.0	7.0
Life to Condition 10 in Years	25.0	30.0	35.0
Life in years to Intervention	16.2	24.5	31.5

Figure U4 – Summary of Modelling Input Parameters for un-sealed road pavement assets

Unsealed road pavement modelling has been undertaken within three groups as detailed in U4 above.

Retreatment intervention levels have been set to reflect the current standard that council is achieving. Life cycles have been maintained at the levels from our last report but the unique degradation curves along with the general condition improvement with a renewal spend of only 64% of the estimated level of annual liability does suggest that life cycles should be longer.

It is also noted within Figure 2.3 that the average depth of imported pavement material has increased from 2.82 mm in 2001 up to 3.16 mm in 2019. This strong condition improvement has been achieved with renewal expenditure levels of only 50% - 60% of the recorded levels of annual depreciation further suggesting that the adopted asset lives are far lower than what is being achieved.

The total sub asset group has been broken down into individual data sets in order to refine the modelling result based on the most appropriate intervention levels and life cycles for each.

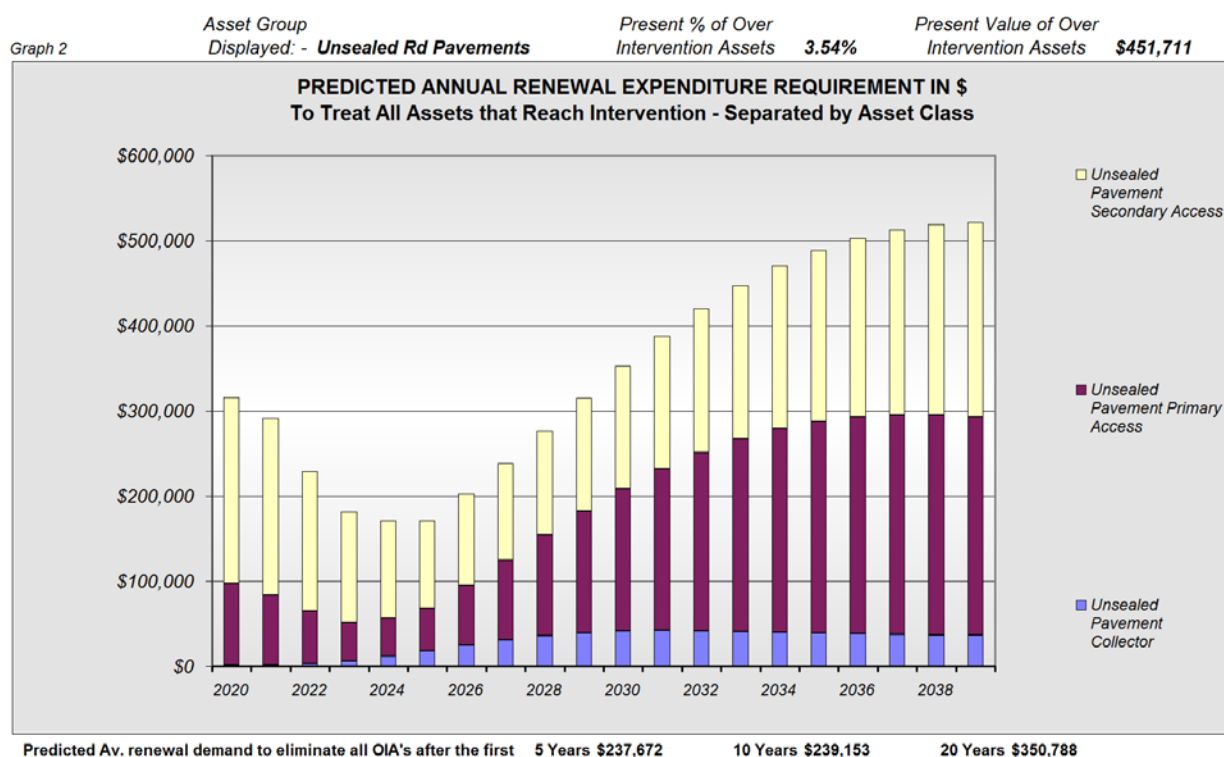


Figure U5 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

Figure U5 plots the annual funding profile required to eliminate all over intervention assets. If there is a large backlog of over intervention assets such that the raw year one demand is 30% or greater than the year two demand then the Moloney model eases the difference in over the first five years (this will show up as a reducing demand over the first five years). For this reason we prefer to quote the present renewal

demand as the average figure for the first 5 years. In this case the first 5 year average renewal demand is estimated at \$238,000 pa. If this expenditure is maintained all OIA's will be eliminated after 5 years.

Figure U5 plots the capital renewal demand pattern to treat all assets that are predicted to reach the retreatment intervention level over the next 20 years. The average renewal demand over the first 5-years is estimated at \$238,000 pa, while the peak demand is estimated at \$522,000 in 2039

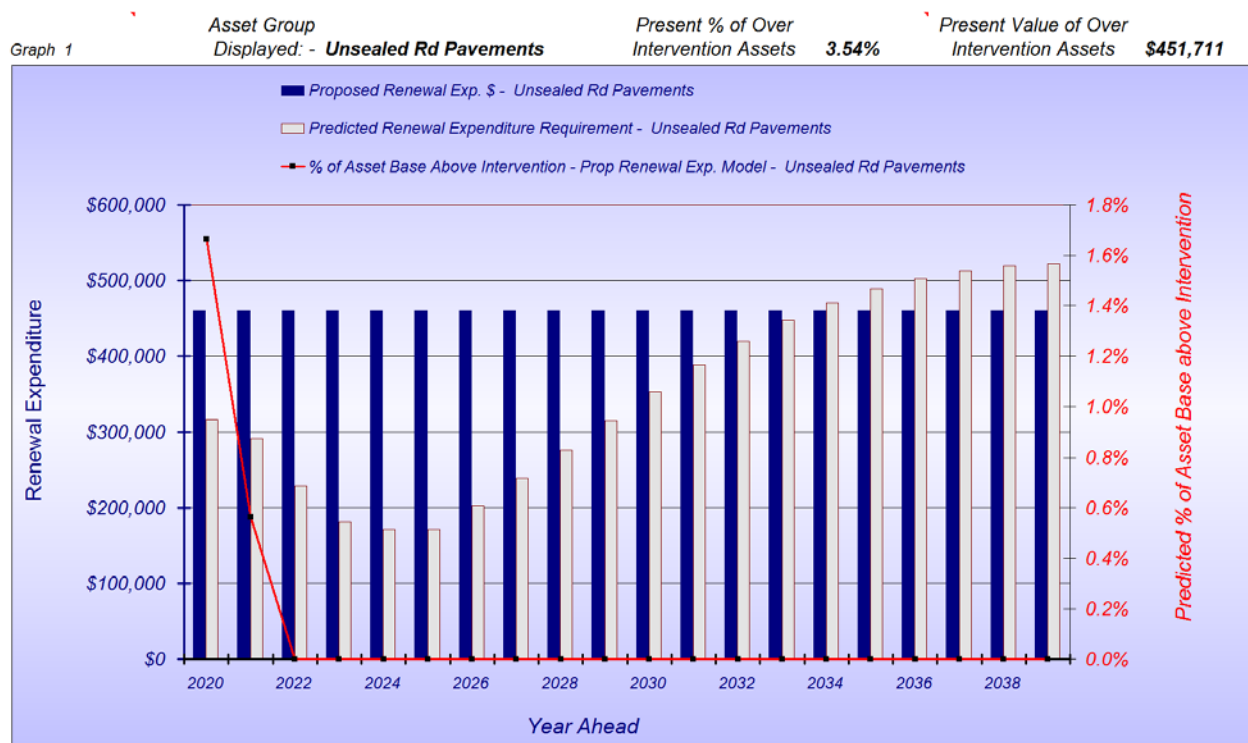


Figure U6 Future Predicted Condition Based on adoption of planned expenditure profile

Figure U6 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the planned level of renewal expenditure (in blue bars). It also plots the predicted renewal demand to treat all over intervention assets within the grey bars (same aggregate figures as within Figure U5 but not split into the individual modelling sets).

Figure U6 indicates that the planned renewal expenditure at \$460,000 pa will result in a zero level of OIA's within 3 years. The present level of over intervention assets at 3.54% of the network represents just under 1 year's average annual liability and as such is within the "Excellent" condition Range (see Appendix D Figure D 1 for details of this rating).

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of over intervention assets within a selected time frame. A global outcome can be set for the whole roads group. In this way the model can also be used to allocate funding between the sub asset groups to deliver the best overall condition outcome for all road assets.

Please refer to Appendix D which explains why and how we set the desired extent of over intervention assets in terms of the number of year's worth of annual liability that it represents. Appendix D4 also provides an explanation of the Moloney funding scenario finder along with its three basic input criteria requirements. The three input criteria adopted for the unsealed road pavement assets are as detailed within figure U7 below with the results of the funding scenario finder operation contained within figure U8.

Road Sub Asset Set Description	Criteria 1. Extent of OIA's		Criteria 2. Years to achieve Desired Condition outcome	Criteria 3 Annual % of Compounding funding increase (if required)
	Expressed as the % of One Years Annual Liability	Expressed as a % of The Total Asset Set Replacement Valuation		
Unsealed Rd Pavements	90%	3.33%	20	0.0%

Figure U7 Modelling scenario finder inputs - Un-Sealed Pavement Assets

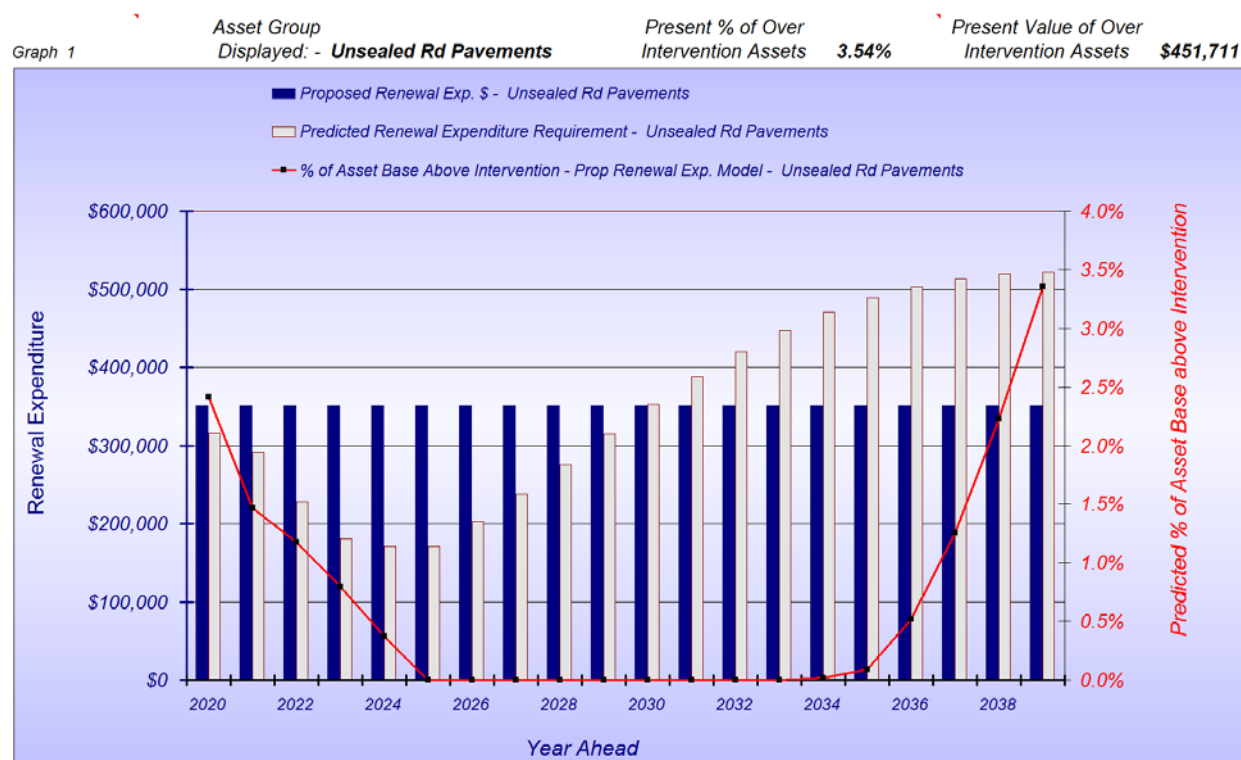


Figure U8 Recommended Renewal funding Strategy

For the unsealed pavements we have set the level of over intervention assets at 90% of one year's annual liability which equates to 3.33% of the network, the current level being 3.54%. We have set the desired extent of over intervention assets towards the top of the Excellent Range (See Appendix D Figure D 1 for details relating to this classification range).

The recommended renewal expenditure level over the next 20 years is a flat \$352,000 pa. Expenditure could be at a lower level for the first 10 years but would need higher levels in the second decade. We set the model for a 20 years predictive period for these assets in order to cater for the strong increase in renewal demand within the second decade.

6.3 Unsealed Road Pavement Summary

The unsealed road pavement assets were found to be in very good overall condition with a 1.6% improvement in the weighted average condition since 2014, but there was found to be a high growth in the extent of localised pavement failures since 2014.

It is recommended that the renewal funding level be set at a flat \$352,000 pa for the next 5 years and then be reviewed again following the next condition survey.

Section 7: Kerb Sub Assets

This section will deal with the Kerb Sub assets. It will look at both internal and external benchmarking of asset condition as well as providing financial forecasting of future renewal demand and projected asset condition.

7.1 Condition and Performance of Kerb assets

The same eight common key performance indicators are used for all road sub assets. An explanation for each is available within sections 4.1 to 4.1.6 above rather than duplicating those details here. Seven of the eight condition indicators that were appropriate to the kerb assets have been used here.

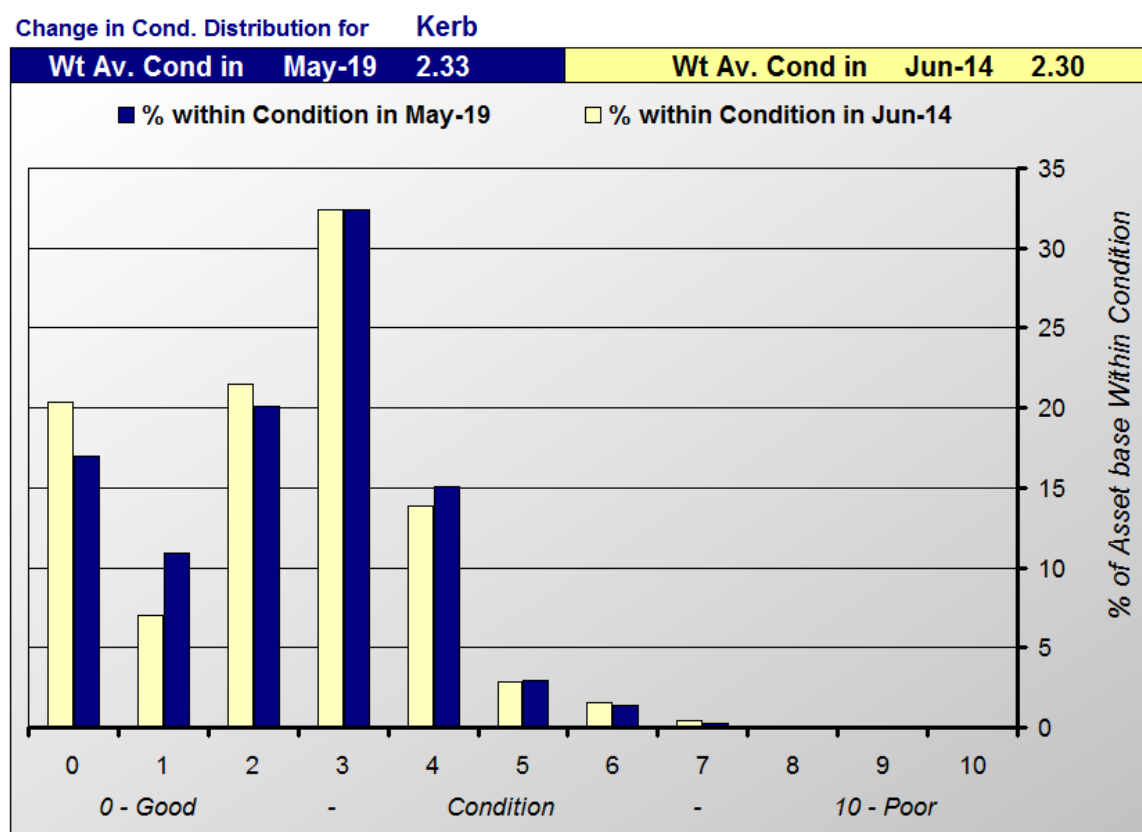


Figure K1 Condition Distribution Comparison Graph – Between Surveys

Key Cond. Indic. No.	Kerb Condition Indicator	Figures from Last Survey in Jun-14	Figures from Current Survey in May-19	Change between Surveys New Minus Old	% Change Between Surveys	Better or Worse Since last Survey
1	Weighted Average Asset Condition	2.299	2.331	-0.032	-0.40%	Worse
2	% of Urgent Failures	1.444	1.470	-0.026	-1.8%	Worse
3	% of Other Failures	7.411	9.533	-2.122	-28.6%	Worse
4	% of Asset Base above Condition 5	4.952	4.544	0.408	8.2%	Better
5	% of Asset Base above Condition 6	2.105	1.626	0.479	22.7%	Better
6	% of Asset Base above Condition 7	0.505	0.278	0.227	44.91%	Better
7	% of Asset Base above Condition 8	0.047	0.000	0.047	100.00%	Better
Renewal Demand Being Met For:		% of Annual Liability expenditure Planned in Future years		% of Annual Liability expenditure Since the time of the last survey		
Kerb Asset Group		91%		64%		

Figure K2 Condition Change since last survey & Renewal demand being met

The above 2 figures provide internal benchmarking that details how asset condition has changed since the last survey. Figure K1 provides the condition distribution for each survey along with the first of the key condition indicators, the weighted average asset condition.

Figure K2 contains seven of the eight key condition indicators that are appropriate to the kerb assets. It also shows how they have changed since the previous survey. At the bottom of the table are two very important figures. These indicate the percentage of the annual liability rate that has been met since the last survey, along with the percentage planned for future years.

The kerbs were found to be in very good overall condition. Weighted average asset condition had declined very slightly by -0.40% since 2014, but the extent of poor condition assets at and above conditions 6 - 8 had declined quite dramatically.

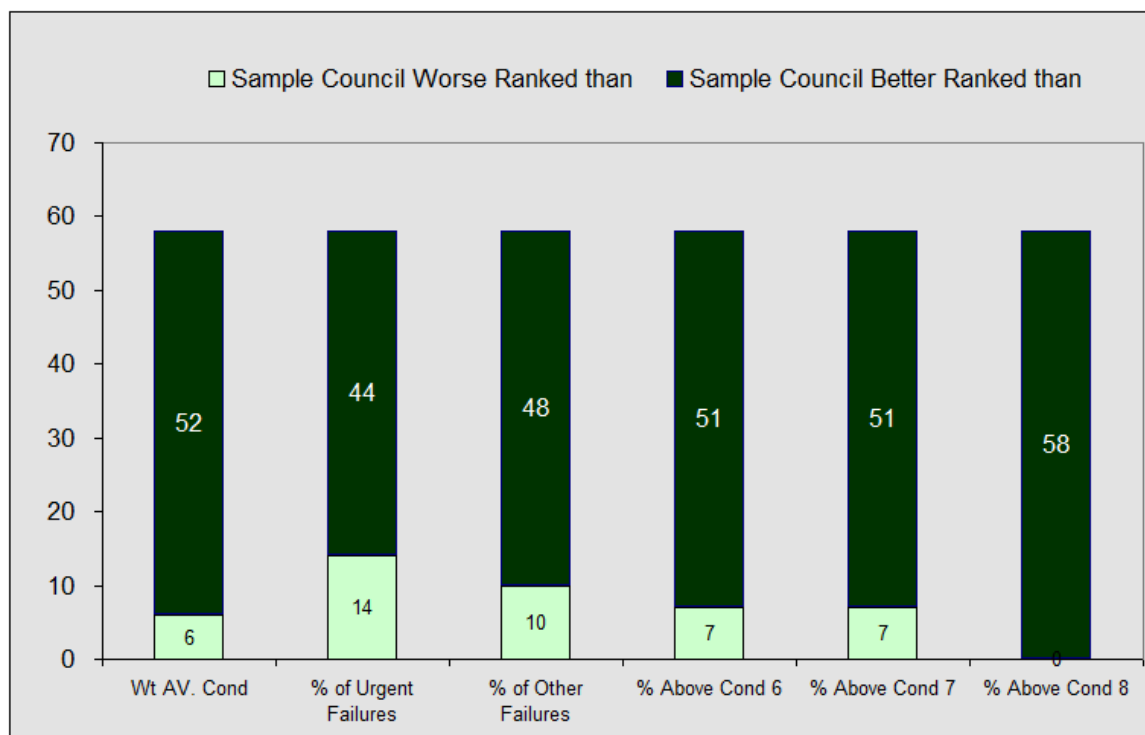


Figure K3 Key Condition Indicators as Compared with other Councils surveyed

Figure K3 provides external benchmarking based on the same key performance indicators as used internally in figure K2. The total number of councils assessed by MAMS on exactly the same basis is 59 for this sub asset class. The graph displays the number of councils ranked better and worse than Sample Council for each of the six performance indicators. The dark green bars represent the number of councils that Sample Council is ranked better than, while the light green is the number that Sample Council is ranked worse than.

The comparison with all 59 councils assessed by MAMS within Figure K3 indicates a set of excellent condition assets across all indicators.

7.2 Kerb Financial Modelling Analysis

Most kerb assets are modelled within a single data set as their performance is generally quite uniform across all assets. We do sometimes separate them when significant stone kerbs are present as these tend to have longer service lives and higher unit renewal rates than concrete kerbs. We sometimes treat the state assets that by default become a council responsibility as a separate asset set.

7.2.1 Kerb Assets – Selection of Retreatment Intervention Level

The point at which you choose to intervene to renew or replace an asset will have a big impact in the predicted future renewal demand. The intervention level can be seen as the level of service associated with the asset set. High intervention level equates to low level of service, while low intervention level relates to a high level of service.

Detailed below are a series of photographs illustrating various kerb condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of the retreatment intervention level.

	
Condition 3 Old but only minor loss of shape & movement	Condition 6 Movement and concrete breakdown
	
Condition 8 Large movement and holding of water	Condition 9 Extreme movement and lack of function

It is very difficult to cover kerb condition in such a limited range of photographs but hopefully they will provide some idea of asset condition in the 6 – 9 condition range where most interventions will take place. Kerbs can be within this condition range for a number of different reasons and the photos will cover only a limited range of these situations. They should be seen as one possible condition situation and not the only situation for that condition rating.

7.2.2 Kerb Assets – Financial Modeling Results

Modelling Parameter	All Kerbs
Asset Quantity in lineal metres	133,486
Unit Renewal Rate	\$127.44
Total Asset Group Renewal Cost	\$17,011,731
Annual Renewal Exp.	\$167,000
Retreat. Intervention Condition	7.0
Life to Condition 10 in Years	100.0
Life in years to Intervention	93.0

Figure K4 – Summary of Modelling Input Parameters for Kerb Assets

Kerbs have been modelled within a single group as detailed in Figure K4 above.

The intervention level has been set at condition 7.0 which is at the lower end of what we consider to be the industry standard figure and reflects the standard that council is currently achieving. Life cycles have been set based on those adopted for the last report and are quite considerably below those coming out of the degradation curve analysis within appendix B.

The ongoing repair of isolated kerb failures does tend to extend the asset lives coming out of our degradation curve analysis as the assets tend to sit within the 4 - 6 condition range for longer than they would without the repairs.

Thus it can be difficult to pin down a firm service life within the model.

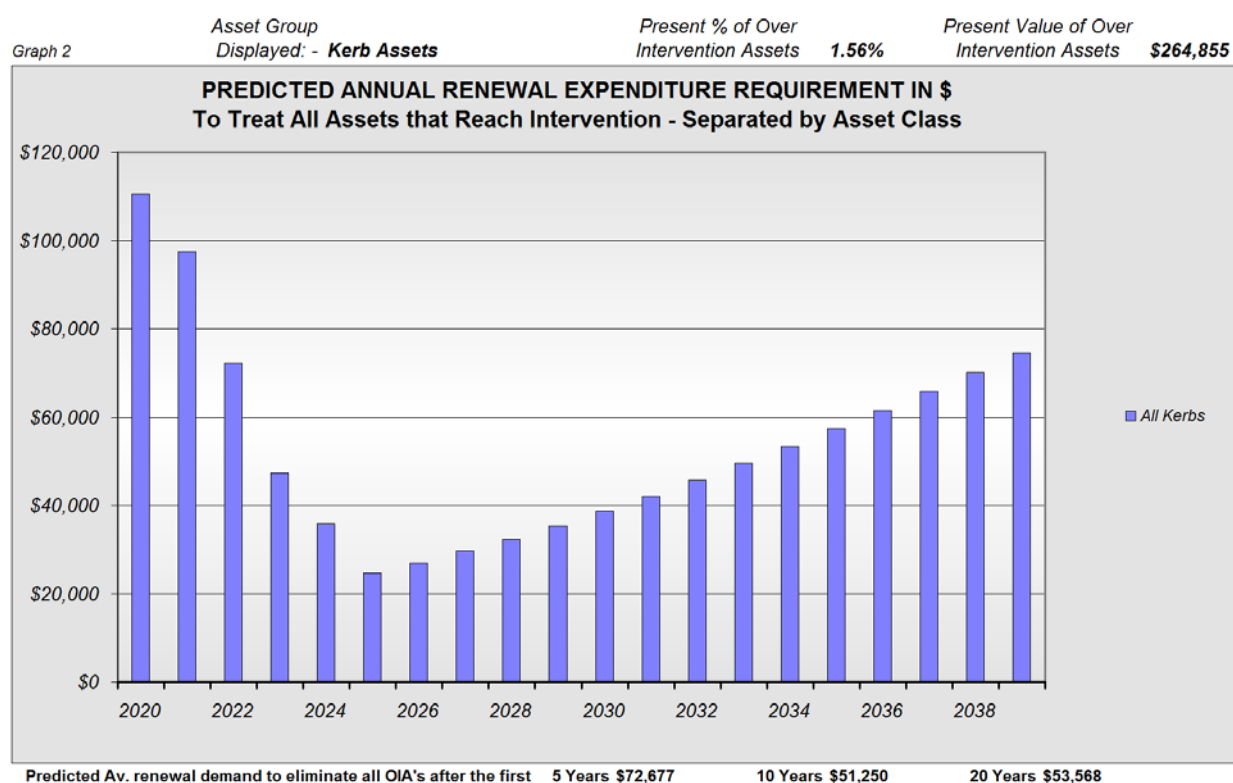


Figure K5 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

Figure K5 plots the annual funding profile required to eliminate all over intervention assets. If there is a large backlog of over intervention assets such that the raw year one demand is 30% or greater than the year two demand then the Moloney model eases the difference in over the first five years (this will show up as a reducing demand over the first five years). For this reason we prefer to quote the present renewal demand as the average figure for the first 5 years. In this case the first 5 year average renewal demand is estimated at \$73,000 pa. If this expenditure is maintained all OIA's will be eliminated after 5 years.

All of the isolated kerb failures that were identified during the survey were converted into small pieces of poor condition asset and then included within the model to be repaired at a higher than normal unit rate because of their short lengths. In this way the model is covering all of the full length poor condition assets as well as the isolated kerb failures within its calculations. This action is a strong contributor to the high spike in the years 1 - 5 renewal demand within Figure K5.

Figure K5 indicates that the capital renewal demand pattern to treat all assets that are predicted to reach the retreatment intervention level over the next 20 years has an average annual renewal demand of \$73,000 pa for the first 5-years. The peak demand over the next 20 years is estimated at \$75,000 in the year 2039.

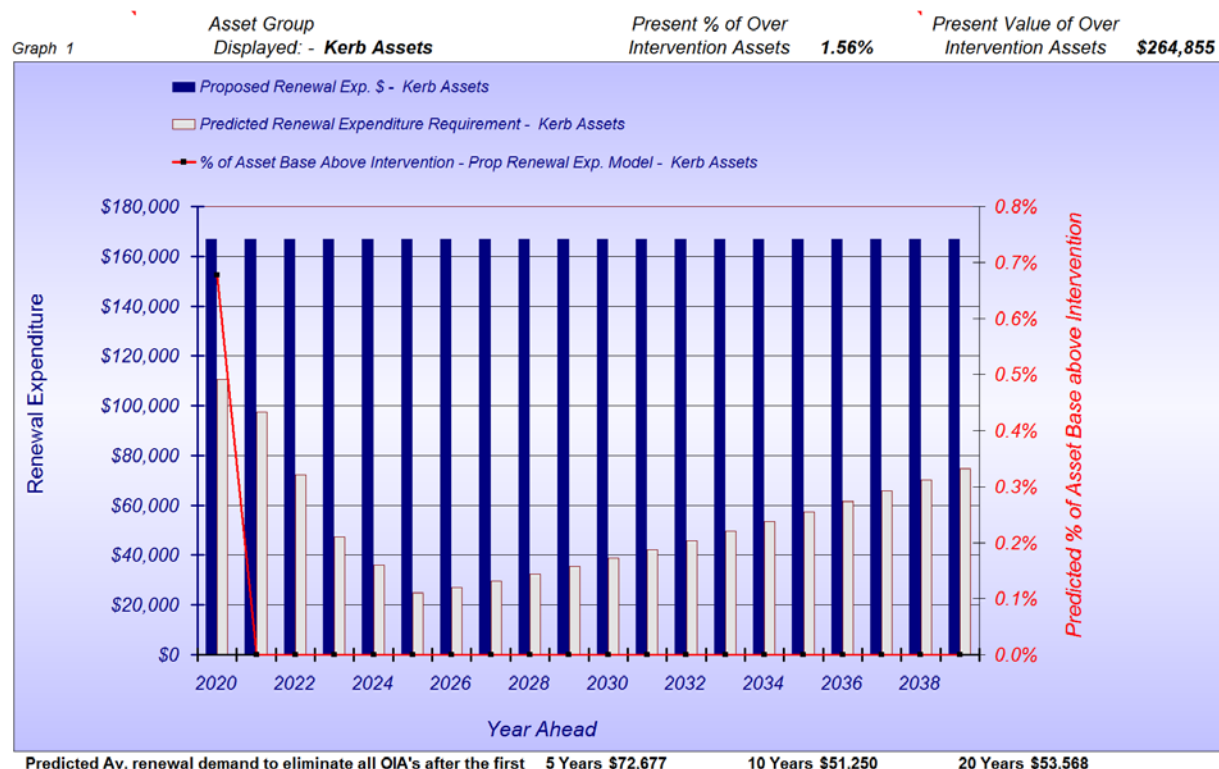


Figure K6 Future Predicted Condition Based on planned expenditure profile

Figure K6 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the continuation of the planned level of renewal expenditure (in blue bars). It also plots the predicted renewal demand to treat all over intervention assets within the grey bars (Same aggregate figures as within Figure K5 but not split into the individual modelling sets).

Figure K6 indicates that the planned renewal expenditure at \$167,174 pa, if maintained, will result in the present extent of over intervention assets of 1.56% being eliminated within two years.

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of over intervention assets within a selected time frame. A global outcome can be set for the whole roads group. In this way the model can also be used to allocate funding between the sub asset groups to deliver the best overall condition outcome for all road assets.

Please refer to Appendix D which explains why and how we set the desired extent of over intervention assets in terms of the number of year's worth of annual liability that it represents. Appendix D4 also provides an explanation of the Moloney funding scenario finder along with its three basic input criteria requirements. The three input criteria adopted for the kerb assets are as detailed within figure K7 below with the results of the funding scenario finder operation contained within figure K8.

For the kerbs we have set the level of over intervention assets at 90% of one year's annual liability which equates to 0.97% of the network. The current level being 1.56%. We have set the desired extent of over intervention assets at the top of the Excellent Range (Refer to Appendix D Figure D 1 for details).

The aim with the funding scenario finder is to deliver a consistent extent of over intervention assets across all road sub asset classes based on the number of years of annual liability that the over intervention assets represent.

We have also extended the modelling period out to 20 years to capture the steadily growing renewal demand within the second decade.

Road Sub Asset Set Description	Criteria 1. Extent of OIA's		Criteria 2. Years to achieve Desired Condition outcome	Criteria 3 Annual % of Compounding funding increase (if required)
	Expressed as the % of One Years Annual Liability	Expressed as a % of The Total Asset Set Replacement Valuation		
Kerbs	90%	0.97%	20	0.0%

Figure K7 Modelling scenario finder inputs - Sealed Pavement Assets

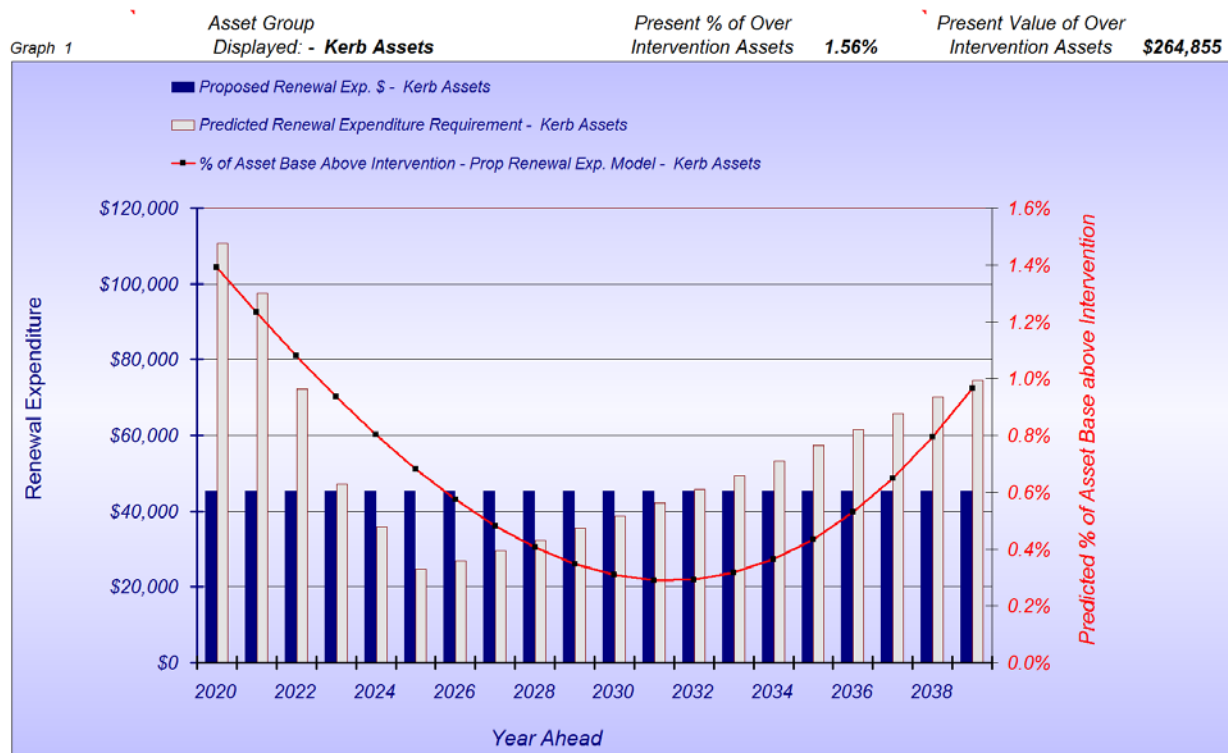


Figure K8 Recommended future Renewal funding strategy

The recommended renewal expenditure level is a flat \$45,000 pa for the next 5 - 10 years.

7.3 Kerb Summary

The kerb assets were found to be in very good to excellent overall condition with a very strong decline in the extent of poor condition assets found since our last survey in 2014.

It is recommended that the renewal expenditure be set at a flat \$45,000 pa for the next 5 years before being reviewed again following the next condition survey.

Section 8: Footpath Sub Assets

This section will deal with the Footpath Sub assets. It will look at both internal and external benchmarking of asset condition as well as providing financial forecasting of future renewal demand and projected asset condition.

8.1 Condition and Performance of Footpath assets

The same eight common key performance indicators are used for all road sub assets. An explanation for each is available within sections 4.1 to 4.1.6 above rather than duplicating those details here. Seven of the eight condition indicators that were appropriate to the Footpath assets have been used here.

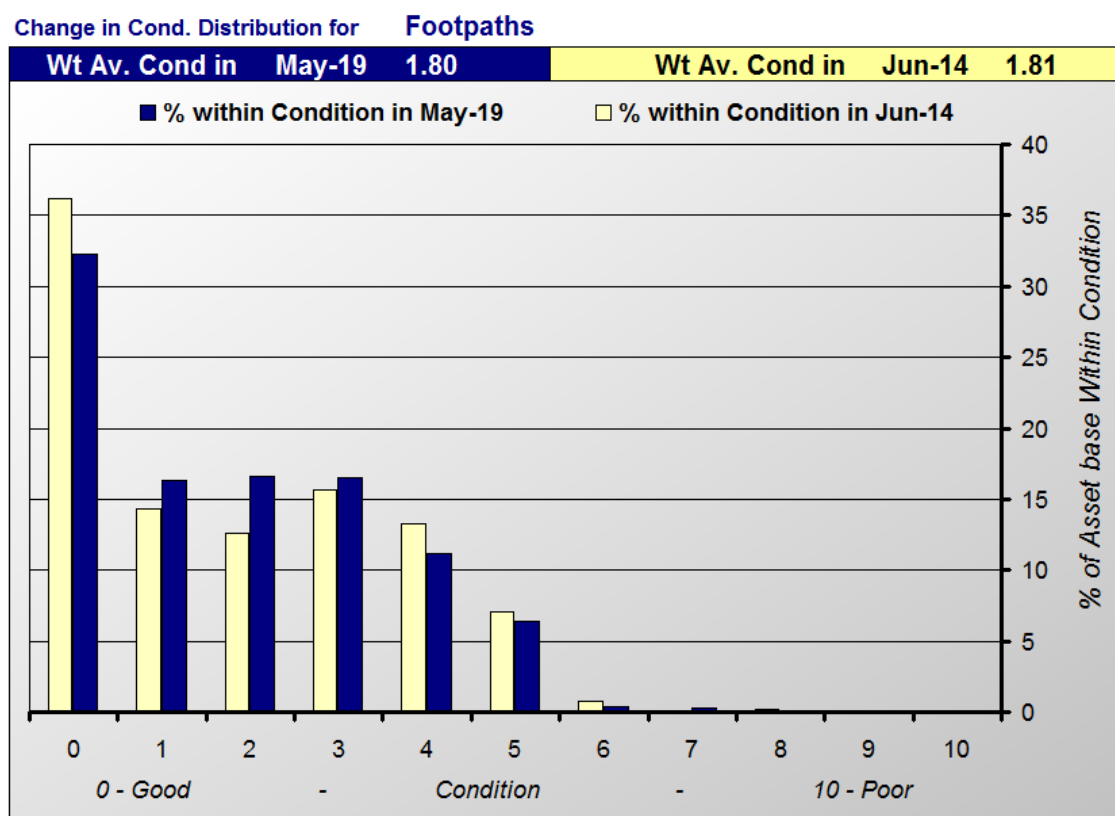


Figure F1 Condition Distribution Comparison Graph – Between Surveys

Key Cond. Indic. No.	Footpath Condition Indicator	Figures from Last Survey in Jun-14	Figures from Current Survey in May-19	Actual Change Negative is a Condition Decline	% Change Between Surveys	Better or Worse Since last Survey
1	Weighted Average Asset Condition	1.81	1.80	0.01	0.1%	Better
2	% of Urgent Failures	0.105	0.022	0.082	78.6%	Better
3	% of Other Failures	1.97	3.01	-1.035	-52.5%	Worse
4	% of Asset Base above Condition 5	8.00	7.04	0.96	12.0%	Better
5	% of Asset Base above Condition 6	0.95	0.65	0.30	31.3%	Better
6	% of Asset Base above Condition 7	0.224	0.274	-0.05	-22.2%	Worse
7	% of Asset Base above Condition 8	0.120	0.002	0.12	98.2%	Better
Renewal Demand Being Met For:		% of Annual Liability expenditure Planned in Future years		% of Annual Liability expenditure Since the time of the last survey		
Footpath Asset Group		38%		46%		

Figure F2 Condition Change since last survey & Renewal demand being met

The above 2 figures provide internal benchmarking that details how asset condition has changed since the last survey. Figure F1 provides the condition distribution for each survey along with the first of the key condition indicators, the weighted average asset condition.

Figure F2 contains seven of the eight key condition indicators that are appropriate to the Footpath assets. It also shows how they have changed since the previous survey. At the bottom of the table are two very important figures. These indicate the percentage of the annual liability rate that has been met since the last survey, along with the percentage planned for future years.

The Footpaths were found to be in excellent overall condition. Weighted average asset condition had improved by 0.1% since 2014, but other indicators were a little variable.

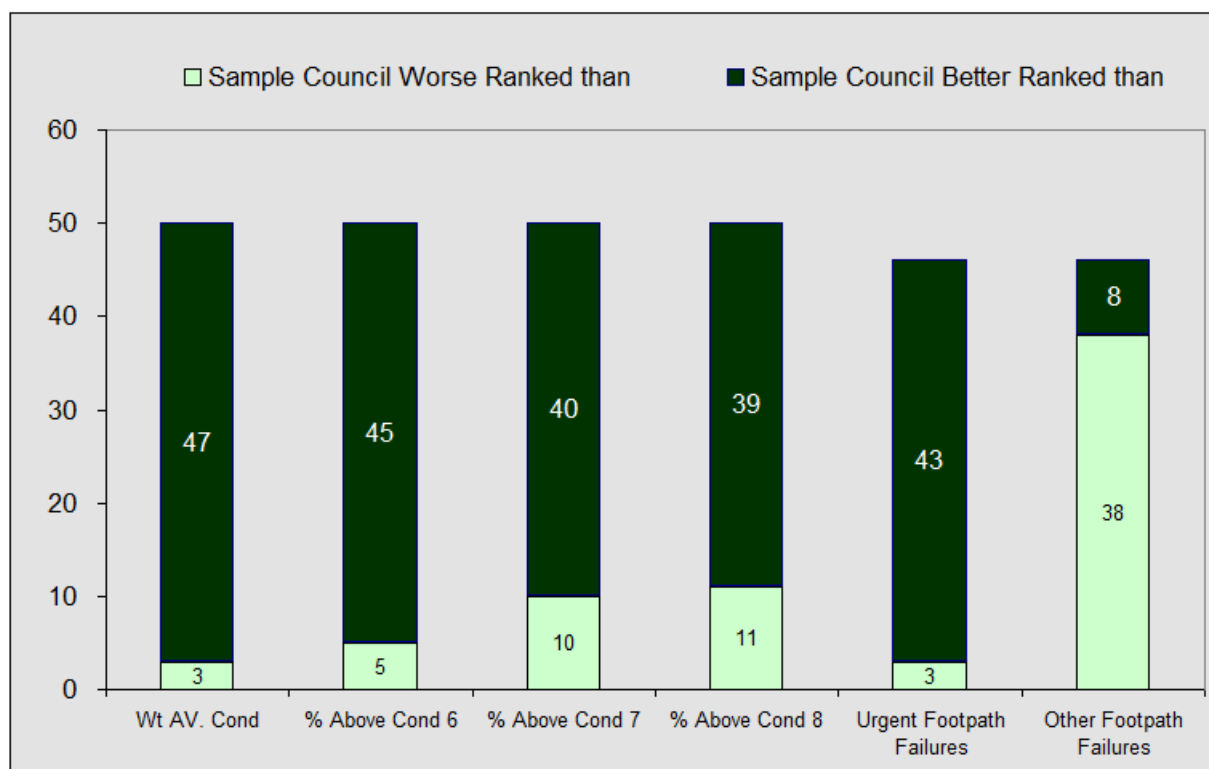


Figure F3 Key Condition Indicators as Compared with other Councils surveyed

Figure F3 provides external benchmarking based on the same key performance indicators as used internally in figure F2. The total number of councils assessed by MAMS on exactly the same basis is 59 for this sub asset class. The graph displays the number of councils ranked better and worse than Sample Council for each of the six performance indicators. The dark green bars represent the number of councils that Sample Council is ranked better than, while the light green is the number that Sample Council is ranked worse than.

The comparison with all 51 councils assessed by MAMS within Figure F3 indicates a set of excellent condition assets across all indicators other than the extent of the other of non urgent footpath failures.

8.2 Footpath Financial Modelling Analysis

Most Footpath assets are modelled within several like performing data sets.

8.2.1 Footpath Assets – Selection of Retreatment Intervention Level

The point at which you choose to intervene to renew or replace an asset will have a big impact in the predicted future renewal demand. The intervention level can be seen as the level of service associated with the asset set. High intervention level equates to low level of service, while low intervention level relates to a high level of service.

Detailed below are a series of photographs illustrating various Footpath condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of the retreatment intervention level.



Condition 0 – 1 Excellent condition



Condition 6 Extensive movement



Condition 7 Extensive cracking and movement



Condition 9 Very poor condition – cracking and breaking up

It is very difficult to cover footpath condition in such a limited range of photographs but hopefully they will provide some idea of asset condition in the 6 – 9 condition range where most interventions will take place. Footpaths can be within this condition range for a number of different reasons and the photos will cover only a limited range of these situations. They should be seen as one possible condition situation and not the only situation for that condition rating.

8.2.2 Footpath Assets – Financial Modeling Results

Modelling Parameter	Brick and Patterned Conc.	Concrete Footpaths	Asphalt Footpaths	Gravel Footpaths
Asset Quantity in sqm	912	55,012	59,923	14,443
Unit Renewal Rate	\$143.78	\$111.07	\$67.88	\$10.02
Total Asset Group Renewal Cost	\$131,125	\$6,110,305	\$4,067,469	\$144,757
Annual Renewal Exp.	\$2,000	\$7,000	\$81,000	\$3,000
Retreat. Intervention Condition	7.0	7.0	7.0	7.0
Life to Condition 10 in Years	60.0	80.0	30.0	20.0
Life in years to Intervention	50.0	73.2	27.4	18.3

Figure F4 – Summary of Modelling Input Parameters for Footpath Assets

Footpaths have been modelled within four groups as detailed in Figure F4 above.

The intervention level has been set at condition 7.0 which is considered to be the industry standard figure. Life cycles have been set based on those adopted for the last report and are quite considerably below those coming out of the degradation curve analysis within appendix B.

The ongoing repair of isolated Footpath failures does tend to extent the asset lives coming out of our degradation curve analysis as the assets tend to sit within the mid to later range conditions for longer than they would without the repairs.

Thus it can be difficult to pin down a firm service life within the model.

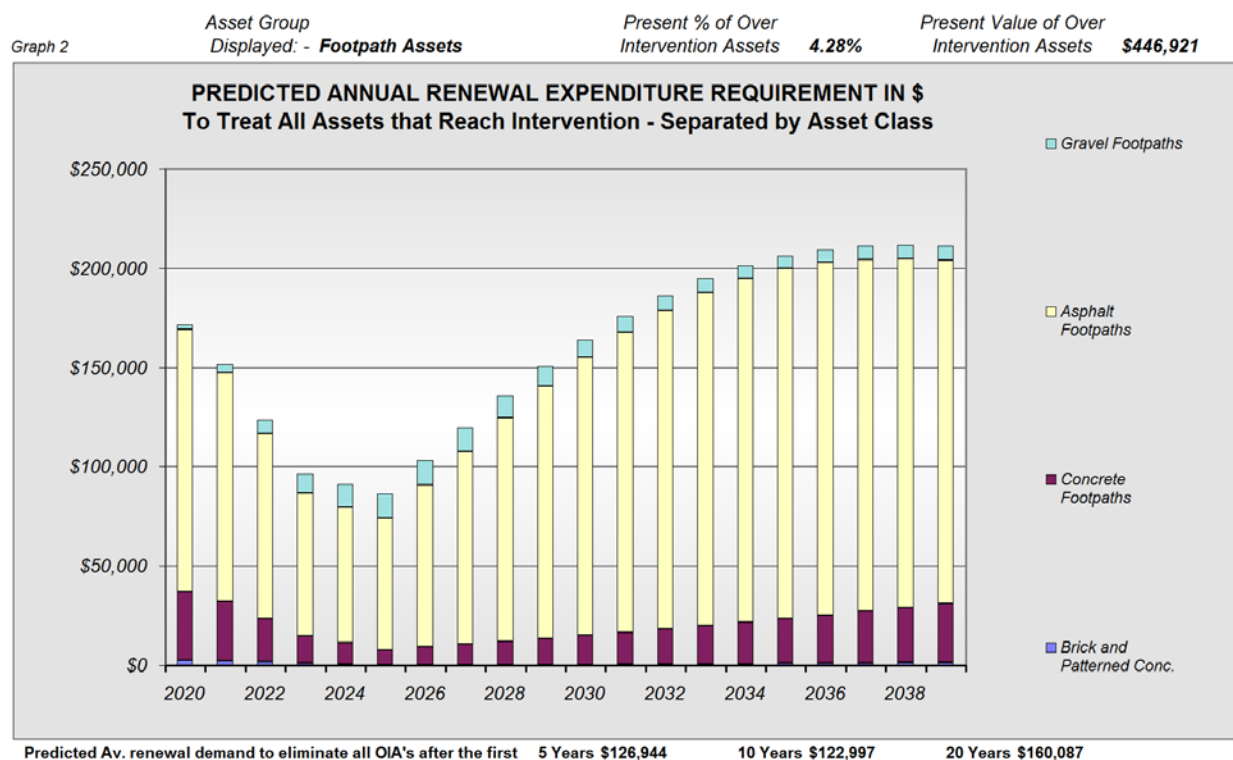


Figure F5 Predicted Renewal Demand to treat all assets that reach the Intervention level in future years

Figure F5 plots the annual funding profile required to eliminate all over intervention assets. If there is a large backlog of over intervention assets such that the raw year one demand is 30% or greater than the year two demand then the Moloney model eases the difference in over the first five years (this will show up as a reducing demand over the first five years). For this reason we prefer to quote the present renewal demand as the average figure for the first 5 years. In this case the first 5 year average renewal demand is estimated at \$126,944 pa. If this expenditure is maintained all OIA's will be eliminated after 5 years.

All of the isolated footpath failures that were identified during the survey were converted into small pieces of poor condition asset and then included within the model to be repaired at a higher than normal unit rate because of their short lengths. In this way the model is covering all of the full length poor condition assets as well as the isolated footpath failures within its calculations. This action is a strong contributor to the higher than trend spike in demand in the years 1 - 5 within Figure F5.

Figure F5 indicates that the capital renewal demand pattern to treat all assets that are predicted to reach the retreatment intervention level over the next 20 years has an average annual renewal demand of \$126,944 pa for the first 5-years. The peak demand over the next 20 years is estimated at \$212,000 in the year 2038.

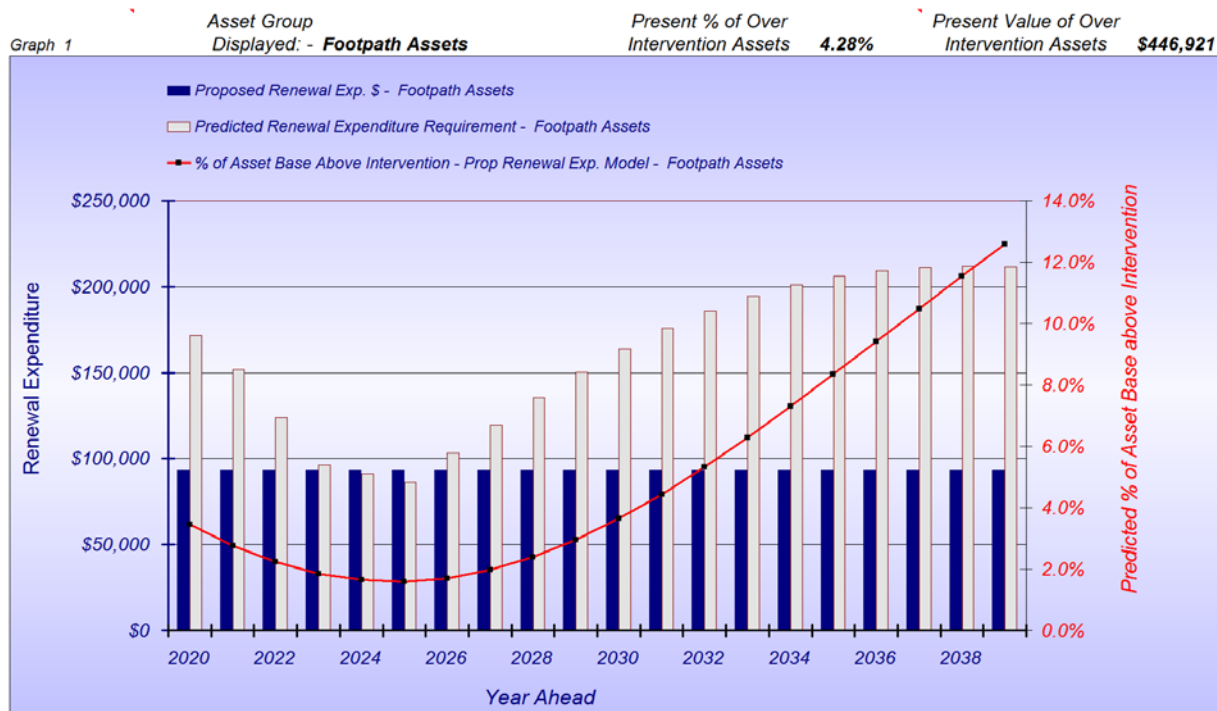


Figure F6 Future Predicted Condition Based on planned expenditure profile

Figure F6 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the continuation of the planned level of renewal expenditure (in blue bars). It also plots the predicted renewal demand to treat all over intervention assets within the grey bars (Same aggregate figures as within Figure F5 but not split into the individual modelling sets).

Figure F6 indicates that the planned renewal expenditure at \$92,545 pa, if maintained will result in a total level of OIA's of 2.96% after 10 years down from the present level of 4.28%.

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of over intervention assets within a selected time frame. A global outcome can be set for the whole roads group. In this way the model can also be used to allocate funding between the sub asset groups to deliver the best overall condition outcome for all road assets.

Please refer to Appendix D which explains why and how we set the desired extent of over intervention assets in terms of the number of year's worth of annual liability that it represents. Appendix D4 also provides an explanation of the Moloney funding scenario finder along with its three basic input criteria requirements. The three input criteria adopted for the Footpath assets are as detailed within figure K7 below with the results of the funding scenario finder operation contained within figure K8.

For the Footpaths we have set the level of over intervention assets at 90% of one year's annual liability after 12 years, which equates to 2.09% of the network, the current level being 4.28%. We have set the desired extent of over intervention assets at the top of the Excellent Range (Refer to Appendix D Figure D 1 for details).

The aim with the funding scenario finder is to deliver a consistent extent of over intervention assets across all road sub asset classes based on the number of years of annual liability that the over intervention assets represent.

Road Sub Asset Set Description	Criteria 1. Extent of OIA's		Criteria 2. Years to achieve Desired Condition outcome	Criteria 3 Annual % of Compounding funding increase (if required)
	Expressed as the % of One Years Annual Liability	Expressed as a % of The Total Asset Set Replacement Valuation		
Footpaths	90%	2.09%	12	0.0%

Figure F7 Modelling scenario finder inputs - Sealed Pavement Assets

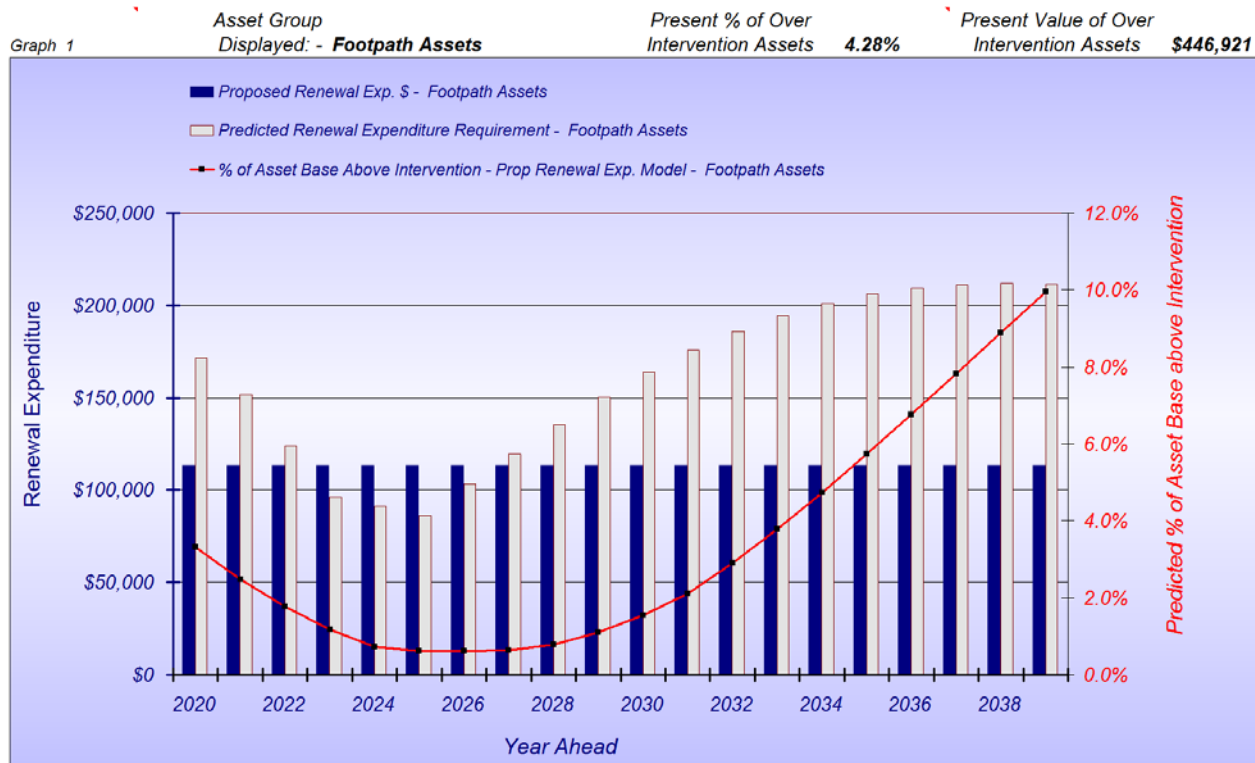


Figure F8 Recommended future Renewal funding strategy

The recommended renewal expenditure level is a flat \$114,000 pa for the next 5 - 10 years. This is predicted to deliver a total level of OIA's of 1.09% after 10 years and 2.09% after 12 years.

8.3 Footpath Summary

The Footpath assets were found to be in excellent overall condition, but there was found to be a 52% increase in the extent of non urgent footpath failures since 2014. However, the total extent of non urgent failures remains at a reasonable level when compared against all other councils assessed (See Figure K3). Overall condition had improved very slightly since our last survey in 2014.

It is recommended that the renewal expenditure be set at a flat \$114,000 pa for the next 5 years before being reviewed again following the next condition survey.

Section 9: Aggregated Modelling Results for the Road Network

9.1 Overall Financial Reporting

Accurate network modelling within the Moloney system depends upon several independent modelling variables. Council now has a good handle on most of these variables and the modelling results are becoming quite meaningful. Modelling has been based upon the ongoing rehabilitation of the existing asset base only and does not allow for an expanding asset base. Any proposed expenditure on the upgrading of existing assets must be added to the figures delivered within this report.

The Moloney System allows for the modelling of up to 40 individual asset sets and to then combine these results firstly into up to ten reporting groups (Sub asset sections in this report). Then finally into an aggregated set of reports for the whole road network. This section will deal with the aggregated modelling results for the whole roads group.

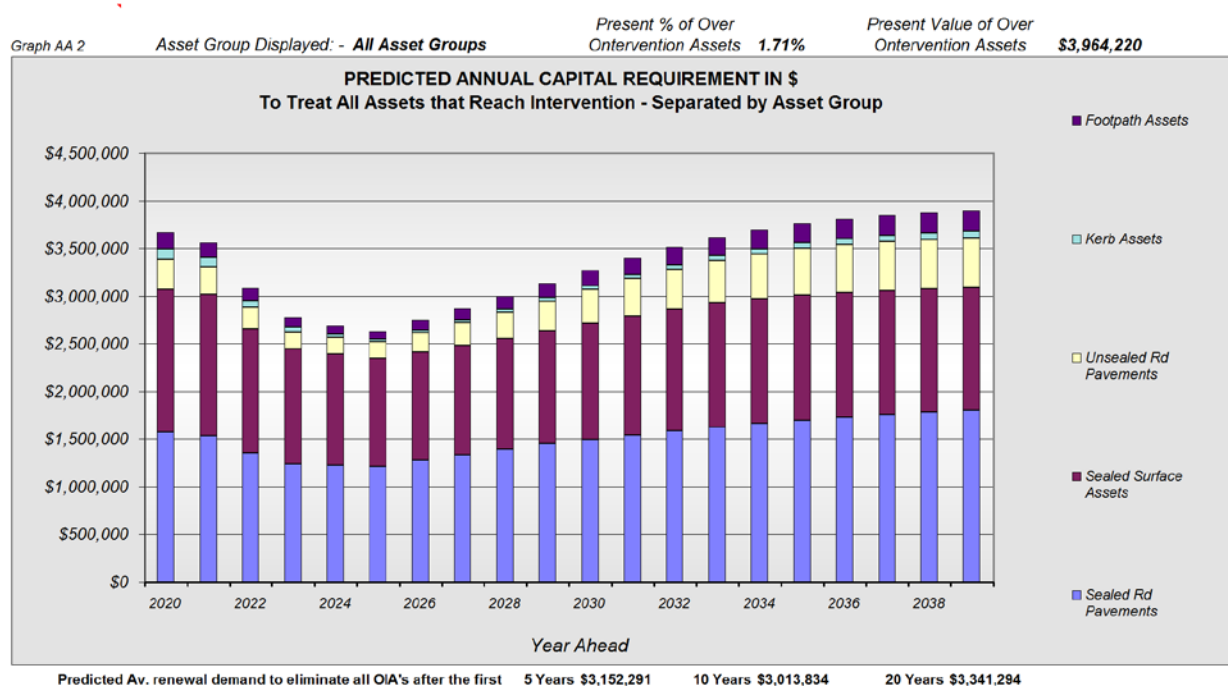


Figure Agg 1 Predicted Renewal Demand to treat all assets that reach the Intervention level

Figure Agg 1 plots the annual funding required to treat all over intervention assets within the first 5 years. It also splits the total renewal demand into the sub asset sets that were analysed within sections 4 to 8 above.

Figure Agg 1 plots the 20 year estimated renewal demand to treat all assets that are predicted to reach the retreatment intervention level through normal decay with time. Because the model is programmed to ease in the year one demand over 5 years when the raw year one demand is 30% greater than year two, it is best to report the commencing renewal demand as an average figure for the first 5 years. The average renewal demand over the first 5 years for the whole roads group is estimated at \$3,153,000. The peak demand over the next 20 years is \$3,894,000 in the year 2039.

Agg 1 also displays at the top of the graph the present extent of over intervention assets for the whole roads group expressed in three ways. Firstly as 1.71% of the total asset base valuation, which equates to a total renewal value of \$3,964,220. Finally as the number of year's worth of annual liability at 100% of one year's figure. The Moloney standardised condition descriptor table in Figure D 1 of Appendix D reports this extent of over intervention assets for the whole road network as being within the "Excellent" condition range.

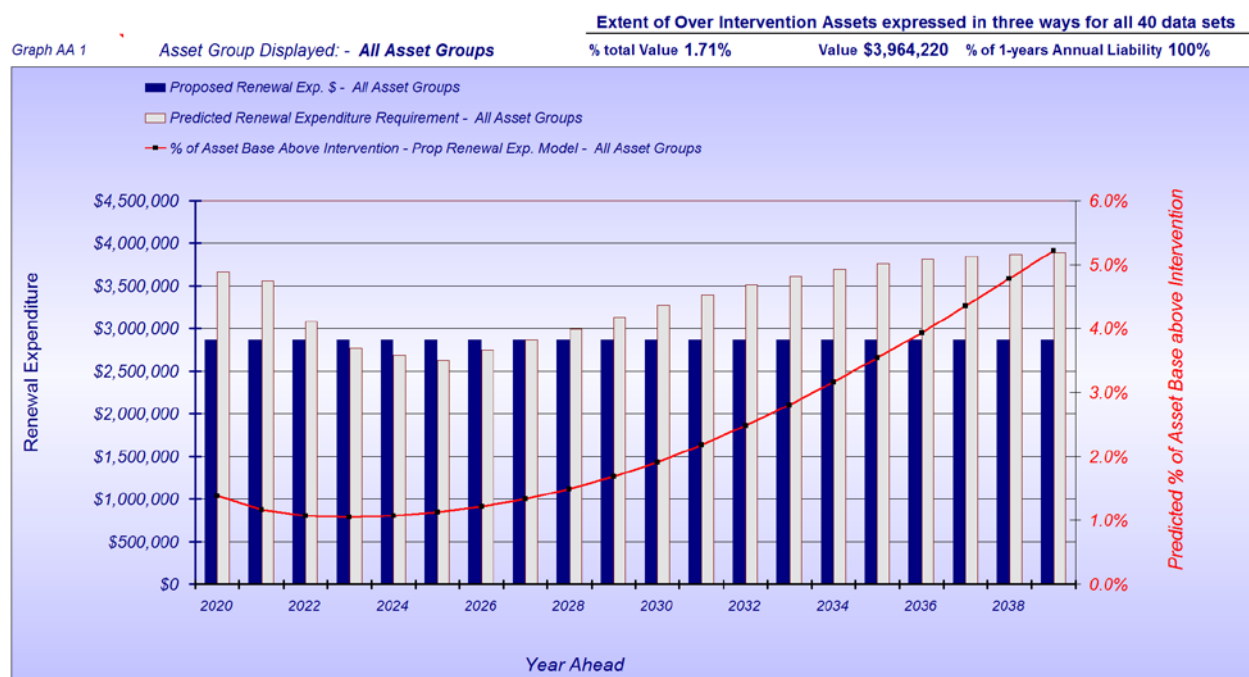


Figure Agg 2 – Future Predicted Condition - Based on the continuation of the planned expenditure profile

Figure Agg 2 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the continuation of the planned level of renewal expenditure (in blue bars) on the same basis as the present split between the road sub assets. It also plots the predicted renewal demand to treat all over intervention assets within the grey bars (Same aggregate figures as within Figure Agg 1 but not split into the sub asset modelling groups).

If the planned renewal expenditure of \$2,868,748 is maintained for the next 10 years figure Agg 2 indicates that the present extent of over intervention assets at 1.71% will drop to 1.68% after 10 years but rise to 5.22% after 20 years. The better performance within Figure Agg 3 with the same total spend is as a result of the funding scenario finder better distributing the renewal expenditure based on need over the next 12 years across all road sub assets.

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of over intervention assets within a selected time frame. A global outcome can be set for the whole roads group. In this way the model is also used to allocate funding between the sub asset groups on a needs basis to deliver the best overall condition outcome for the whole roads group.

Please refer to Appendix D which explains why and how we set the desired extent of over intervention assets in terms of the number of year's worth of annual liability that it represents. Appendix D4 also provides an explanation of the Moloney funding scenario finder along with its three basic input criteria requirements.

Road Sub Asset Set Description	Criteria 1. Extent of OIA's		Criteria 2. Years to achieve Desired Condition outcome	Criteria 3	
	Desired extent of Over intervention assets as a % of one Years Annual Liability	Desired Over Intervention Assets as a % of total asset base		Annual % of Compounding funding increase (if required)	Annual Compounding increase in renewal expenditure expressed in \$
Sealed Rd Pavements	90%	0.97%	12	0.00%	\$0
Sealed Surfaces	90%	5.40%	12	0.00%	\$0
Unsealed Rd Pavements	90%	3.33%	20	0.00%	\$0
Kerbs	90%	0.97%	20	0.00%	\$0
Footpaths	90%	2.09%	12	0.00%	\$0
All Assets	90%	1.54%	Variable	0.00%	\$0

Figure Agg 3 Modelling scenario finder inputs - All Assets

The three input criteria adopted for each of the road sub asset sets are as detailed within figure Agg 3 with the results of the funding scenario finder operation contained within figure Agg 4.

Figure Agg 3 contains the details of the three criteria that were used within the Moloney funding scenario finder for each of the five road sub asset sets that were modelled. The same three criteria were adopted for all sub assets other than an extension of the time to deliver from 12 to 20 years for the unsealed pavement and kerb assets.

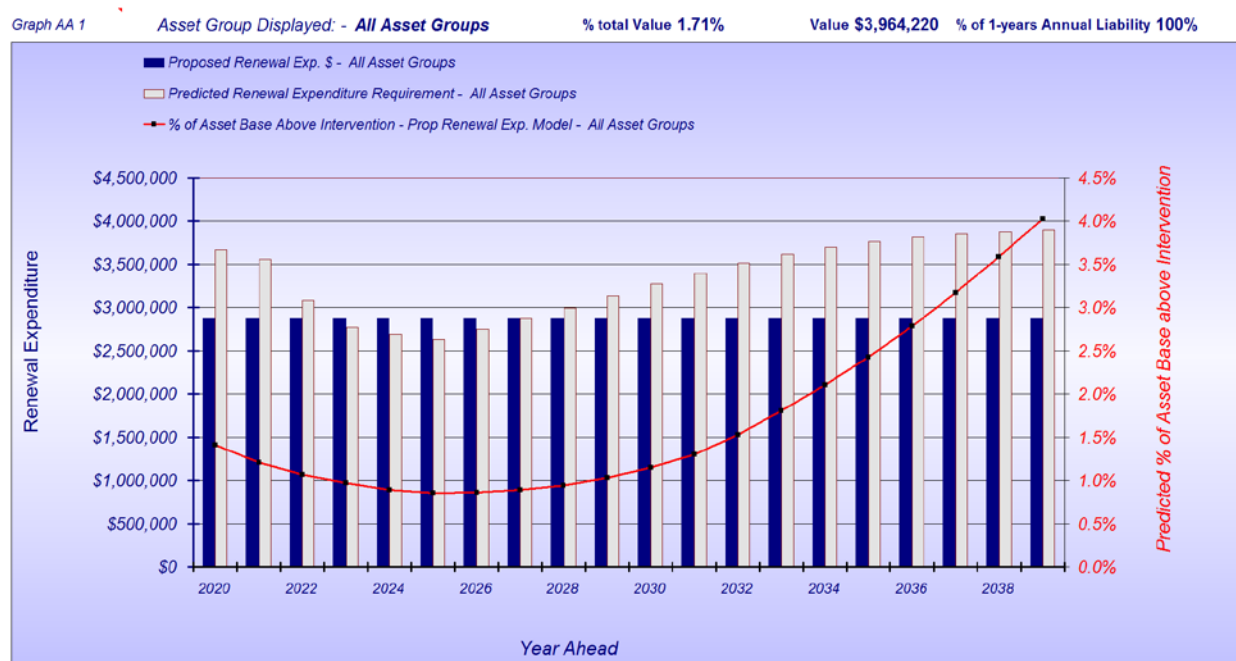


Figure Agg 4 – Recommended future funding Strategy

Figure Agg 4 details the recommended total renewal expenditure level for the next Variable years.

It was found that a flat expenditure of \$2,868,000 pa over the next 12 years would deliver the required condition outcome of 90% of one years annual liability or 1.54% of the total network replacement value at the end of 12 - 13 year.

If a 20 year modelling time frame were set then council could achieve the same total extent of OIA's of 90% of one years annual liability or 1.54% of the total network replacement value at the end of the 12 year period.

In summary, the present total planned renewal expenditure level of \$2,868,000 pa is considered to be at an appropriate total level for the next 12 years to deliver on the desired overall condition outcome.

If council wanted to extend the modelling period out to 20 years with the same condition outcome, it would require an additional 0.8% compounding annual increase for the whole 20 years.

Other scenarios can be run to achieve different outcomes on different time frames. The Moloney model is extremely versatile and it is strongly recommended that council spend the time to understand it and use it, as it will be a most valuable tool in the development of the 10 year financial plan for the organization. Note also that the model is not limited to road assets and can be set up to analyse any assets that are created, decay with time and then require replacement or renewal.

The model can also be set to allow for annual CPI increases. But over a 10 - 20 year time frame it can be difficult to distinguish between real increasing renewal demand and that relating to inflation. Hence our preference is to report in today's values only.

Sub Asset Description	Present Annual Expenditure on Upgrades and New Assets	Average Planned renewal expenditure next 5 Years	Average Annual Liability (Based upon modelling lives and valuations)	Annual Depreciation based on Accounting valuations and lives	Average Capital Renewal Demand for next 5-years to eliminate all over intervention assets	Year of Condition Inspection	Recommended Commencing Year 1 funding level with no annual compounding increase
Sealed Pavements	\$0	\$968,650	\$1,834,147	\$2,001,450	\$1,385,000	2019	\$1,247,000
Sealed Surfaces	\$0	\$1,180,379	\$1,242,115	\$1,056,447	\$1,330,000	2019	\$1,110,000
Unsealed Pavements	\$0	\$460,000	\$472,391	\$571,092	\$238,000	2019	\$352,000
Kerbs	\$0	\$167,174	\$182,873	\$172,719	\$73,000	2019	\$45,000
Footpaths	\$0	\$92,545	\$242,293	\$231,830	\$127,000	2019	\$114,000
Totals	\$0	\$2,868,748	\$3,973,819	\$4,033,537	\$3,026,000		\$2,868,000
C - G Value being consumed annually		\$1,105,071					

Figure Agg 5 – Summary Table of Current & Recommended Renewal Expenditure Levels

Figure Agg 5 provides some important overall financial figures. It shows that Sample Council is presently funding its road renewal program at an appropriate total level of \$2,868,748 pa. The full annual liability is estimated at \$3,973,819 pa, so the assets will be consumed at around \$1,105,071 pa.

We try to commence the recommended renewal expenditure level in year 1 at the same level as your present total expenditure. In this case we were able to push out the modelling period to 12 years and still achieve a very strong condition outcome based on the continuation of your planned total renewal expenditure level.

All figures within this report are in today's values. No allowance has been made for CPI increases. The Moloney software does have the capacity to report with an allowance for CPI. But over a 10-20 year time frame CPI lifts values quite markedly and it can be difficult to discern if a rising renewal demand is due to CPI or real growth in demand. Thus we prefer to report the predicted renewal demand in today's values.

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Appendix A: Asset Valuations

This appendix deals with asset valuations

A.1 Estimated Asset Valuations

Following the completion of the survey the data was placed into the Moloney asset management system and the table below represents a summary of the overall asset quantities and valuations. The annual depreciation figure of \$4,033,537 pa is based upon the best available accounting greenfields construction costs and the adopted accounting service lives.

Annual Depreciation has not been used within this report as the basis of the average long term renewal demand. We have adopted what we call the "Annual Liability" for this purpose. See Appendix E for the definitions of both figures.

The annual liability figures are all based on the estimated rehabilitation costs (Not greenfields construction costs) and we have more flexibility to set service lives that are closer to the lives coming out of the degradation curve analysis. In this way our financial modelling results can be more accurate and we can compare planned or recommended expenditure levels to the actual average annual long term liability rather than the annual depreciation which is designed to deliver a tax deductible figure for use in business tax calculations.

ASSET DESCRIPTION	Total Quantity	Units	Replace. Value \$	Asset Life in Years	Written Down Value \$	Accumul. Deprec. \$	Annual Deprec. \$	Average Date of Cond. Assessment	Annual Liability from Modelling inputs
Footpath	71,485	Lin. Met	10,301,145	47.8	8,447,370	1,853,775	231,830	10-May-19	\$242,293
Kerb	139,132	Lin. Met	16,951,956	97.2	13,000,658	3,951,298	172,719	10-May-19	\$182,873
Sealed Pavements	574,879	Lin. Met	170,817,558	89.2	111,776,701	59,040,857	2,001,450	10-May-19	\$1,834,147
Unsealed Pavement	385,451	Lin Met	12,752,897	22.7	10,151,282	2,601,616	571,092	10-May-19	\$472,391
Sealed Surface	574,879	Lin. Met	21,343,095	20.7	14,592,906	6,750,189	1,056,447	10-May-19	\$1,242,115
			\$232,166,652		\$157,968,916	\$74,197,736	\$4,033,537		\$3,973,819

Figure 3.1 Table of asset valuations for financial modelling purposes

There is some minor variation between the annual depreciation and annual liability figures within Figure 3.1. Sometimes accounting valuations are restrained by Australian and international accounting standards that are more focused on delivering an annual depreciation figure for taxation purposes than an annual ongoing liability estimate.

We tend to ignore the accounting unit rates and life cycles if we feel they do not relate to delivering an accurate "annual liability" figure. The unit rates and life cycles used within the modelling process are focused on the best and most accurate actual financial outcomes and can vary from a strict interpretation of the accounting standards.

In this case the total annual Liability is a little lower than the annual depreciation figure. We have mostly adopted the same unit renewal rates but the asset service lives have been amended within the model to better reflect the values coming out of our degradation curve work over the last 18 years.

However, it is felt that there is some scope to increase the service lives a little further based on both the degradation curve analysis and asset condition performance when compared to renewal expenditure levels.

Appendix B: Asset Degradation – Performance Curves

Asset degradation or performance curves, unique to the district, can be developed once two or more consistent condition surveys have been undertaken. This is done in the Moloney system by examining all assets within a given condition rating following the first survey and determining which have degraded by the time of the second and or subsequent surveys.

The condition change between surveys is used to predict the annual statistical probability of an asset degrading from one asset condition to the next. In turn this equates to an expected average life within each condition rating. The degradation curves serve two very important functions. Firstly they are used within the financial modelling section of the Moloney system to predict future asset condition movement and financial demand. Secondly they should form the basis of the justification for the selection of depreciation or service life cycles within the accounting system.

The term Degradation Curve comes from a particular format that the degradation data can be presented in. Figure B 1 below is a graphical representation of one of the pavement groups to be modelled and shows how an average asset within the group would perform. In this case it commences at year zero in condition zero at the top left side of the graph and progresses to reach condition 10 after 147 - years.

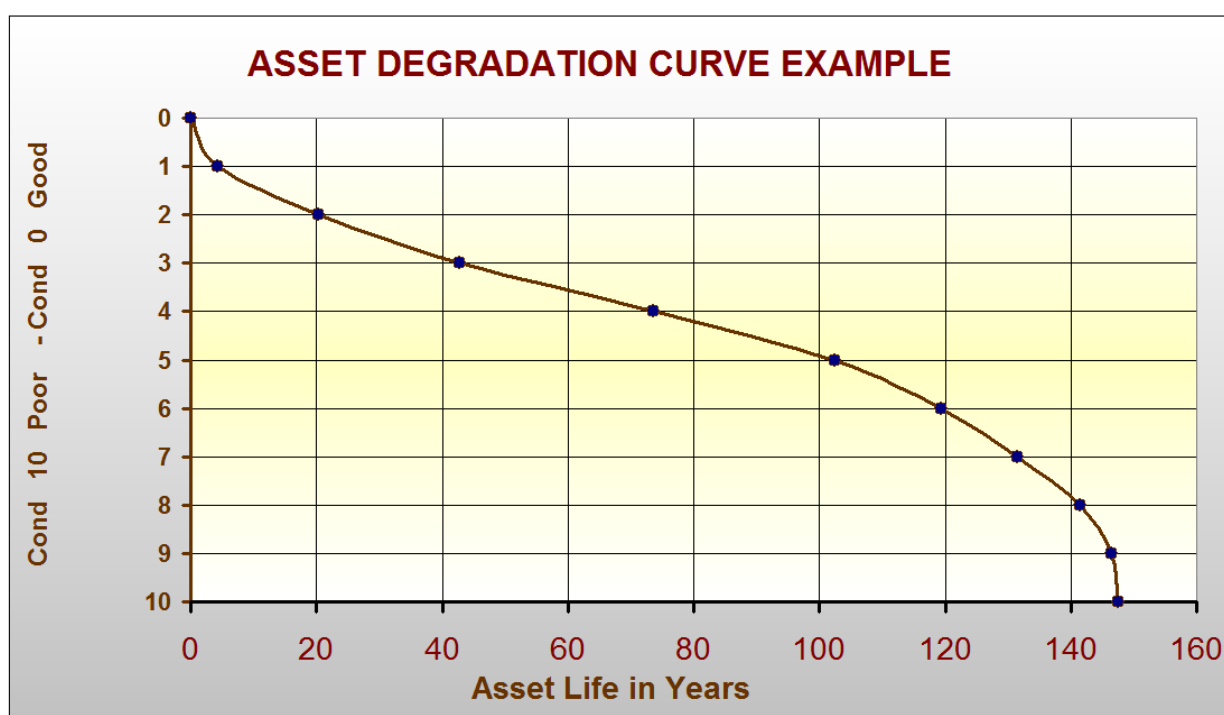


Figure B 1 Example of a Degradation Curve (See Fig B 2 First Column)

Within the asset degradation tables below the results are expressed as an expected life in years within each of the condition ratings 0 to 9. Little or no asset life is allocated above condition 8 as this is generally considered the upper condition limit for an asset to remain in service.

Figures sometimes need to be manually adjusted to remove inconsistencies resulting from small sample size at the extreme ends of the condition range. In all cases the total expected life will be reduced because of the small sample size. In no situations will the total life be increased other than the rare case where there are no assets present within a condition range that have degraded between the two surveys.

B.1 Degradation Curves as developed by MAMS

Degradation curves were produced for Sample Council by analysing the change in asset condition over five condition surveys since 2001

The total life illustrated in all of the tables within this section is the life to condition 10. In practice you will often intervene and rehabilitate before reaching condition 10. The total life is input into the financial model and the life to the selected intervention level will be less than that figure depending upon where you choose to intervene.

If you choose a low intervention level (High level of service) then your life to intervention can be very much lower than the total life to Condition 10. Think of the car tyre analogy. Down to the indicator lugs at, 40,000 km. fully worn through at 70,000 km.

B.1.1 Sealed Road Pavement - Degradation Curves

Asset Condition Rating Range	All Sealed Town Street Pavements 2001 - 2019	All Sealed Rural Pavements 2001 - 2019	All Sealed Town Street Pavements 2001 - 2014	All Sealed Rural Pavements 2001 - 2014	All Sealed Town Street Pavements 2005 - 2014	All Sealed Rural Pavements 2005 - 2014
9 - 10	1.0	1.0	1.0	2.0	3.0	2.0
8 - 9	5.0	5.0	2.0	5.0	5.0	3.0
7 - 8	10.0	10.0	10.0	10.0	10.0	10.0
6 - 7	12.0	15.0	20.0	15.0	12.0	20.0
5 - 6	17.0	22.0	22.0	20.0	25.0	25.0
4 - 5	28.9	22.0	25.0	20.0	25.0	25.0
3 - 4	30.8	15.0	20.0	20.0	25.0	16.0
2 - 3	22.5	14.0	20.0	15.0	15.0	10.0
1 - 2	16.0	10.1	10.0	11.5	10.0	9.8
0 - 1	4.3	5.0	5.0	11.4	9.4	8.0
	147	119	135	130	139	129

Figure B.2 Sealed Rd Pavement Degradation Table

Figure B 2 displays the average service life within each of the 10 condition rating changes starting with the life between zero and one and ending with the life from nine to ten.

Life cycles on the sealed road pavements were developed for urban and rural roads separately. The results tend to be higher than average and suggest the life to condition 10 for the urban sealed pavements will be around 140 years and for rural pavements 120 years. The service life to the respective intervention levels being around 125 and 100 years respectively. These are longer lives than we have adopted within the model. But they are further supported by the measured condition performance with time against the level of renewal expenditure which is considerably less than the estimated consumption rate. While overall asset condition has been held constant over the long term.

B.1.2 Sealed Surface - Degradation Curves

Asset Condition Rating Range	All Asphalt Surfaces 14 - 19	All Spray Seals 14 - 19	All Asphalt Surfaces 05 - 14	All Spray Seals 09 - 14
9 - 10	1.0	1.0	1.0	1.0
8 - 9	2.0	1.0	2.0	2.0
7 - 8	3.0	2.0	2.0	3.0
6 - 7	6.0	3.0	3.0	5.0
5 - 6	6.0	6.0	5.0	6.0
4 - 5	7.0	4.8	6.5	5.7
3 - 4	12.0	4.0	8.0	4.6
2 - 3	5.0	4.1	6.0	3.7
1 - 2	4.0	3.5	7.0	2.7
0 - 1	3.0	2.7	5.0	2.5
	49	32	46	36

Figure B.3 Sealed Surface Degradation Table

The sealed surface assets are broadly in line with results from most other council district with total life to condition of 30 - 35 years for Spray seals and 45 - 49 for asphalt. The ideal intervention level for these assets is within the 6.5 - 7.0 condition range so the life to intervention would be around 23 years for spray seals and 33 for asphalt.

B.1.3 Unsealed Pavement - Degradation Curves

We have four consistent condition surveys for the unsealed road pavements and as such our degradation curves are becoming quite strong.

Asset Condition Rating Range	All Unsealed Rd Pavements 01 - 19	All Unsealed Rd Pavements 04 - 19	All Unsealed Secondary Access Roads 05 - 14	All Unsealed Primary Access Roads 05 - 14
9 - 10	1.0	0.0	0.0	1.0
8 - 9	1.0	1.0	1.0	3.0
7 - 8	5.0	2.0	2.0	5.0
6 - 7	6.0	8.0	5.0	5.0
5 - 6	12.0	10.0	8.0	10.0
4 - 5	12.0	15.0	12.0	10.0
3 - 4	12.0	15.0	10.0	10.0
2 - 3	10.0	10.0	8.0	7.0
1 - 2	8.0	7.0	6.0	6.0
0 - 1	4.0	3.0	4.0	5.0
	71	71	56	62

Figure B.4 Un-sealed pavement degradation table

The design depth of imported pavement material at Sample Council is 150 mm. Thus asset capital condition is based upon the measured depth in the field so any pavement that was found to have 150 mm or more was recorded as condition zero. We found 28% of the pavements to have depths of 150 mm or more.

The lives coming out of the degradation analysis are very high, but asset condition over the full 18 year period since our first survey has continued to improve. Total life to condition 10 is within the 50 - 70 year range and to the intervention level of condition 5.5 - 6 would be around 35 - 40 years

B.1.4 Kerb - Degradation Curves

Asset Condition Rating Range	All Kerbs 09 - 19	All Kerbs 01 - 19	All Kerbs 01 - 14	All Kerbs 09 - 14
9 - 10	1.0	1.0	3.0	3.0
8 - 9	2.0	5.0	5.0	5.0
7 - 8	8.0	10.0	10.0	10.0
6 - 7	20.0	18.0	25.0	15.0
5 - 6	26.7	25.0	30.0	20.0
4 - 5	35.0	30.0	22.0	30.0
3 - 4	30.0	30.0	22.1	25.0
2 - 3	19.4	25.0	11.9	15.1
1 - 2	10.6	14.8	6.3	10.0
0 - 1	5.0	8.0	6.1	6.0
	158	167	141	139

Figure B.5 Kerb Degradation Table

The kerb assets were found to have a total life to condition 10 of around 140 - 150 years and a life to the selected intervention level of condition 7 of around 120 - 130 Years. There are problems with the analysis of both kerb and footpath degradation curves because of the way in which the assets are managed. They are not simply constructed and then follow the condition scale up with time. Isolated failures are often

repaired as they occur and so the assets can sit for a very long time in the condition 5 - 7 range. Thus some care must be exercised in the use of these lives.

B.1.5 Footpath - Degradation Curves

Asset Condition Rating Range	Asphalt Paths 09 - 19	Concrete Footpaths 09 - 19	Concrete Footpaths 05 - 14	Concrete Footpaths 01 - 14	Asphalt Footpath 09 - 14
9 - 10	0.5	1.0	2.0	0.0	1.0
8 - 9	1.0	3.0	5.0	3.0	1.0
7 - 8	3.0	10.0	8.0	8.0	5.0
6 - 7	8.0	25.0	15.0	15.0	5.0
5 - 6	8.0	30.0	30.0	30.0	6.0
4 - 5	8.0	25.0	25.0	25.0	7.0
3 - 4	7.0	20.0	25.0	20.0	7.0
2 - 3	7.0	18.0	14.0	19.0	5.0
1 - 2	6.0	16.9	12.0	18.0	4.0
0 - 1	5.0	15.0	12.0	12.0	3.0
	54	164	148	150	44

Figure B.56 Footpath Degradation Table

Concrete footpaths were found to have a total life to condition 10 of around 145 - 160 years. Asphalt footpaths had 44 - 54 years. Their service lives to the intervention level of condition 7.0 were found to be 130 and 35 years respectively. There are problems with the analysis of both kerb and footpath degradation curves because of the way in which the assets are managed. They are not simply constructed and then follow the condition scale up with time. Isolated failures are often repaired as they occur and so the assets can sit for a very long time in the condition 5 - 7 range. Thus some care must be exercised in the use of these lives.

B. 2 Benefit of Unique Degradation Curves

Unique degradation curves developed via an analysis of condition change between surveys takes all variables into account to deliver a time - condition performance profile based upon the actual council locality. It is then used within the Moloney model to predict future condition change with time and greatly enhances the overall financial Modelling outcome.

In an indirect way the unique degradation curves take all variables into account. If council has a very poor attention to the maintenance of table drains alongside the rural sealed roads for example, the roads will decay more quickly and this will be reflected within the unique curves.

Appendix C - The Moloney Financial Model

C.1 The basis of the model

Predictive modelling is undertaken within the Moloney financial modelling software in the following way

- It is a whole of asset set model that predicts overall performance of the asset set not an individual asset.
- The model commences with the present condition distribution (series1 figures within each of the of the sub assets sections),
- The degradation curves are applied to the present condition distribution annually. If there was a 10 year life found within the degradation curves between conditions 3 and 4 then the model would degrade 1/10 or 10% of the condition 3 assets to condition 4 annually. This process operates across the condition range annually.
- From this point there are two distinct modelling paths. Model 1 and Model 2.
- Within Model No 2 - A retreatment intervention condition is nominated (level of service) and all assets that rise above the intervention level through the degradation process are returned as a capital renewal requirement. The primary output being a 20 year capital renewal profile to deliver a zero level of over intervention assets. (See the series 5 figures in each of the sub asset sections above). The model returns the repaired assets back to condition zero annually and they start their cycle again.
- Within Model No 1 - A proposed 20 year capital renewal expenditure profile is input and the model predicts the resulting asset condition change with time. (See the series 6 figures in the sub asset sections).
- Model No 1 takes the annual value of the planned renewal expenditure from the worst end of the condition distribution and put back to condition zero each year. Condition change can be monitored in a number of ways but the extent of the asset base that rises above the selected intervention level each year is considered to be the most useful. This is referred to as the level of "Over intervention Assets" or OIA's.
- We have also reverse engineered model No 1 through an iterative process to deliver a desired extent of OIA's after a selected number of years. The model delivers the annual expenditure necessary to achieve this outcome. We call this operation the "funding scenario finder" and a further explanation is available within Appendix D below. A detailed explanation is available from our web site at www.moloneys.com.au off the [Information](#) Tab - 1 The Funding Scenario Finder Aug 2018

C .1.1 More detail on the operation of the Financial Model

For a more detailed explanation of the model and how it works please refer to our web site at www.moloneys.com.au and from the Information tab download the PDF document titled The basis of the Moloney Model. There is also an extensive amount of other background information. No log in or other details are required to be input on the web site for access to this information.

C.2 Source and Status of the Modelling Inputs

Modelling outcome is very much dependent upon the accuracy of the input data and how assets are grouped. The basic five input criteria required for the modelling process are detailed below with their source identified.

Rehabilitation Cost	—	Supplied by Council
Present Expenditure Levels	—	Supplied by Council
Asset Quantity	—	Directly from this survey
Asset Condition	—	Directly from this survey
Degradation Curves	—	Unique Degradation curves developed by MAMS

Modelling outcome is dependent upon all 5 of the above variables. If any one is of poor or questionable quality then the whole process can be flawed.

The degradation curves used in the modelling process within this report have been specifically developed for Sample Council via a statistical analysis of asset condition change over five condition surveys since 2001.

For Sample Council the modelling inputs are now considered to be quite strong and reliable.

C.2.1 Asset Unit Renewal Rates

The asset unit renewal rates used within the modelling sections of this report are all based upon the projected cost to renew or rehabilitate the asset. Unit rates used within the asset valuation section may vary depending upon the accounting requirements of the council and may not directly relate to the values and or service lives used within the model.

C.2.2 Modelling Projections

This report is limited in its financial analysis of the costs associated with the ongoing cyclical rehabilitation of the existing road network. Costs associated with new or upgraded assets would need to be added to the total expenditure levels delivered here. The financial analyses undertaken within the report can best be seen as an estimate of the ongoing financial demand to maintain the present asset base in perpetuity.

Any variation from this approach would be detailed within the sub asset report sections. For example council may have a policy to reconstruct all sealed rural roads of a particular class to a minimum width of say 6.8 m. We can adjust the model to accommodate this policy and if this were done it would be explained within the relevant sub asset section.

Appendix D Setting the Extent of Over Intervention assets and the funding scenario finder

This Appendix will deal with the setting of the Intervention Level and the setting of the extent of Over Intervention Assets. It will also briefly cover the operations of the Moloney "funding scenario finder".

D.1 Definitions

D.1.1 Intervention Level - Level of Service

The Intervention level is the condition rating at which it is believed the asset should be replaced or rehabilitated. An asset usually commences at condition zero when new or newly rehabilitated and then progresses with time up the 0 - 10 condition rating scale. While the scale ends at condition 10 it would be normal to intervene to replace or rehabilitate the asset within the condition range 6 - 9 depending upon the desired level of service.

The intervention Level is simply the condition rating point at which the authority decides an asset should ideally be replaced or rehabilitated. You may not always achieve this level of service and the extent of the asset base that is above the selected intervention level at any time is your level of over intervention assets or your level of OIA's.

D.1.2 The Extent of Over Intervention Assets (OIA's)

The extent of OIA's is a very strong indicator of overall condition performance. In very simple terms it is the extent of the asset base that is above the selected Intervention level. It can be applied at an individual asset set level, a sub asset group level or at a whole of roads group level. It can also be expressed in a number of different ways three of which are illustrated at the top of Figure Agg 2 above and are as described below.

1. The OIA's as a Percentage of the total asset set valuation
2. The Dollar value of the OIA's
3. The OIA's as a percentage of the value of one year's average annual liability or consumption rate.

D.1.3 Annual Liability

The term "Annual Liability" is a practical substitute for the accounting term of "Annual Depreciation". They can be equal or quite close in value in some cases. But can also be very different in value. The problem stems from the purpose of each figure. Annual depreciation is designed to deliver the amount that can be claimed for taxation purposes for the ongoing consumption of an asset and has some strong restrictions in terms of international and Australian accounting standards.

Annual liability is aimed at providing an estimate of the future liability associated with the ongoing ownership and replacement of an asset. They are both derived in the simplest sense by dividing the replacement cost by the service life. But for a variety of reasons the best estimate of the replacement cost and the service life used in the derivation of annual depreciation can be quite different to your actual future liability to maintain the asset.

To simplify matters and to ensure consistent reporting within this document we have adopted "Annual liability" as our reporting figure that links to the future renewal demand associated with your assets.

Our annual liability figure comes directly from the replacement cost divided by the life to the selected intervention level as used for each individual asset set that is modelled. (You can see these two figures for each asset set within the series 4 tables within each of the sub asset set sections).

D.2 Setting the Extent of Over Intervention Assets (OIA's)

If you had \$1,000 as the level of OIA's on a total asset base of \$100,000 your extent of OIA's would be 1.0% (See 1 in D.1.2 above). Its value would be \$1,000 (See 2 in D.1.2 above). However, there is a problem in reporting on a simple percentage of OIA's across assets with different service lives. Just as there is in comparing the dollar value between authorities with very different asset replacement values.

For example, if reporting on a single asset set with a service life of 100 years that had OIA's of 10% of the asset base, this would represent a very poor situation, with 10 years worth of average annual liability as

the backlog. But if reporting on an asset set with a service life of 10 years that same 10% level of OIA's, would represent only 1 year's level of average annual liability and would be a very sound position to be in. Hence straight reporting of the percentage of OIA's does not translate well between assets with different service lives.

Similarly the total dollar value of OIA's cannot be compared between authorities with different asset base valuations and unit renewal rates.

To address this problem the extent of OIA's can be expressed as the number of years worth of annual liability (in accounting terms the number of years worth of annual depreciation) that the level of OIA's represents. The size of the backlog of OIA's expressed in this way provides a really strong indicator that is independent of both asset service life, total asset valuation and the unit renewal rate.

This is of particular value when using the Moloney funding scenario finder on multiple asset sets with different service lives. In this situation the desired extent of OIA's can be set just once within the model as a percentage of one year's annual liability, rather than manually selecting different percentages of OIA's to match expected service life. Service life is thus eliminated as a variable. The model can then apply the same condition outcome in financial terms to sub asset sets with quite different service lives.

D.3 Standardised descriptors for the level of over Intervention Assets OIA's

Figure D 1 has been developed as a guide to the selection of a suitable level of OIA's. The figures within the table are based on our 25 years of road condition rating experience, involving in excess of 245 full council road network surveys.

Guide to the acceptable extent of over intervention assets (OIA's)

% Range of one years Annual Liability	Your Asset Base renewal value at the top of this range	Value expresses as a % of the total Asset Base	Standardised Condition Description	Additional Comments on Descriptor
0% - 50%	\$1,986,909	0.9%	Exceptionally good	Extremely low levels of over intervention assets
50% - 100%	\$3,973,819	1.7%	Excellent	Very low level of over intervention assets
100% - 150%	\$5,960,728	2.6%	Very Good	low level of over intervention assets
150% - 200%	\$7,947,637	3.4%	Good	Low to acceptable level of over intervention assets
200% - 250%	\$9,934,547	4.3%	Fair	Condition only Fair and a little below the good range
250% - 300%	\$11,921,456	5.1%	Acceptable	Level of OIA's at the upper extent of the acceptable range
250% - 350%	\$13,908,366	6.0%	Poor	Moving into the start of the problem area
350% - 400%	\$15,895,275	6.8%	Very Poor	In need of urgent reduction
400% and Above	\$19,869,094	8.6%	Disastrous	Severe problems with assets in this condition

Figure D 1 Standardised descriptors for the level of OIA's

Figure D 1 displays nine ranges of OIA's expressed in years worth of annual liability. As explained above, linking the extent of OIA's back to the number of years of annual liability eliminates the problem that can occur with different asset lives. Reporting the extent of OIA's in this way provides a uniform platform that enables strong external benchmarking of Council performance as well as eliminating the bias that can occur with short life assets that may have what at first appears to be a high level of OIA's. It also allows the setting of a single and consistent extent of OIA's across several data sets with different service lives when using the Moloney model.

What the table is saying in the simplest of terms is that a level of one year's annual liability as the value of OIA's is an excellent position. Two years remains at a good level. Three years is at the top of the acceptable range and four year and more is considered to be a very poor overall condition.

Another way of looking at it is to think of it as the number of years you are behind in meeting the renewal demand in terms of year's worth of unmet annual liability, or average annual renewal demand.

Present extent of OIA's expressed in three ways			Your overall road asset condition based in the extent of OIA's	
Current % of OIA's expresses in years worth of average annual liability	Your present value of OIA's in \$	Your OIA's as a % of your total asset base valuation	Moloney standardised condition description	Additional comments on standardised condition descriptor
100%	\$3,964,220	1.71%	Excellent	Very low level of over intervention assets

Figure D 2 Your extent of Over Intervention Assets as a % of annual liability

Figure D 2 presents your level of OIA's expressed as a percentage of one year's level of annual liability. Your figure being 100%. The table also records the total value of your OIA's in straight dollar terms as well as it's percentage of the total asset base replacement value.

Your figure at 100% of one year's annual liability is within the "excellent" range as per figure D1 above. The present excellent condition is no accident it is as a direct result of the strong renewal funding that has been applied to the assets over many years.

Note that all figures used within the report that represent the average annual asset consumption rate (annual liability) are all linked to the asset lives and unit rates used within the modelling process. The report is in no way bound to accounting lives or unit renewal rates, as these can have accounting standards constraints that render them quite problematic in the prediction of future renewal demand.

D.4 The Moloney funding scenario finder and it's inputs

The Moloney financial modelling software has the capacity to develop a recommended renewal funding profile that will deliver a nominated extent of over intervention assets within a selected time frame. A global outcome can be set for the whole roads group. In this way the model is also used to allocate funding between the sub asset groups to deliver the best overall condition outcome for the whole roads network.

There are three input criteria that can be set independently for each sub asset class or they can all be set to a common figure for all sub assets. They are generally set to a common figure but sometimes there may be sound reasons why certain sub assets are set independently. For example you may require a zero level of over intervention assets on the footpaths because of their perceived higher public risk while accepting some extent of OIA's on other sub assets.

The funding scenario finder operates within the Moloney model in an iterative way to find a recommended funding profile that will deliver on a desired condition outcome. There are three basic input criteria.

1. Desired extent of over intervention assets (OIA's)
2. Year ahead by which you wish to achieve this outcome
3. The value of any annual compounding percentage increase in renewal funding

D.4.1 Desired extent of over intervention assets

As detailed within D3 above the extent of over intervention assets is generally set in terms of the number of year's worth of annual liability that it represents. It is often set to the same figure for all road sub assets. But it can be varied if required.

D.4.2 Year ahead to achieve the condition outcome

This can be set within the model for any time frame from 3 - 50 years. The most common time frame used is 10 years, but in some cases this is extended to 20 years.

D.4.3 Annual compounding increase in renewal expenditure

This facility was included to enable the year one commencing expenditure to be lowered to match the planned renewal expenditure. In this way a funding strategy can be developed that commences from your present level of renewal expenditure and ends up at a higher level in later year. Most councils do have a growing renewal demand and this facility caters for that situation. It is designed to delivers a proposed future funding strategy that starts from where you currently are and gets you to where you need to be with asset condition in future years.

D.4.4 The funding scenario finder operation

The program uses the Moloney Model No 1 (see Appendix C 1 above) in an iterative way to deliver the recommended funding strategy. Model No 1 was designed to deliver the predicted condition outcome for a selected renewal expenditure profile over a 3 - 50 years time frame.

An iterative process has been set up within Model No 1 based on the above three input criteria. It commences by estimating the year one commencing funding level required to achieve the condition outcome. It then keeps adjusting that figure by lifting or dropping it depending upon the condition outcome. When the condition outcome is within 0.05% of the desired level (as set in 1 above) the process ceases and that figure is returned as the required year one commencing expenditure level.

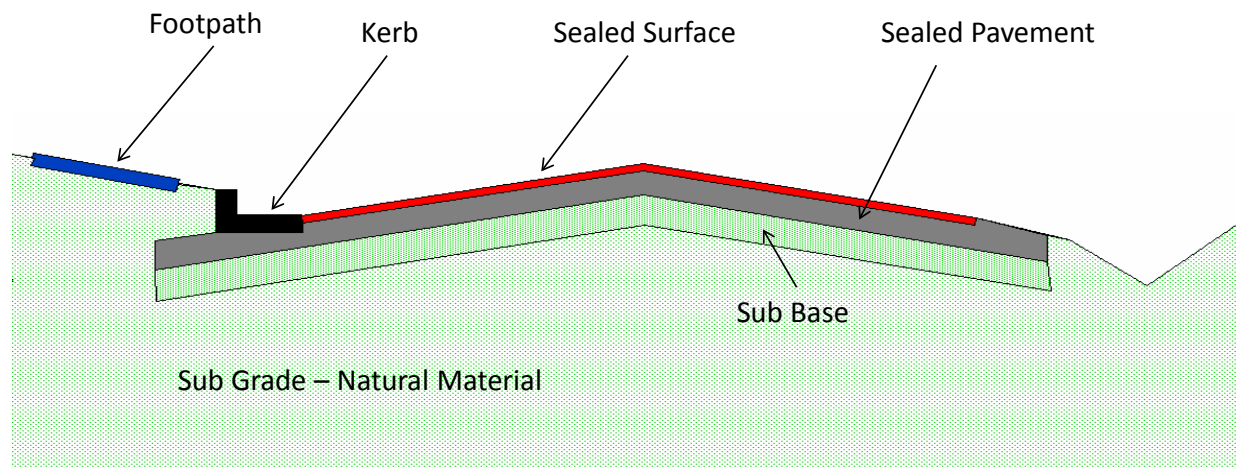
Within the Moloney software the scenario finder can be run for a single asset set or more commonly for all road sub assets. When running it for multiple road sub asset sets it has the added advantage of splitting the total renewal funding on a needs basis between the different road sub asset classes and ensuring that none of them get forgotten.

Appendix E: Road make up and the Road sub Assets

This section will provide details of the five possible sub asset components that make up the full road asset group.

E.1 The Road Sub Asset components

The infrastructure assets within council's road reservations consist broadly of the following five sub assets.



- | | |
|---|-------|
| 1 <u>Sealed Surface</u> - | Red |
| 2 <u>Sealed Rd Pavement</u> - | Grey |
| 3 <u>Kerb</u> - | Black |
| 4 <u>Unsealed Pavement</u> - | Grey |
| Same as Sealed Pavement without the seal on top | |
| 5 <u>Footpath</u> - | Blue |

Sub Grade is the natural material that the road is built upon

Sub Base is a second pavement layer that may or may not be present

Figure E.1 Road cross section showing the five possible road sub asset sets to be examined

The total road asset is broken down into five like performing sub asset sets as detailed above. The main reason for separating the road assets is to group them into like performing assets with the same service life. For example the sealed surface on the top of a sealed road pavement may have a service life of 10 - 20 years while the underlying pavement may be in the 50 - 150 year range. Hence they cannot be examined or modelled as a single asset set.

E.1.1 The Sealed Surface Sub Asset Set - Red

The sealed surface is the thin sprayed bitumen seal or asphalt surfacing that seals off the underlying pavement from the intrusion of water. Its primary purpose is to waterproof the underlying pavement as well as maintain a more constant moisture content within the pavement layer. It also provides a smooth wearing surface. Typical service life 15 - 30 years

E.1.2 The Sealed Road Pavement Sub Asset Set - Grey

The sealed road pavement is made up of a granular material (crushed rock, gravel or the like) that is used to distribute the imposed vehicle wheel load to the underlying soil over a greater area than the wheel contact area, such that there is little or no deformation or movement in the underlying soil. Pavements do break down and move with time and typically their service life would be in the 50 - 150 year range.

E.1.3 The Kerb Sub Asset Set - Black

Kerbs in urban areas are normally constructed of concrete and are used to drain water away from the pavement. They tend to have a life similar to the sealed road pavement. They also assist in retaining the pavement edge in place.

E.1.4 The Unsealed Road Pavement Sub Asset Set - Grey

The unsealed road pavement performs the same role as the sealed pavement except that it does not have the additional protection of a sealed surface. Its service life is generally shorter than the sealed pavement and typically would have a life of 15 - 30 years.

E.1.5 The Footpath Sub Asset Set - Blue

Footpath assets are not really related to the road itself and can be seen as pavements for foot traffic. Their life may vary greatly and can be quite extensive if localised failures are repaired as they occur. Typical service life for concrete footpaths is 40 - 80 years.

As can be seen from the above very brief descriptions, the adopted road sub asset components all have different lives and performance requirements. This is why they are examined and modelled separately.

This survey has covered all of the above road sub asset sets.

Appendix F: What the condition Inspection has Delivered

This appendix will deal with and explanation of what the condition survey has delivered.

F.1 Segmentation and measurement of the road network

The linear road network was broken down into like performing segments that were generally constructed at the same time. Then each of the five sub asset components that were present within each segment and were to be part of the condition survey were measured quantified and condition rated.

For Sample Council the full road network was broken down into 1528 individual like performing segments. Each segment was then measured and condition rated for the particular sub assets that were present.

F.2 What has been delivered

Once this data was placed within the MAMS System, the software delivered a range of outputs including those listed below.

F.2.1 Capital works programs

Works programs in priority order, based upon both the condition of the assets and the hierarchy or relative importance of the road, can be delivered within the following areas:

- Reseal – resurfacing program on sealed roads
- Sealed Road Pavement Rehabilitation program
- Sealed Road Pavement Major Patching or dig out repair program
- Sealed Road shoulder repair program
- Unsealed Road Resheeting program.
- Unsealed road spot patching program.
- Kerb Renewal program and a separate Isolated Failure repair program.
- Footpath Renewal program and a separate Isolated Failure repair program.
- A host of other major maintenance reports such as crack sealing report, edge break report etc. These can be extracted from the data and are programmed directly into the MAMS road software.

F.2.2 Asset valuations

Asset valuations can be delivered based on either the condition or the age of the assets. For a detailed explanation of the road asset valuation methodology adopted by MAMS please refer to the document titled [Road Asset Valuations June 2017](#) available on our web site at Moloneys.com.au under the Information tab.

But a note of caution, the asset valuations presented within this report may vary from those adopted for accounting purposes. There are a lot of matters to be considered in the delivery of the accounting valuation figures and unless we were specifically engaged to deliver accounting valuations our figures may vary from councils adopted figures and you are advised to undertake your own accounting valuations using the survey data set as the basis of that operation.

F.2.3 Prediction of future financial renewal demand

The Moloney financial model can be used in conjunction with the survey information to deliver a prediction of the ongoing renewal demand and a recommended future funding strategy. See Appendix C and D for more details relating to the operation of the Moloney Model.

F.2.4 Performance benchmarking

Council's asset performance since the last survey is benchmarked against a series of key performance indicators. It is also externally benchmarked against all councils assessed by MAMS on the same performance indicators, currently 69 councils.

Appendix G Long Term Asset Condition Trends

This appendix provides some graphical representations of the asset condition movement since our first survey in 2001

G.1 Condition Based on Extent of Poor condition Assets

The extent of poor condition assets is one very important way of looking at overall asset condition. It is not the whole story but it is often the area that asset users are most critical of and so does need to be understood.

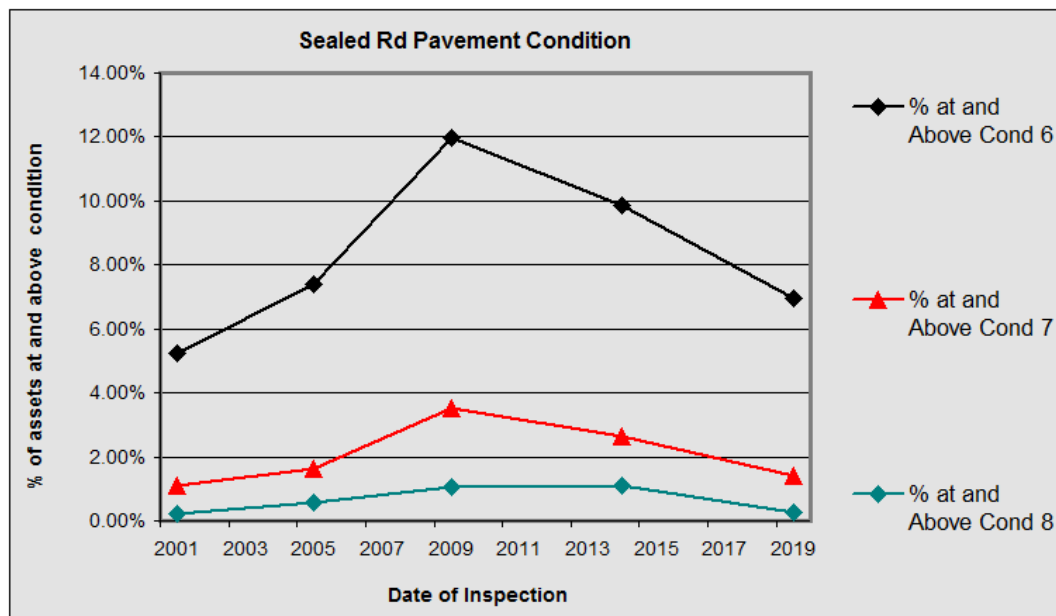


Figure G1 Movement in the extent of Poor condition Sealed Rd Pavement Assets

The sealed road pavement assets declined in condition over the first 2 surveys when funding was low but have steadily improved since 2009

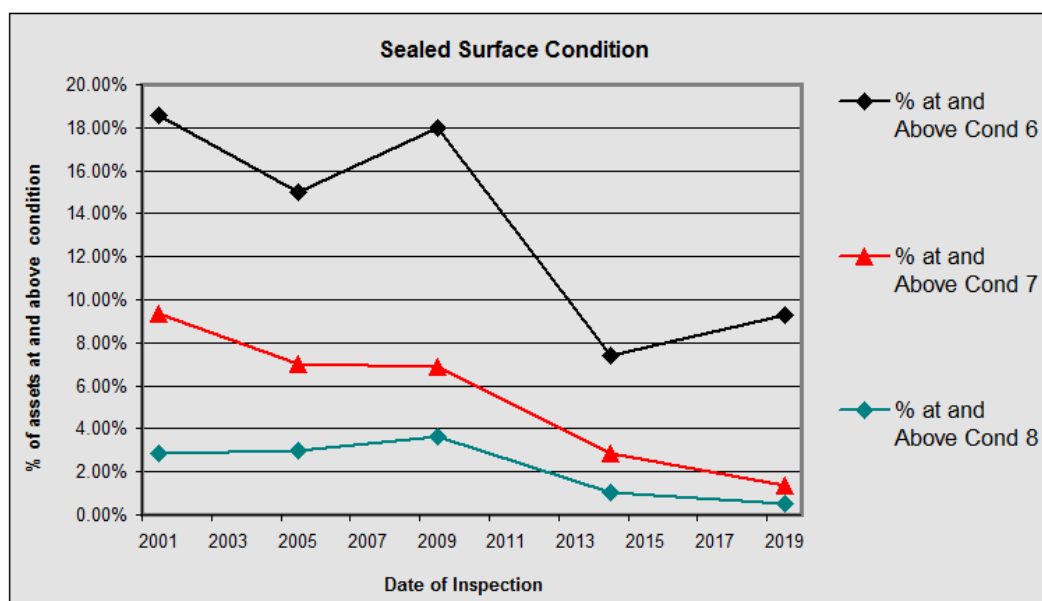


Figure G2 Movement in the extent of Poor condition Sealed Surface Assets

The long term trend on the sealed surface assets has been a continual condition improvement.

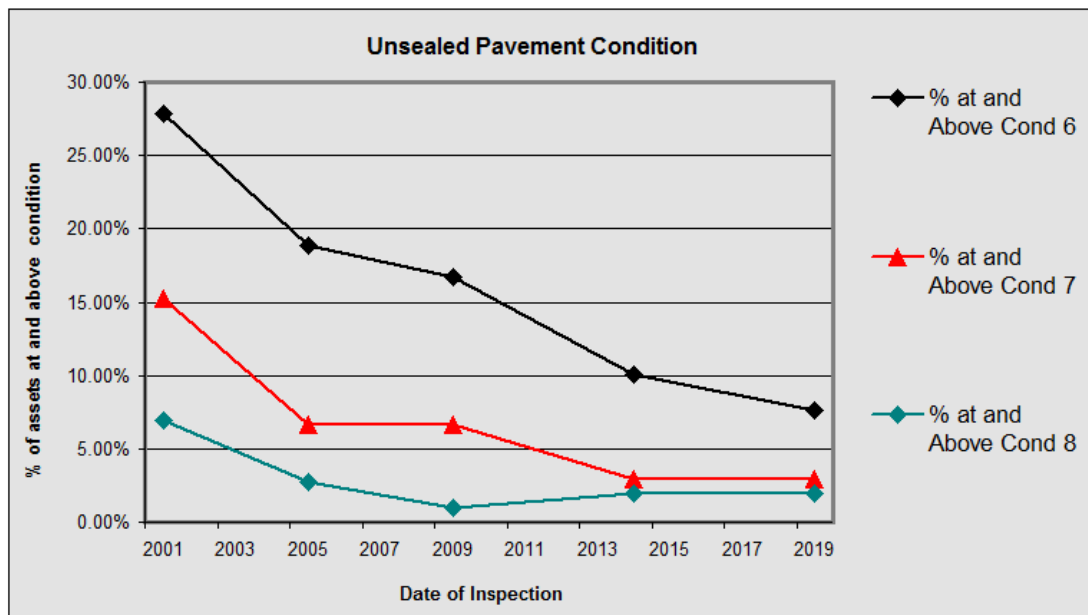


Figure G3 Movement in the extent of Poor condition Unsealed Pavement Assets

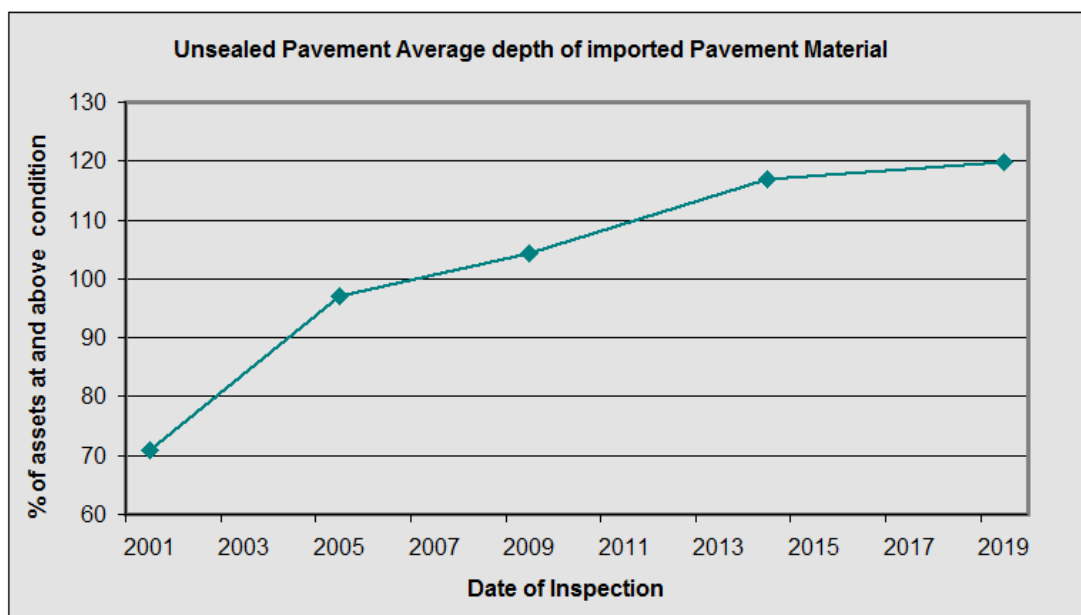


Figure G4 Movement in the extent of imported pavement material for unsealed roads

Figures G3 and G4 demonstrate a very strong and continuous condition improvement for the unsealed pavement assets

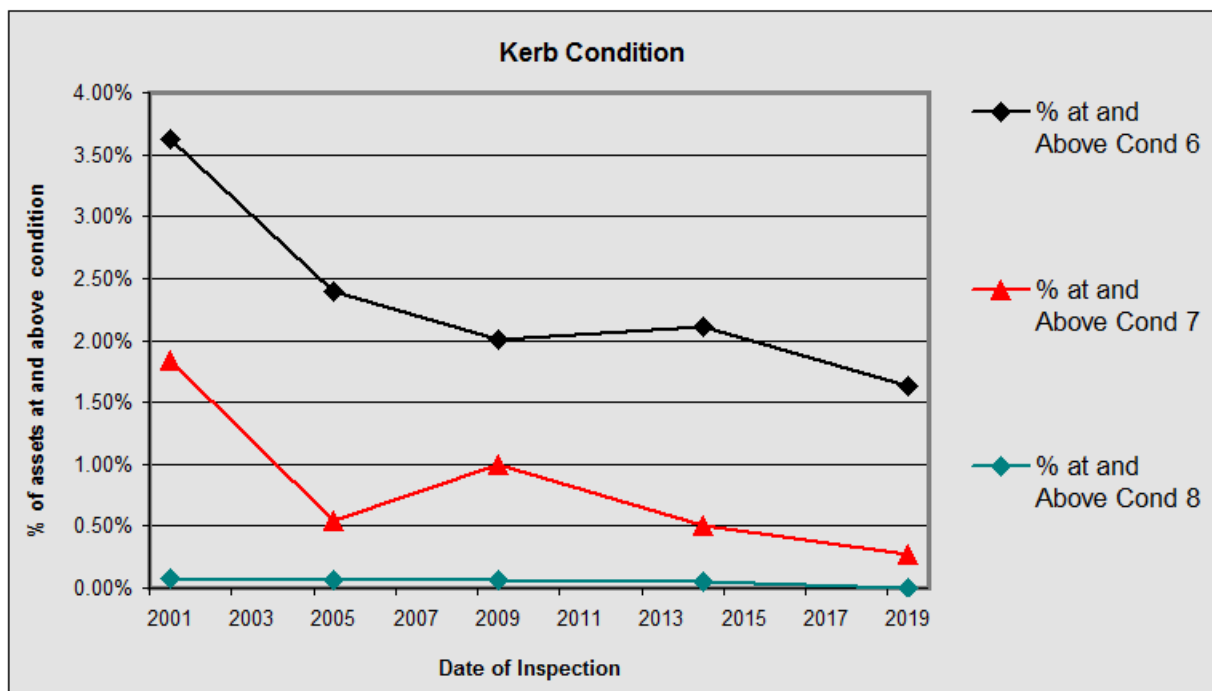


Figure G5 Movement in the extent of Poor condition Kerb Assets

The long term trend on the kerb assets has been a continual condition improvement.

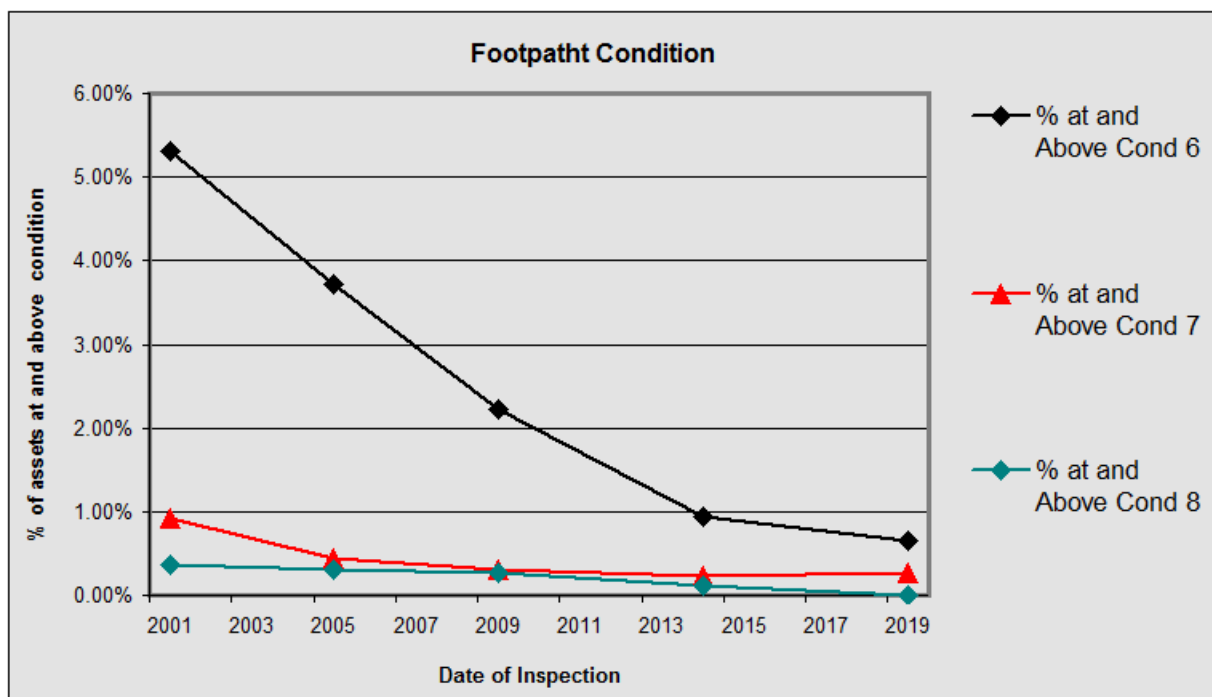


Figure G6 Movement in the extent of Poor condition Footpath Assets

The long term trend on the Footpath assets has been a continual condition improvement.

G.2 Weighted average asset condition

The weighted average asset condition (WAAC) is the strongest measure we have for a single condition indicator that represents the whole of the asset set condition. It is established by weighting the condition of the individual asset components for their extent and then dividing by the total extent to deliver a single average asset condition. It can vary from the findings within the extent of poor condition assets.

For example you may have treated most of the very poor condition assets but have a very high level within Conditions 4 - 6. While these assets may not require immediate rehabilitation they will in the not too distant future. So for a longer term understanding of your performance the tracking of the weighted average asset condition can be very informative.

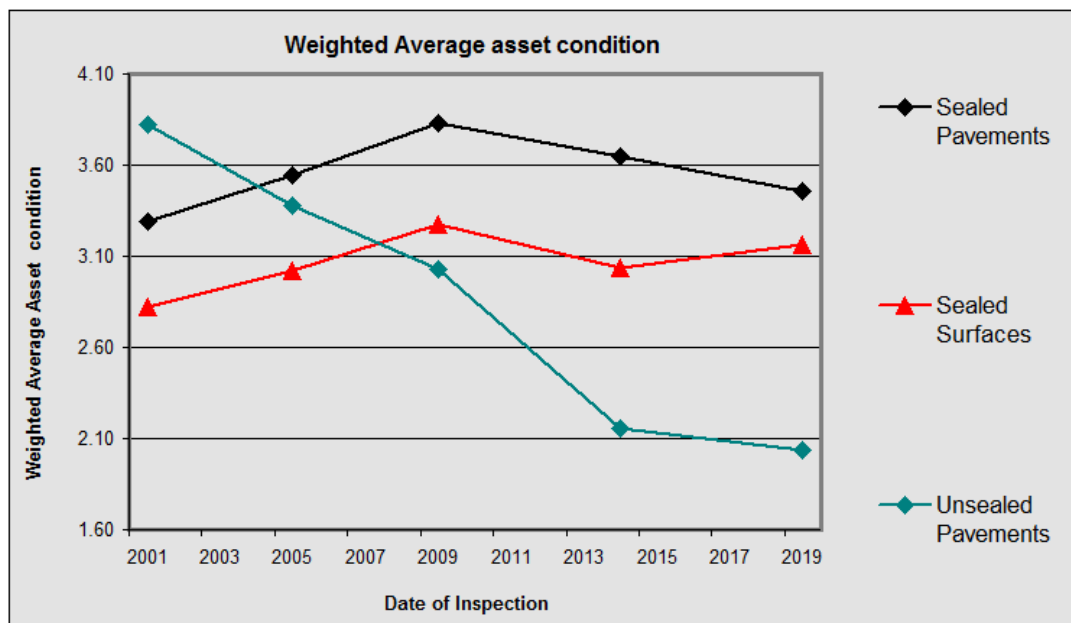


Figure G7 Movement in the weighted average asset condition - Pavement related Assets

The long term trend for the sealed road pavements and sealed surface assets is a slow but steady increase in the WAAC which is to be expected as at no time over the period has council spent at the total level of the Annual Liability. Hence while the extent of poor condition assets has been reduced the condition of the overall asset base has declined a little.

This is quite consistent with the predicted long term growth in renewal demand as per figures P5 and to a lesser extent S5 above.

For the unsealed pavement assets the situation is reversed with the WAAC continually improving over the whole of the inspection period. This along other evidence does suggest that the adopted accounting life cycles for the unsealed pavement assets are lower than what is being achieved.

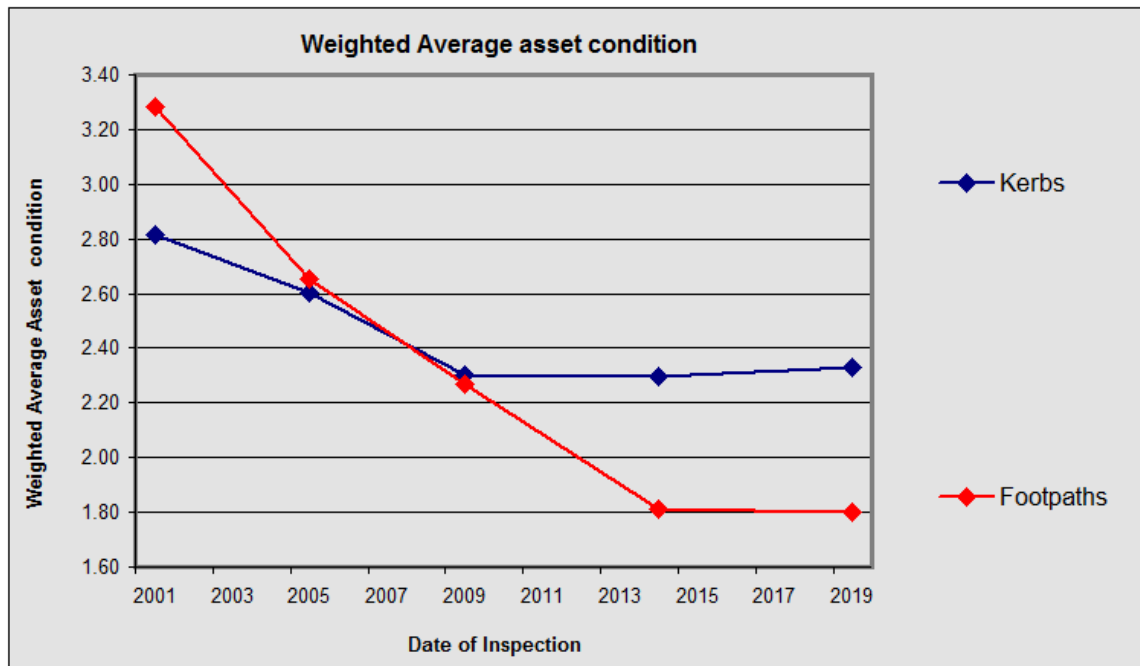


Figure G8 Movement in the weighted average asset condition - Footpath and Kerb Assets

Footpaths have been an outstanding success story since 2001. This is very strongly linked to the relatively high levels of both renewal and new asset spending over the time. Figures F1 and F3 within the Footpath sub asset section show an excellent set of assets.

Kerbs have also performed very well and have levelled out over the last two surveys at a very good WAAC figure.

G.3 Estimated percentage of Asset Base Consumed

We can also use the WAAC to report on the extent of the asset base that has been consumed. This is done by expressing the WAAC as a percentage of the end point condition at which it is felt there is no remaining value in the asset. This point will vary depending upon the asset type, how it has been assessed and your chosen level of service. Recorded at the top of Figures G9 and G10).

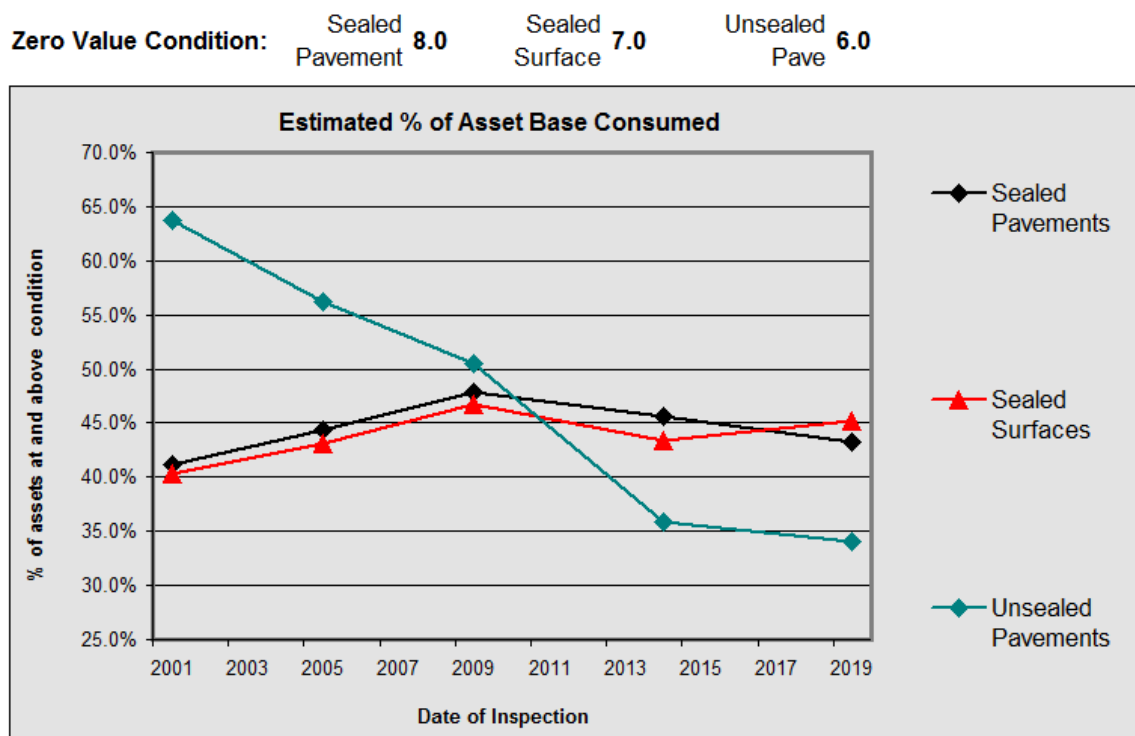


Figure G9 Estimated % of Asset Base Consumed - Pavement related Assets

A word of caution here: The percentage of asset consumption has been based on a linear scale. But the degradation curves do indicate that there tends to be more life within the condition 5 - 7 range for most assets. However, we have done some trials based on actual remaining life coming out of the degradation curves and with a good spread of assets across the condition scale, we found there was only around a 1.0% - 1.5% variation between the linear results and those based on the degradation curves. Thus there is some value in this simplified approach.

Figure G9 indicates that there has been a round a 5% loss in sealed surface valuations, a 2% loss in sealed pavement valuations and a 30% gain within the unsealed pavement assets. So overall this is considered to be a very strong outcome for this phase of the asset life cycle.

Zero Value Condition: Kerbs 8.0 F/Path 7.0

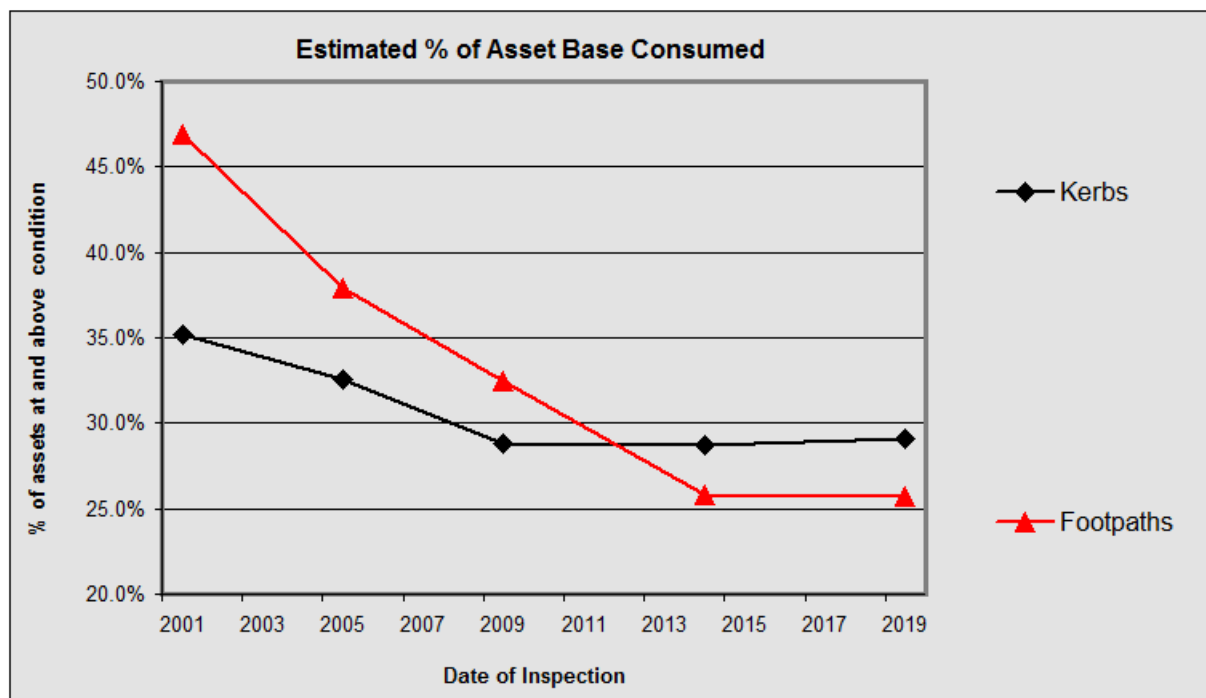


Figure G10 Estimated % of Asset Base Consumed - Footpath and Kerb Assets

Figure G10 indicates that there has been a round a 6% gain in the kerb asset valuations, and a 21% gain for the footpath assets. Once again overall performance is considered to be a very strong outcome for this phase of the asset life cycle.

Appendix H Glossary of Terms and Definitions

The table below contains a list of explanations for some common terms and phrases that have been used within the report

Term Used in Report	Explanation
Asset Condition Rating Scale	The condition Rating scale for all assets is on a (0 - 10) scale with 0- Brand new and 10 - No remaining value
Annual Depreciation	This is an accounting term designed to deliver the annual tax deductibility associated with an asset. It is largely irrelevant to Local Government financial management and forecasting, but Australian accounting standards dictate that it be reported upon even though councils do not pay income tax.
Annual Liability	This is the average annualised cost of the future replacement of the full extent of the asset base. It can vary dramatically from "Annual Depreciation". Financial Forecasting needs to be linked to the Liability of future renewal or replacement cost rather than historic cost. Throughout the report any reference to "Annual Liability" will be linked to the financial modelling unit rates and service lives and not those used for accounting purposes.
Asset set	This is an individual set of assets that is modelled within the Moloney model as a single asset set. There may be five sealed road pavement "Asset Sets" that make up the Sealed Rd Pavement asset group or "Sub Asset Set". They are generally modelled separately because of different "Service Lives" and or different "Levels of Service"
Backlog	This is an alternative term used to express the extent of Over Intervention Assets as a backlog of unmet renewal demand.
Funding Scenario Finder	The Moloney Financial Model has an inbuilt function that can create a recommended funding profile across the whole of the roads group based on a desired extent of over intervention assets (OIA's) after a set time frame. The scenario finder enables all asset sets to be modelled together and to also have the renewal expenditure optimised between the sub asset groups.
Greenfields - Brownfields Construction costs	These are accounting terms that can have a huge impact on financial modelling outcome. Greenfields construction cost is the original cost when the site was vacant with no traffic or other incumbrances. Brownfields construction cost is the cost associated with the reconstruction of the asset with all of the additional incumbrances such as other services, traffic etc. ALL replacement costs within this report are based on Brownfields costs as this is the only realistic way to undertake meaningful financial modelling.
Intervention Level - Or Retreatment Intervention Level	This is the point within the condition rating scale (0 - 10) that you determine the asset needs to be replaced or rehabilitated. It represents your planned level of service and is normally within the 6 - 9 cond. Range
Level of Service	Level of service within this report is directly related to the selected "Intervention Level". Low intervention level delivers high level of service, while high intervention level delivers Low level of service.
MAMS	Moloney Asset Management Systems.
Moloney Standardised Condition Descriptor	This is a description developed by MAMS that links overall asset condition to the extent of over intervention assets expressed as the number of years worth of "Annual Liability"
OIA's	"Over Intervention Assets"
Over Intervention Assets OIA's	This is the extent of the asset base that is above the selected intervention level. It is the extent of the asset base that needs renewal now. Sometimes referred to as the backlog of OIA's
Replacement Value	All replacement values used within this report (other than within Appendix A dealing with accounting valuations) are based on the actual planned replacement or rehabilitation cost of the asset. Also referred to as the "Renewal Cost". It may vary considerably from the accounting replacement cost. (See "Greenfields - Brownfields" Definition)
Service Life	This is the expected life in years that an asset on average will remain in service. Service life will reduce as your level of service improves with lower intervention levels. You don't get the additional asset life that could be obtained beyond the intervention level (if adopting a higher level of service).
Sub Asset Set	For reporting purposes this document has adopted up to five road sub asset sets within the broader roads asset group. They are, Sealed Rd Pavements, Sealed Surfaces, Unsealed Rd Pavements, Kerbs and Footpaths. The asset sets are modelled and reported upon separately within the report, broadly in line with councils funding categories.

Figure G 1 Glossary of terms and Definitions used in report