Moloney Asset Management Systems

MAMS

Report Following the Survey of Road Assets for Tumbarumba Shire

Jan-2015

Report produced by Moloney Asset Management Systems
exclusively for Tumbarumba Shire

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Section 1: Report Summary

This report provides a summary of the major findings following the road asset condition survey, undertaken in Jan-15 for Tumbarumba Shire by Moloney Asset Management Systems MAMS.

This summary aims to provide an overview of the important findings coming out of the survey as well as a snapshot of the overall asset condition and financial Modelling results, it is in three parts as detailed below.

1.1 Overall Report Findings

1.2 Summary of Asset Condition Findings

1.3 Summary of financial Modelling results

1.1 Overall Report Findings

The following are the major findings coming out of the condition survey and analysis of results within this report.

1.1.1 Major Report Findings

1. The road assets within Tumbarumba Shire district were found to be in good overall condition and are presently being funded at what is considered to be an appropriate total level of renewal expenditure.

2. The total present level of over intervention assets, or backlog, for the whole roads group was found to be 1.12% representing a total renewal value of $1,040,450. This is a reasonably low figure by industry standards and reflects some serious funding effort in recent years

3. Tumbarumba appears to have some difficult subgrades, high rainfall, steep terrain and high volumes of heavy traffic. Despite this, the extent of poor condition assets and isolates failures across the sealed road network is very low by industry standards.

4. The assets do have an aged profile and we expected far more extensive poor condition assets and isolated failures on the network. The fact that they are not present is a great testament to the management and funding of the assets over recent years.

5. Council's practice of repairing sealed road isolated pavement failures prior to resealing and keeping up a strong reseal program is very strongly endorsed and will deliver long term cost benefits.

6. It is recommended that the total annual renewal funding level be set at $1,260,000 pa for the next 3 to 5 years. If maintained in real terms for the next 12-years it is predicted to deliver the same low total extent of over intervention assets as currently exists (1.12%).

7. The sealed road pavements were found to be in very good overall condition and have been exceptionally well managed in recent years with very low levels of urgent isolated pavement failure and a very low extent of poor condition assets. Given the age profile of the assets the key performance indicators are generally much better than would be expected.

8. The sealed surface assets (reseals) were found to be in excellent overall condition and given the age of the pavements the high priority given to the reseal program is strongly endorsed.

9. The unsealed road pavement assets were found to be in excellent overall condition but there is a high level of isolated pavement failures possibly due to heavy vehicles on the roads. The design standard of only 100 mm of imported pavement material may be a little low for the more important roads and possibly needs to be reviewed by Council.

10. The Kerb assets, like the sealed pavements, have a high age profile, but the extent of poor condition assets and urgent failures is extremely low suggesting very sound management practices.

11. The footpath assets were found to be in only fair overall condition. But the extent of urgent failures was zero (the only zero figure we have ever recorded) and the extent of very poor condition assets was also extremely low.

12. Leaving the unsealed pavements out of the equation, as more work needs to be done on the classification of these assets, the management of all other road related assets is considered to be of a very high standard. The age profile of the assets is clearly quite high (high weighted average asset condition), but the extent of isolated failures and very poor condition assets is amongst the lowest we have ever encountered. The only conclusion is that the assets are being managed exceptionally well and the level of renewal funding has been at appropriate levels for a considerable period.

13. This is the first time in 194 such surveys over 20 years that I have made such a comment as in 12 above. I am not saying that your assets are in excellent condition. I am saying that your management practices are among the best we have ever encountered.

14. There is a predicted strong growth in renewal demand over the next 22 - 35 years and it is important that this be understood. A subsequent survey undertaken on the same basis in 3 - 4 years time will deliver unique degradation curves that can be used to greatly enhance the accuracy of the modelling process.

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1.1.2 Other Important matters covered within the report

1. Key performance indicators have been developed to benchmark Tumbarumba Shire against the other 59 councils assessed by MAMS. This information is of great value and indicates that council is in a strong position with its road assets.

1.2 Summary of Asset Condition Findings

SUB ASSET DESCRIPTION	Overall Asset Cond. Indicator	Urgent Isolated Failures	Other Isolated Failures	Ext of Poor Cond. Assets
Sealed Pavements	**Worse**	**Better**	**Better**	**Better**
Sealed Surfaces	**Better**	**N/A**	**N/A**	**Better**
Unsealed Pavements	**Better**	**Worse**	**N/A**	**Better**
Kerbs	**Worse**	**Better**	**Worse**	**Better**
Footpaths	**Worse**	**Better**	**Worse**	**Worse**

Figure 1.1 Summary of asset condition as compared to other councils assessed

The above table provide a very simple assessment of how certain key performance indicators compare with all 51 councils assessed by MAMS. The overall asset condition is a single condition factor representing the condition of the whole asset set. The urgent isolated failures are those that need to be addressed immediately. The other isolated failures represent all other failures that are not considered to be urgent. The extent of poor condition assets is the extent of the asset base at and above condition 6 - 8 depending upon the asset class. The Moloney Condition rating system is consistent across all asset types and commences at zero with a new asset and ends in the 8 to 10 range when there is no remaining life in the asset.

The table is a simplified version of a more detailed set of tables that are provided within each of the sub asset sections below.

Tumbarumba has a somewhat mixed outcome within Figure 1.1 and in this case it would probably be better to refer to the condition comparisons within the sub asset sections of the report (sections 5 to 10) below. However, what can be said is that council is managing its road assets exceptionally well and ranks very highly when it comes to sound targeting of capital works and isolated failure repair programs.

1.3 Summary of financial modelling results at whole of roads group level

The Moloney financial modelling tool has two distinct modelling paths. One predicts future renewal demand based on a desired condition outcome, the other predicts future asset condition based on a proposed renewal expenditure.

Reporting within this section and more broadly within this report will deliver the following three graphs for each asset class.

- Figure 1.1 - Prediction of renewal expenditure demand to maintain all assets strictly within a desired condition range (Ideal funding pattern if there is no limit on funding)
- Figure 1.2 - Prediction of future asset condition based on the continuation of the current levels of renewal expenditure (Where you will be, if you maintain the current funding levels)
- Figure 1.3 - Prediction of future asset condition based upon a recommended renewal funding pattern (gets to the desired condition over a longer period and often costs less up front)

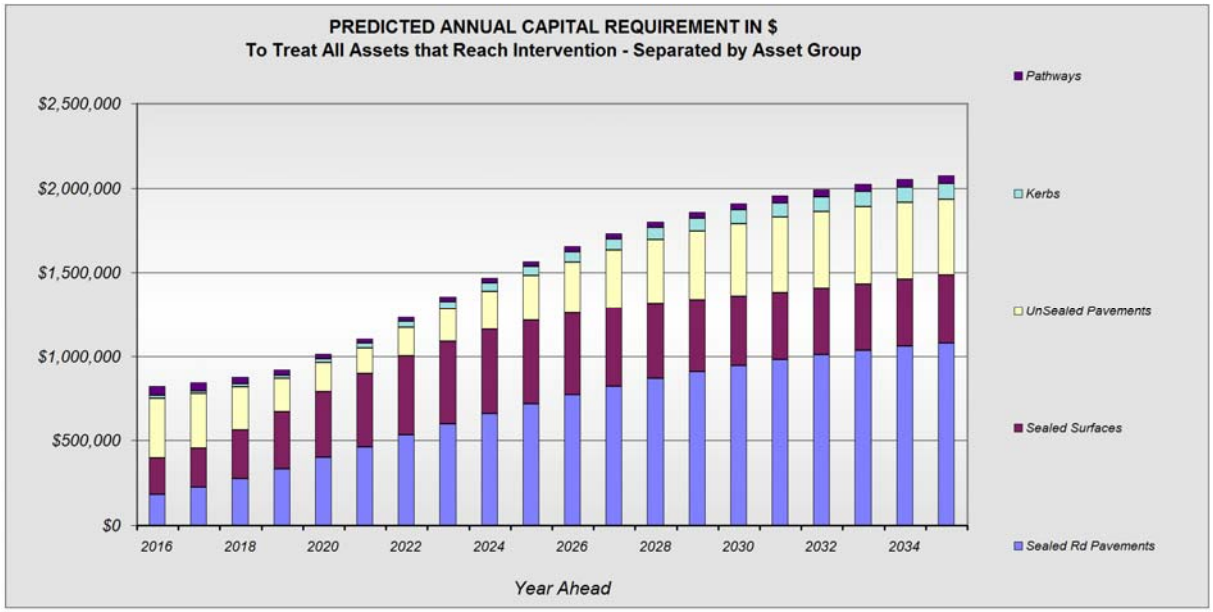


Figure 1.1 Predicted Renewal Demand to maintain selected condition outcome

Figure 1.1 represents the annual renewal funding requirement to treat all assets that are predicted to reach the intervention level through the normal degradation process with time. It predicts a present renewal demand at $823,000 pa and a peak demand over the next 20-years of $2,076,000 in the year 2035.

There is a predicted steady growth in the demand associated with the sealed road pavements. It is really important to pin down this projected demand and future condition surveys will greatly assist via the development of unique asset degradation or performance curves that will enhance the modelling outcome.

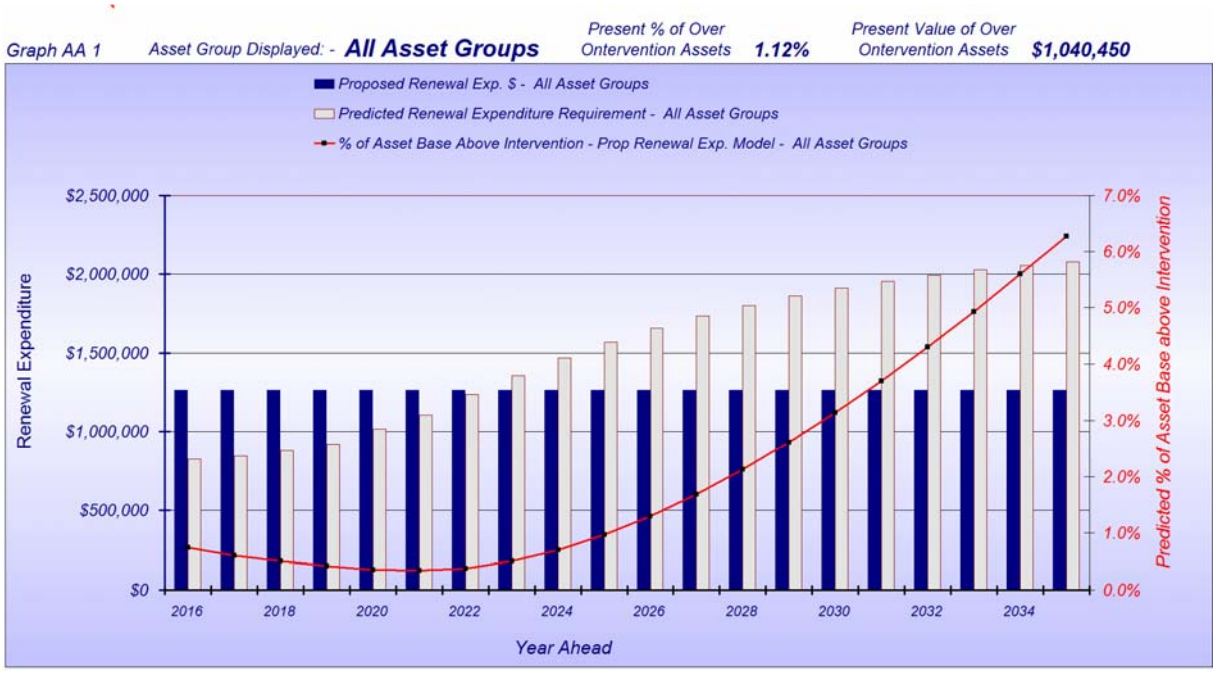


Figure 1.2 Predicted Condition based on continuation of current levels of renewal funding

Figure 1.2 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the planned expenditure profile or the continuation of the present level of renewal expenditure (blue bars). It also plots the predicted renewal demand to treat all over intervention assets (grey bars) for comparison purposes.

Total present renewal expenditure at $1,265,000 pa is actually higher than the predicted present requirement of $823,000 pa. But demand is predicted to steadily rise over the next 20-years and council can either maintain the present level of renewal expenditure which is predicted to deliver the same extent of over intervention assets after 12-years as presently exists. Or it could lower the present renewal expenditure to match the demand and accept a 6% annual compounding increase in expenditure for the next 15-Years. Both would deliver a similar outcome in terms of the level of over intervention assets after 12 - 15 years.

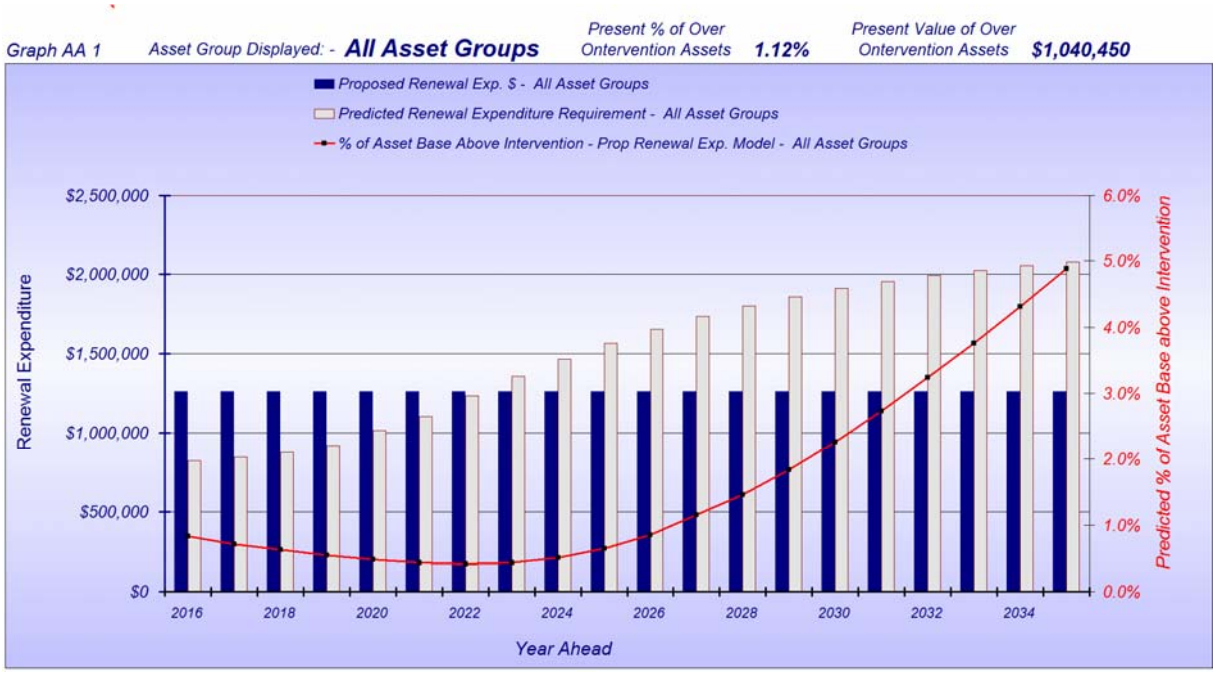


Figure 1.3 Recommended 10-years funding profile – All road assets

Figure 1.3 represents the recommended renewal funding profile. The MAMS software has the capacity to develop a proposed 10 - 20 year renewal funding profile that will deliver a designated percentage of the asset base to be over the selected intervention level within a nominated number of years and also allows

for an annual percentage increase in renewal expenditure (if required). It does this through an iterative process that amends expenditure until the desired outcome is achieved. There are 3 variables that are used in the development of the recommended expenditure profile.

The three common variables used for all assets in this modelling process are as detailed below:

- Desired Percentage of over intervention assets: Same as the present level (1.12%)
- Time to achieve this: 12-Years
- The annual percentage increase in renewal funding: Zero

Figure 1.3 indicates that a flat total renewal expenditure of $1,260,000 pa will deliver the desired condition outcome. The slightly better outcome in Figure 1.3 compared to 1.2 is the result of the model allocating the total renewal expenditure strictly on a needs basis. However, Councils present expenditure pattern is very close to the optimised one delivered within the model.

Councils total present renewal expenditure on the road network is considered to be at an appropriate level. Other modelling scenarios can be run to achieve different outcomes (see Figure Agg 4 below). But with the predicted steady growth in renewal demand over the next 25-years it is considered that council should maintain the current total level of renewal expenditure if it can afford to do so.

1.5 Recommended Renewal Funding levels for the next 3 - Years

Figure 1.4 below contains 4 sets of figures relating to renewal expenditure levels for the asset sets under consideration. The first covers the present actual renewal expenditure as committed by Council for the current financial year. The second is the full-required expenditure to treat all assets that are at the selected intervention level in year 1 (the ideal scenario). The third is the recommended funding level and finally the annual depreciation figures (estimated consumption rate) are provided for comparison purposes.

The recommended expenditure profile in Figure 1.3 may not treat all present over intervention assets within the first 2 – 5 years, as is the case with Figure 1.1. But what it will do is allow you to reach a desired percentage of the asset base to be above intervention within a selected time frame. In this way it can ease in and ramp up expenditure into the future, to achieve the desired goal within a reasonable time frame.

Sub Asset Description	Present total Annual Capital Renewal Expenditure	Req Renewal Exp from Model to treal all assets Reaching Intervention	Recommended Annual Renewal Funding Levels for next 3-years	Annual Depreciation - Average Long Term Annual Ren. Demand
Sealed Pavements	**$543,000**	**$185,000**	$595,000	**$731,086**
Sealed Surface	**$450,000**	**$211,000**	$410,000	**$366,898**
Unsealed Pavement	**$195,000**	**$354,000**	$190,000	**$275,920**
Kerbs	**$33,000**	**$18,000**	$40,000	**$69,938**
Footpaths	**$44,000**	**$55,000**	$25,000	**$33,099**
Totals	$1,265,000	**$823,000**	$1,260,000	**$1,476,940**

Figure 1.4 Recommended Annual Renewal Expenditure levels

Modelling suggests that the current total level of renewal expenditure at $1,265,000 pa is a little higher than the minimum required level to treat all over intervention assets. But renewal growth is predicted to rise steadily in future years and if Council can afford to maintain the present level of renewal funding it will ease the growing burden in future years.

Funding may vary between sub asset classes over the years and the recommended funding levels within Figure 1.4 should be seen as an average long term expenditure.

The recommended total expenditure for the whole roads group also includes $95,000 pa for bridge assets hence the total recommended expenditure comes up to $1,365,000 pa for roads and bridges combined.

Section 2: Introduction

2.1 The Condition Survey and what it has delivered

The Moloney Asset Management system "Roads Module" covers the road sub asset groups of:

- Sealed Surfaces
- Sealed Road Pavements
- Kerbs
- Unsealed Road Pavements
- Footpaths

The sealed surface is the thin spray sealed or asphalt surfacing that seales off the underlying pavement from the intrusion of water. This component has a shorter life that the underlying pavement and typically would need to be renewed on a 12 to 20 years cycle.

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

Kerbs in urban areas are used to drain water away from the pavement and tend to have a life similar to the sealed pavement.

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

Footpath assets are not really related to the road pavement and can be seen as pavements for foot traffic. Their life will vary greatly and can be quite extensive if localised failures are repaired as they occur.

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 groups.

The condition survey involves the measurement and quantifying of all of the above sub asset groups and the breaking down of the assets into a series of like performing segments that are then individually condition rated.

Once this data is placed within the MAMS System the software will deliver works programs in priority order, based upon both the condition of the assets and the hierarchy or relative importance of the road. If data for all of the designated condition and inventory fields is collected, then the software will deliver a costed priority works program for the following activities.

- Reseal – Resurfacing program on sealed roads.
- Sealed Road Pavement Rehabilitation program
- Sealed Road Pavement Major Patching or dig out repair program
- Unsealed Road Re-Sheeting 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.

The prime purpose of the condition assessment survey is to deliver the above works programs. But the information collected also serves further very important functions. Firstly it enables full and accurate asset valuations to be undertaken and secondly via the MAMS financial modelling software the data can be used to predict the future pattern of asset renewal demand.

The data is also used to benchmark an individual councils performance between two condition surveys as well as providing industry wide benchmarking against all other councils assessed by MAMS (*Currently around 51 councils).*

In summary the one condition and inventory data set that has just been completed, delivers the following 4 very important outcomes.

- **Council's capital renewal works and major maintenance programs.**
- **Road asset valuation figures.**
- **Predictive modelling of future renewal demand cost.**
- **Internal and External benchmarking of asset condition and performance.**

2.2 The Aim of this report

While the condition assessment survey delivers detailed condition ratings right down to individual segment level, this report is aimed at a higher level and tracks the performance of the roads on a network basis.

This report will focus on the last 3 of the above 4 dot points. For access to the detailed works programs you are referred back to the reports within the MAMS software itself.

In more specific terms the aim of this report is to deliver the following.

- Benchmark asset condition both internally (compared to a previous condition survey if one is available) and externally (compared to all other councils assessed by MAMS).
- Deliver asset valuation figures including annual depreciation for the whole network.
- Produce asset degradation curves based upon the statistical analysis of condition change between two condition surveys.
- Deliver a 10-year predicted pattern of asset renewal demand and recommended funding levels using the MAMS financial modelling software in conjunction with the survey results.

2.3 The Moloney Financial 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
- The model commences with the present condition of the assets and then degrades them to simulate the passage of time based on a unique degradation curve developed for each council
- From this point there are two distinct modelling paths
- A retreatment intervention condition is nominated (level of service) within the first path 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 10-year capital renewal profile.
- In the second path a proposed 10-year capital renewal expenditure profile is input and the model predicts the resulting asset condition over the same period.

For a detailed explanation of the model and how it works please refer to our web site at www.moloneys.com.au and from the "Get Information" tab download the PDF document titled "The Moloney Financial Modelling Methodology".

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. Council has supplied the rehabilitation unit rates and present expenditure levels. The survey of the assets has delivered the other variables.

The degradation curves used in the Modelling process are best-fit curves at this stage as we do not yet have two consistent condition surveys for Tumbarumba Shire*.*

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	—	Best fit 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.

2.3.1 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 an existing asset. Section 3 of the report dealing with asset valuations, uses unit construction rates based upon (green fields construction) or construction for the first time where no asset previously existed. This is an accounting requirement for valuations, but if those same unit rates were to be used in the future financial modelling of the assets the projected renewal demand could be quite misleading.

2.4 Capital Rehabilitation - Renewal and Capital Expansion Works

The term **Capital Expenditure** has a broad meaning that can denote different things under certain circumstances. For the purpose of this report all **Capital Expenditure** relates to Renewal or **Capital Rehabilitation Expenditure**. That is, expenditure put towards the replacement or rehabilitation of existing assets.

This report is limited in its financial analysis to the costs associated with the ongoing cyclical rehabilitation of the existing road asset base. Costs associated with new or upgraded assets would need to be added to the total expenditure levels delivered within the report. 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.

Section 3: Valuations and Current Expenditure Levels

This section will examine the overall asset valuations and the current level of capital-renewal and maintenance expenditure.

3.1 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 $1,476,940 is really an accounting figure and may vary from the actual annual renewal demand or what we term the Annual Renewal Liability. Annual Depreciation represents the first attempt to define the annual loss in capital value within the asset set. At its most basic level it represents the rate of annual capital consumption of the asset base.

ASSET DESCRIPTION	Total Quantity	Units	Weighted Av. Asset Cond.	Replace. Value $	Asset Life in Years	Written Down Value $	Accumul. Deprec. $	Annual Deprec. $
Footpath	13,389	Lin. Met	3.501	2,623,884	78.2	1,401,312	1,222,571	33,099
Kerb	37,300	Lin. Met	3.941	5,595,000	80.0	2,838,881	2,756,119	69,938
Sealed Pavements	334,917	Lin. Met	3.739	60,240,653	86.3	32,104,212	28,136,441	731,086
Unsealed Pavement	232,105	Lin Met	1.641	8,450,393	30.0	6,725,708	1,724,684	275,920
Sealed Surface	335,337	Lin. Met	3.012	7,574,913	20.4	4,317,058	3,257,855	366,898
				84,484,842		**47,387,171**	**37,097,671**	**1,476,940**

Figure 3.1 Table of asset valuations

Important Note:

The asset valuations detailed above are based upon the best available information at the time of preparing this report. Before they are adopted for accounting purposes council MUST check the inputs and assumptions to ensure that the results are consistent with their approach to the valuation of road assets.

3.2 Current Levels of Renewal Expenditure vs. Av Long-term Demand

Sub Asset Description	Present total Annual Capital Renewal Expenditure	Annual Depreciation or Average Long term Annual Demand	% of Annual Depreciation Being Met
Sealed Pavements	**543,000**	**731,086**	74
Sealed Surface	**450,000**	**366,898**	123
Unsealed Pavement	**195,000**	**275,920**	71
Kerbs	**33,000**	**69,938**	47
Totals	**1,265,000**	**1,476,940**	86

Figure 3.2 Details of Current Expenditure Levels and demand

Figure 3.2 provides some very important overall figures. It indicates that the average long-term annual renewal demand (depreciation) is $1,476,940 pa and that the present capital renewal expenditure is $1,265,000 PA.

Council is funding around 86% of the average long-term demand (Annual Depreciation) or consumption rate. Modelling in later sections of the report will determine if the current level of expenditure is meeting present renewal demand. But 86% is a reasonable figure by industry standards.

Section 4: 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 survey.

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 life cycles within the accounting system.

With only 1 survey completed for Tumbarumba we are unable to create unique degradation curves at this stage. However, we do have a vast body of curves we have created for other councils and the shape of the present condition distribution (for the longer life assets) does provide a strong indication of the total asset life. We will adopt curves and lives that are the best fit.

Section 5: Sealed Road Pavement Assets

The Sealed Road Pavement assets consist of the crushed rock or other granular that lies between the bituminous sealed surface and the underlying soil. The purpose of the layer is to spread out the vehicle wheel loads so that when they reach the underlying soil its deformation will be limited. They do have a life and through gradual deformation and isolated failures will reach a point where they need to be replaced or renewed.

5.1 Condition and Performance Indicators for Sealed Road Pavements

MAMS have developed a series of 6 key performance indicators that can be applied to all road sub asset sets. They are used to measure condition movement between field surveys some years apart. They are also used to benchmark against other council districts assessed on the same basis.

The same key performance indicators are used for all road asset groups. However for some asset classes certain indicators are not applicable and as such are omitted. Detailed below is a brief explanation of the 6 key indicators. The explanation is also applicable to their use with other road sub asset sets other than the sealed road pavements.

5.1.1 Weighted Average Asset Condition

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

5.1.2 Percentage of Urgent Failures

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

5.1.3 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 again expressed as a percentage of the total asset quantity.

5.1.4 Average Roughness

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

5.1.5 Average Profile

Average pavement profile is similar to the roughness rating and can be seen as the pavement cross sectional shape indicator while roughness is the longitudinal pavement shape indicator. It is based on a 0 – 10 scale with 0 being perfect and 10 un-driveable.

5.1.6 Extent of Poor Condition Assets above a given Condition

The percentage of the asset base at and above a given condition rating is a very good 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 3 – 5 years.

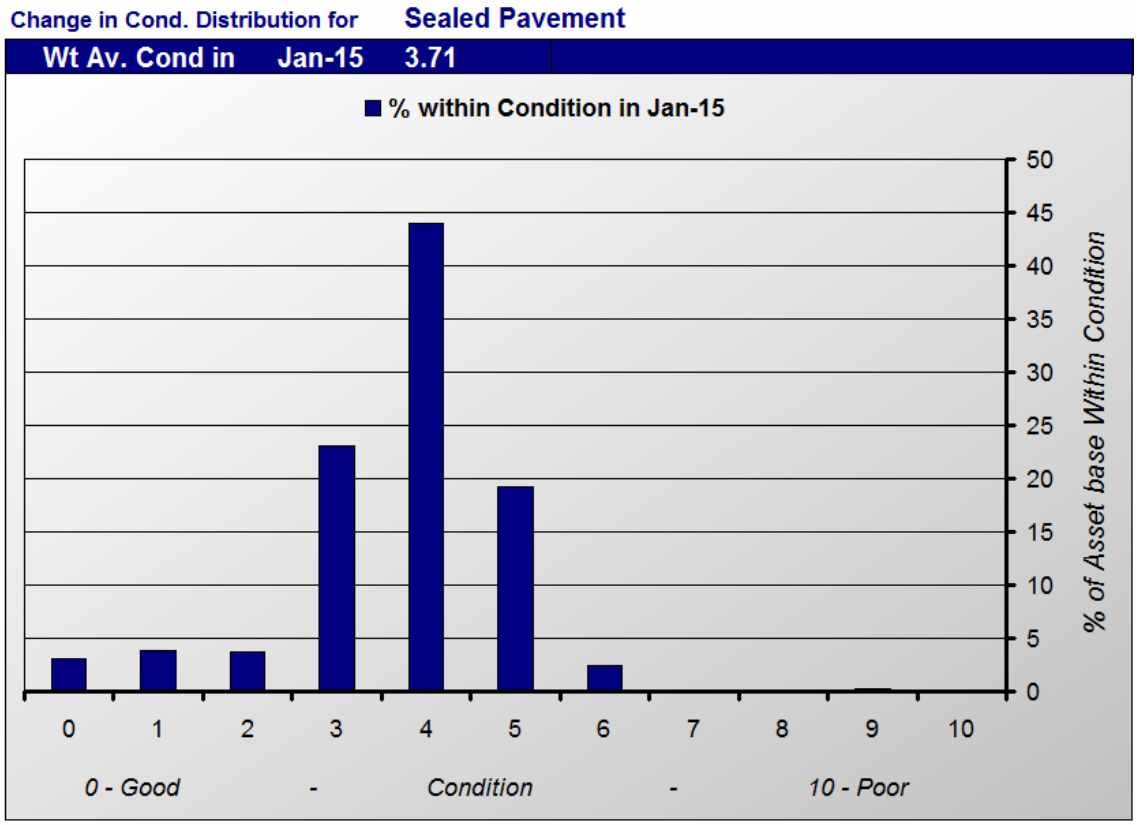


Figure P1 Condition Distribution for Sealed Road Pavements

Figure P1 is a plot of the condition distribution for this sub asset set. Condition commenced at zero when the assets are new and progresses to ten with time. Typically assets will be renewed at around the 7 - 9 condition range.

The condition distribution in Figure P1 above is quite interesting in that there is a very small percentage of the asset base at and above condition 7 (0.52%) and only 2.38% within condition 6. This represents a very strong outcome and is further highlighted within Figure P2 when compared to the average figures for all 59 Councils assessed by MAMS.

Key Cond. Indic. No.	Sealed Pavement Condition Indicator	Mean Indicator for all Councils assessed by MAMS	Figures from Current Survey in Jan-15	Raw Difference Your Figure Less the Mean	% Difference Your Figure to the Mean	Better or Worse than the Mean
1	Weighted Average Asset Condition	3.673	3.739	-0.066	-1.8	Worse
2	% of Urgent Failures	0.245	0.004	0.241	98.4	Better
3	% of Other Failures	1.852	1.103	0.749	40.4	Better
4	Average Pavement Roughness	3.133	3.463	-0.330	-10.5	Worse
5	Average Pavement Profile	2.667	2.072	0.595	22.3	Better
6	% of Asset Base above Condition 6	11.611	2.898	8.713	75.0	Better
7	% of Asset Base above Condition 7	2.880	0.515	2.364	82.1	Better
8	% of Asset Base above Condition 8	0.680	0.368	0.312	45.9	Better

Renewal Demand Being Met For:	% of Long Term Demand Being Met
Sealed Rd Pavement Asset Group	74.3

Figure P2 Table of Key performance Indicators and how they compare to the mean of all councils assessed

Figure P2 details the key performance indicators that are followed by MAMS. It also provides a comparison with the average figures for all 55 councils we have assessed. (See section 5.1 for a detailed explanation of all indicators). At the bottom of the table is recorded the percentage of the consumption rate (annual depreciation) currently being met. This provides a further valuable performance indicator.

The key performance indicators in Figure P2 indicate a set of assets in very good overall condition. Clearly they have some age about them with the slightly higher than average weighted average condition, but the extent of poor condition assets at and above condition 6 and the extent of urgent pavement failures is absolutely outstanding.

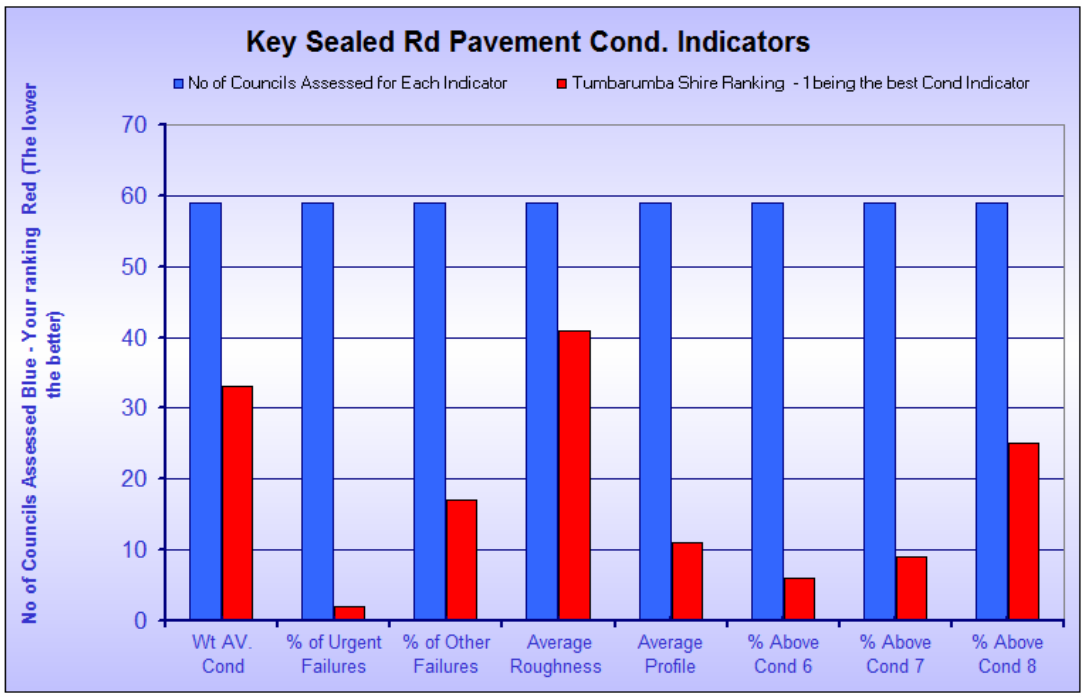


Figure P3 Key performance Indicators as Compared with other Councils surveyed

Figure P3 presents the same performance indicators in a different way. Here the total number of councils that have been assessed by MAMS for each indicator is represented by the blue bars. The red bar represents your ranking against all other councils assessed. The higher the red bar the worse the ranking. If you were the best council assessed for an indicator, your red bar would be at 1. If the worst, your red bar would be at the same level as the blue.

The sealed road pavements within Tumbarumba Shire are in very good overall condition. Figure P3 reinforces the findings of the table above. The weighted average asset condition is a guide to the age of the assets and council is sitting right in the middle of the 59 councils assessed.

The percentage of urgent pavement failures is the second best ever encountered and the extent of poor condition assets is also comparatively low. Clearly council has put a strong effort into the management of these assets in recent years and the practice of stabilizing localises pavement failures prior to reseal appears to be having a big impact on the findings and is strongly endorsed.

5.2 Sealed Road Pavement Financial Modelling Analysis

The Sealed road pavement assets will normally be modelled in three groups with the results aggregated here in one presentation. The table below contains a list of the basic Modelling parameters used. Note that the useable life is the life to intervention, an asset should not remain in service after that point.

5.2.1 Sealed Road Pavement – Selection of Re-treatment 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 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 re-treatment 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 7 – 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 considered as a typical situation and not the only situation for that condition rating.

5.2.2 Sealed Road Pavement Financial Modelling

Modelling Parameter	Regional Road Sealed Pavements	Council Urban Sealed Rd Pavements	Council Rural Sealed Rd Pavements
Asset Quantity in sqm	901,679	292,895	1,038,794
Unit Renewal Rate	$35.00	$35.19	$25.00
Total Asset Group Renewal Cost	$31,558,765	$10,307,470	$25,969,850
Annual Renewal Exp.	$255,000	$60,000	$228,000
Retreat. Intervention Condition	7.5	8.0	7.5
Life to Condition 10 in Years	80.0	100.0	80.0
Life in years to Intervention	72.2	94.7	73.8

Figure P4A – Summary of Modelling Input Parameters for sealed pavement assets

Sealed road pavement modelling has been undertaken within 3 categories based upon the rural urban split and the regional roads as a separate group. Retreatment intervention levels have been set to reflect and maintain the current condition standard of the assets. Total asset life has been set based on both

council advice and an examination of other councils we have degradation curves for, where we see similarities with Tumbarumba.

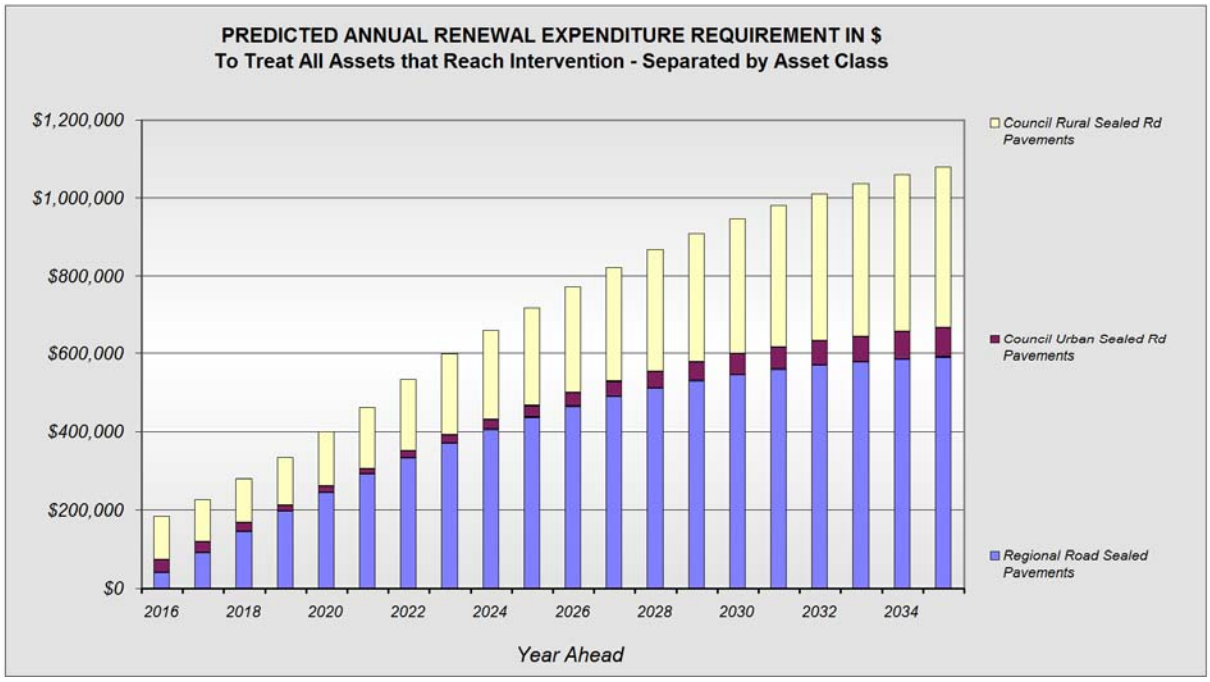


Figure P4 Predicted Capital Requirement Model – Renewal Demand to treat all assets at Intervention

Figures P4 provides a profile of the predicted renewal demand to treat all assets that reach the adopted retreatment intervention level through the degradation process. It also splits the results up based upon the individual sub sets of the data that were modelled separately.

Renewal demand is presently sitting at only $185,000 pa with the peak demand over the next 20-years predicted to be $1,080,000 in 2035. The low early renewal demand reflects the very good present condition of the assets.

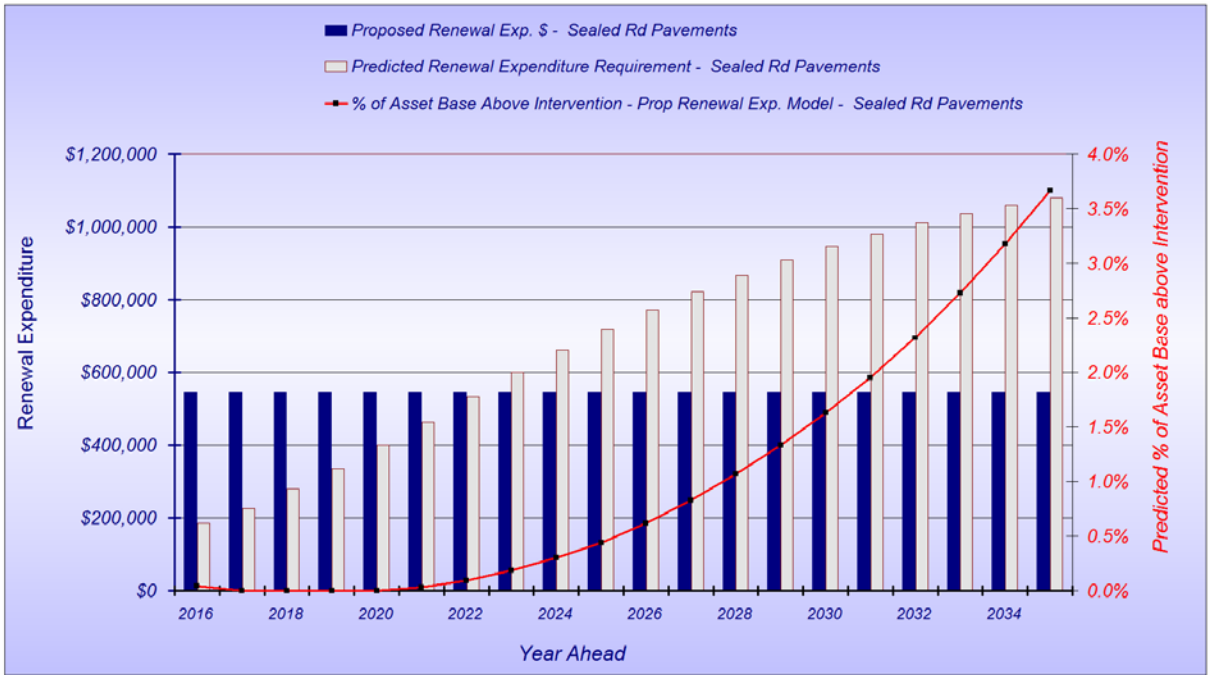


Figure P5 Future Condition Based on Proposed Renewal Expenditure

Figure P5 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the planned expenditure profile or the continuation of the present level of renewal expenditure (blue bars). It also plots the predicted renewal demand to treat all over intervention assets (grey bars) for comparison purposes.

The present renewal expenditure at $543,000 is well above predicted demand and appears to have been lifted to address an earlier backlog in poor condition assets. But the backlog has now been addressed.

The total expenditure also includes the pavement stabilization program, which it is felt is halting the progress of pavement condition beyond condition 6.0. A second survey will shed more light on this matter when we will be able to observe the movement in the 8 key performance indicators and compare that with the level of expenditure since the last survey. We will also have unique degradation curves for Tumbarumba which will greatly enhance the modelling outcome.

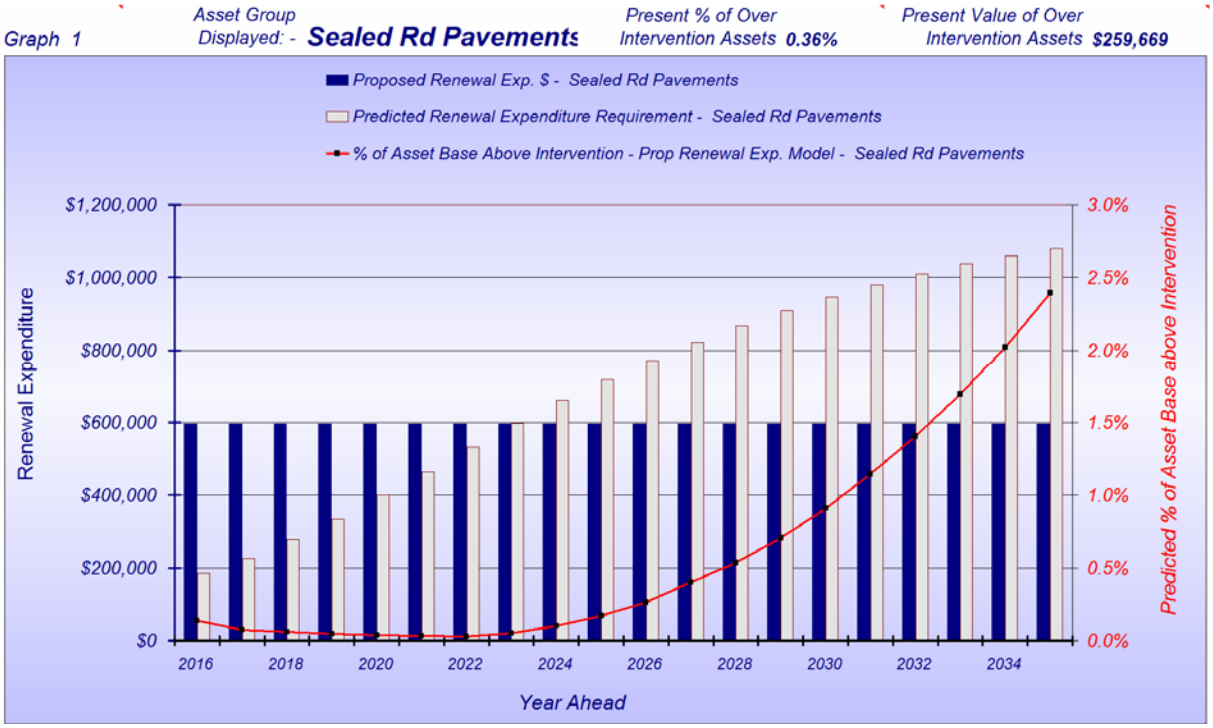


Figure P6 Recommended funding profile

Figure P6 represents the recommended renewal funding profile. The MAMS software has the capacity to develop a proposed 10 - 20 year renewal funding profile that will deliver a designated percentage of the asset base to be over the selected intervention level within a nominated number of years and also allows for an annual percentage increase in renewal expenditure (if required). It does this through an iterative process that amends expenditure until the desired outcome is achieved. There are 3 variables that are used in the development of the recommended expenditure profile.

The three variables used for the sealed pavement assets were:

- Desired Percentage of over intervention assets: Same as the present level (0.36%)
- Time to achieve this: 12-Years
- The annual percentage increase in renewal funding: Zero

Figure P6 indicates that a flat renewal expenditure of $590,000 pa will deliver the desired condition outcome. The present level of over intervention assets at 0.36% is very low by industry standards and it could be argued that funding could be lowered. However, our observations during the condition survey indicate that council has a very strong major patching program that appears to be operating in conjunction with the reseal program and that these combined activities are tending to hold the pavement condition to a maximum of around condition 6 and is endorsed as a very sound strategy.

It is thus recommended that funding be held at around its present level and reviewed again in 3-4 years time following the next condition survey. Adding further weight to this recommendation is the predicted steady rise in the renewal demand which is predicted to keep rising for the next 25-years.

5.3 Sealed Road Pavement Summary

The sealed road pavement assets were found to be in very good overall condition and compared quite favourably with the 59 councils assessed by MAMS. Council is managing these assets exceptionally well and the current policy with its strong emphasis on treating isolated pavement failures in conjunction with the reseal program is strongly endorsed.

It is recommended that total renewal funding on this asset class including the stabilization of isolates pavement failures be set at $590,000 pa for the next 3 - 4 years and then reviewed again following the next condition survey.

Section 6: Sealed Surface Assets

The Sealed Surfaces assets are made up of the thin layer of bitumen and entrapped stone that prevent water from entering and exiting the pavements underneath. The bitumen that binds this layer together does break down with time and for spray seals needs to be renewed on a 12 -18 year cycle. Failure to do so will result in the break up of the sealed surface followed by the eventual failure of the more expensive sealed road pavement.

6.1 Condition and Performance Indicators for Sealed Surfaces

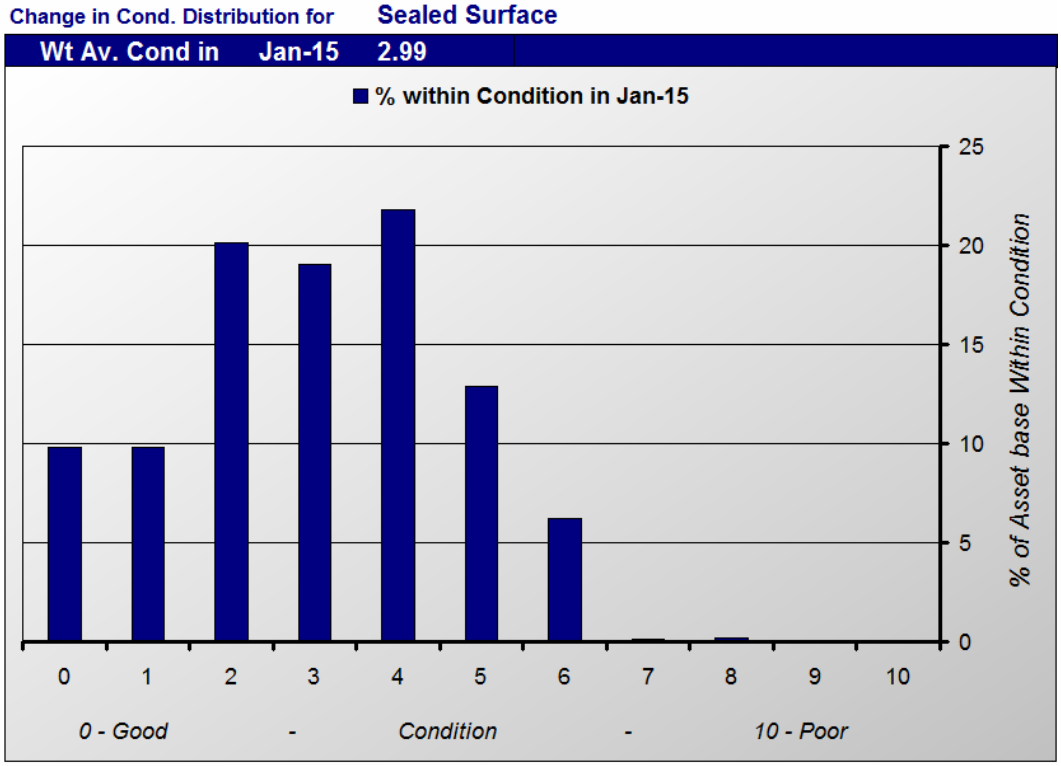


Figure S1 Condition Distribution Comparison Graph – Between Surveys all Sealed Surfaces

Figure S1 is a plot of the condition distribution for this sub asset set. Condition commenced at zero when the assets are new and progresses to ten with time. Typically assets will be renewed at around the 6.5 - 7.5 condition range.

Key Cond. Indic. No.	Sealed Surface Condition Indicator	Mean Indicator for all Councils assessed by MAMS	Figures from Current Survey in Jan-15	Raw Difference Your Figure Less the Mean	% Difference Your Figure to the Mean	Better or Worse than the Mean
1	Weighted Average Asset Condition	3.407	3.012	0.395	11.6	Better
2	% of Asset Base above Condition 5	31.869	19.435	12.434	39.0	Better
3	% of Asset Base above Condition 6	17.437	6.535	10.902	62.5	Better
4	% of Asset Base above Condition 7	6.880	0.323	6.557	95.3	Better
5	% of Asset Base above Condition 8	1.328	0.189	1.139	85.8	Better

Renewal Demand Being Met For:	% of Long Term Demand Being Met
Sealed Surface Asset Group	123

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

The sealed surfaces were found to be in excellent condition with around 40% of the assets at or better than condition 2. The comparison with other councils assessed in Figure S2 also illustrates an outstanding set of sealed surfaces.

Figure S2 details the key performance indicators that are followed by MAMS. It also provides a comparison with the average figures for all 57 councils we have assessed. (See section 5.1 for a detailed explanation of all indicators). At the bottom of the table is recorded the percentage of the consumption rate (annual depreciation) currently being met. This provides a further valuable performance indicator.

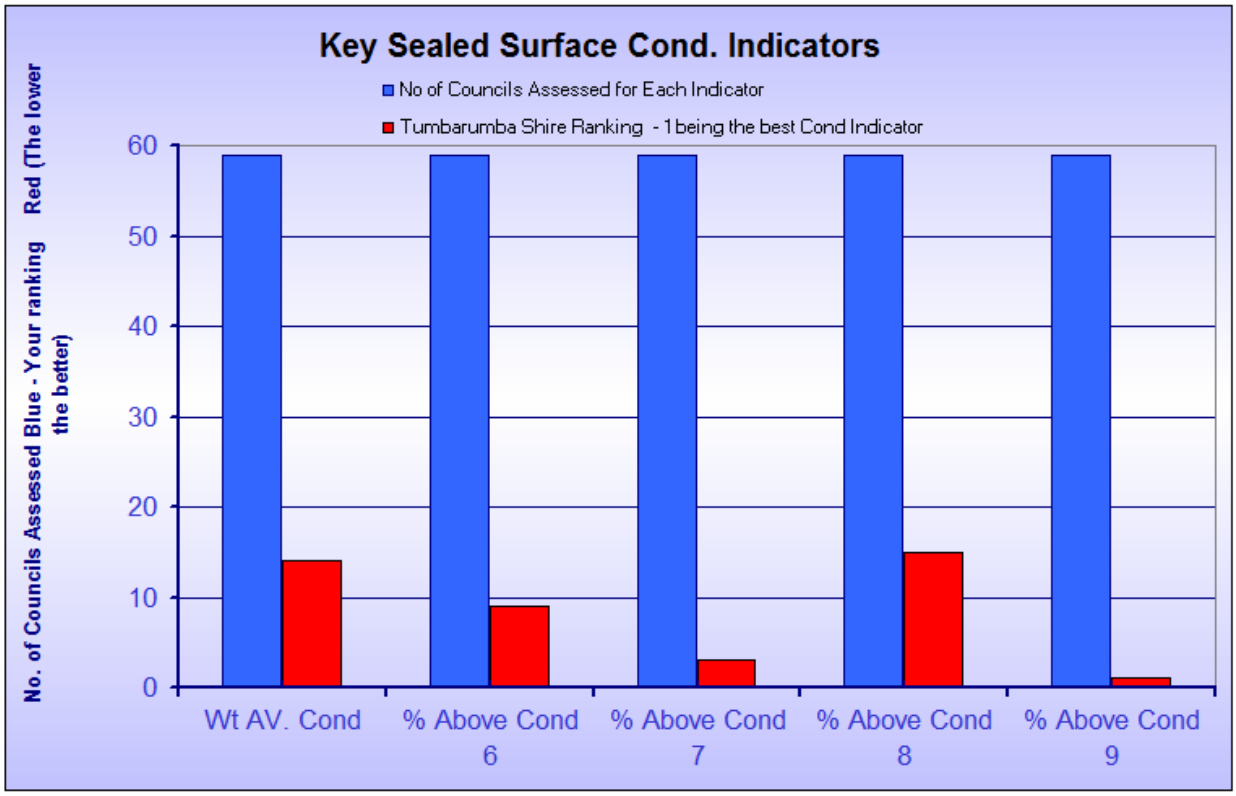


Figure S3 Key performance Indicators as Compared with other Councils surveyed

Figure S3 presents the same performance indicators in a different way. Here the total number of councils that have been assessed by MAMS for each indicator is represented by the blue bars. The red bar represents your ranking against all other councils assessed. The higher the red bar the worse the ranking. If you were the best council assessed for an indicator, your red bar would be at 1. If the worst, your red bar would be at the same level as the blue.

The sealed surfaces within Tumbarumba Shire are in excellent condition and compare very favourably with the 59 councils assessed by MAMS. Council is ranked 14th out of the 59 councils assessed by MAMS for the very important weighted average asset condition. The extent of the asset based in condition 0 - 1 is close to 20% with a further 20% in condition 2. This is an outstanding achievement and is strong evidence of a sound reseal program within the Shire.

6.2 Sealed Surface Financial Modelling Analysis

The Sealed Surface assets will be modelled in two groups with the results aggregated here in one presentation. The table below contains a list of the key Modelling parameters used. Note that the useable life is the life to intervention, an asset should not remain in service after that point.

6.2.1 Sealed Surfaces – Selection of Re-treatment 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 sealed surface condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of re-treatment intervention level.

	
Condition 0 – 1 Seal in Excellent near new condition	Condition 5 Cracking but seal not too oxidized
	
Condition 6.5 - 7 Oxidized and Stripping	Condition 8 Fully Oxidized and falling apart

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 7 – 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 situations. They should be considered as a typical situation and not the only situation for that condition rating.

6.2.2 Sealed Surfaces – Financial Modelling Results

Modelling Parameter	Regional Road Spray Seals	Council Urban Sealed Surfaces	Council Rural Sealed Surfaces
Asset Quantity in sqm	807,107	296,419	996,736
Unit Renewal Rate	$3.3	$4.0	$3.3
Total Asset Group Renewal Cost	$2,623,098	$1,200,000	$3,239,392
Annual Renewal Exp.	$150,000	$50,000	$250,000
Retreat. Intervention Condition	7.0	7.0	7.0
Life to Condition 10 in Years	20.0	20.0	20.0
Life in years to Intervention	16.6	16.6	16.6

Figure S4A – Summary of Modelling Input Parameters for Sealed Surface Assets

The sealed Surfaces will be modelled in the same groupings as the sealed road pavements with the broad input parameters as per the figures within Figure S4A above.

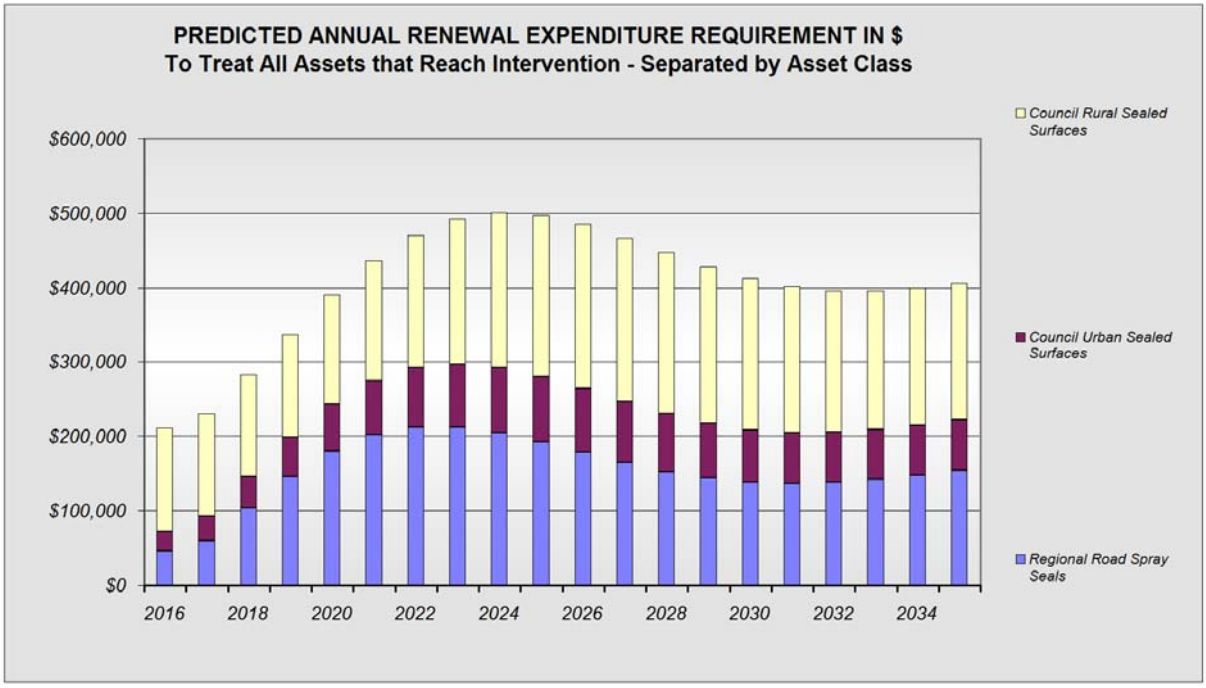


Figure S4 Predicted Capital Requirement Model – Renewal Demand to treat all assets at Intervention

Figures S4 provides a profile of the predicted renewal demand to treat all assets that reach the adopted retreatment intervention level through the degradation process. It also splits the results up based upon the individual sub sets of the data that were modelled separately.

Capital renewal demand is presently sitting at around $211,000 pa with the peak demand over the next 20-years at $500,000 in the year 2024.

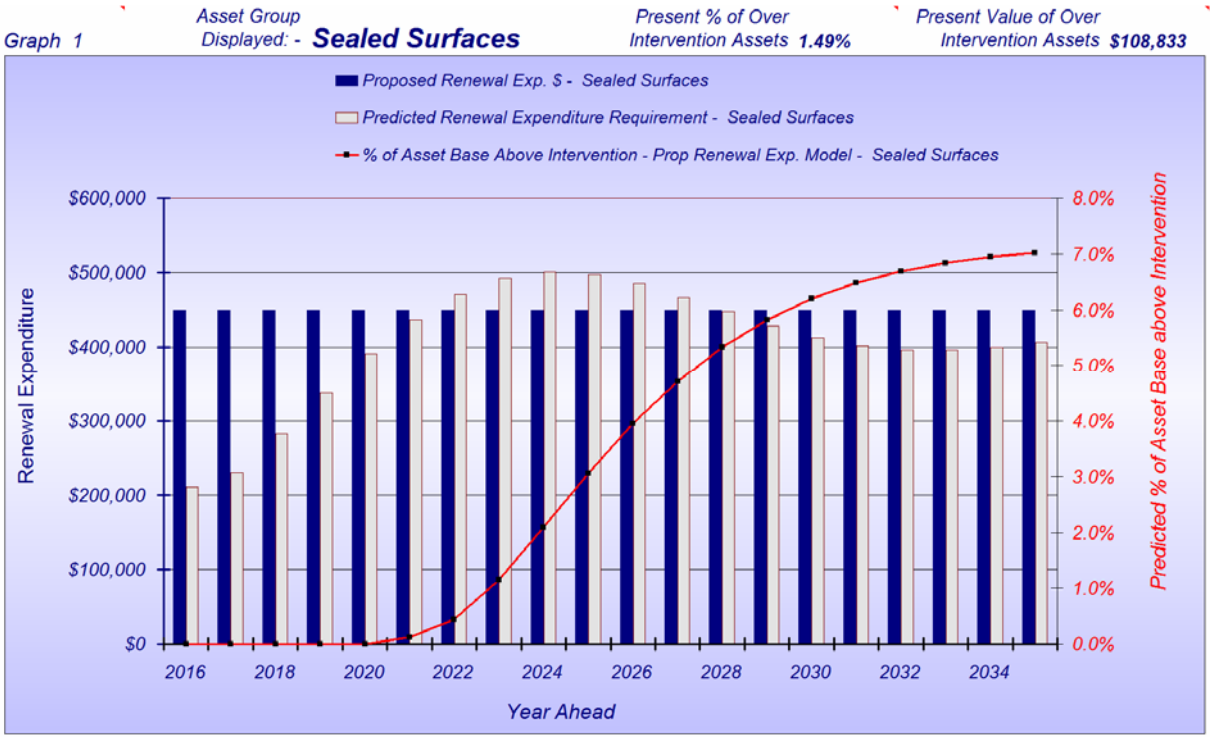


Figure S5 Future Condition Based on Proposed Renewal Expenditure

Figure P5 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the planned expenditure profile or the continuation of the present level of renewal expenditure (blue bars). It also plots the predicted renewal demand to treat all over intervention assets (grey bars) for comparison purposes.

The present renewal expenditure level at $450,000 pa is higher than the present renewal demand and given the excellent condition of the assets could perhaps be lowered a little.

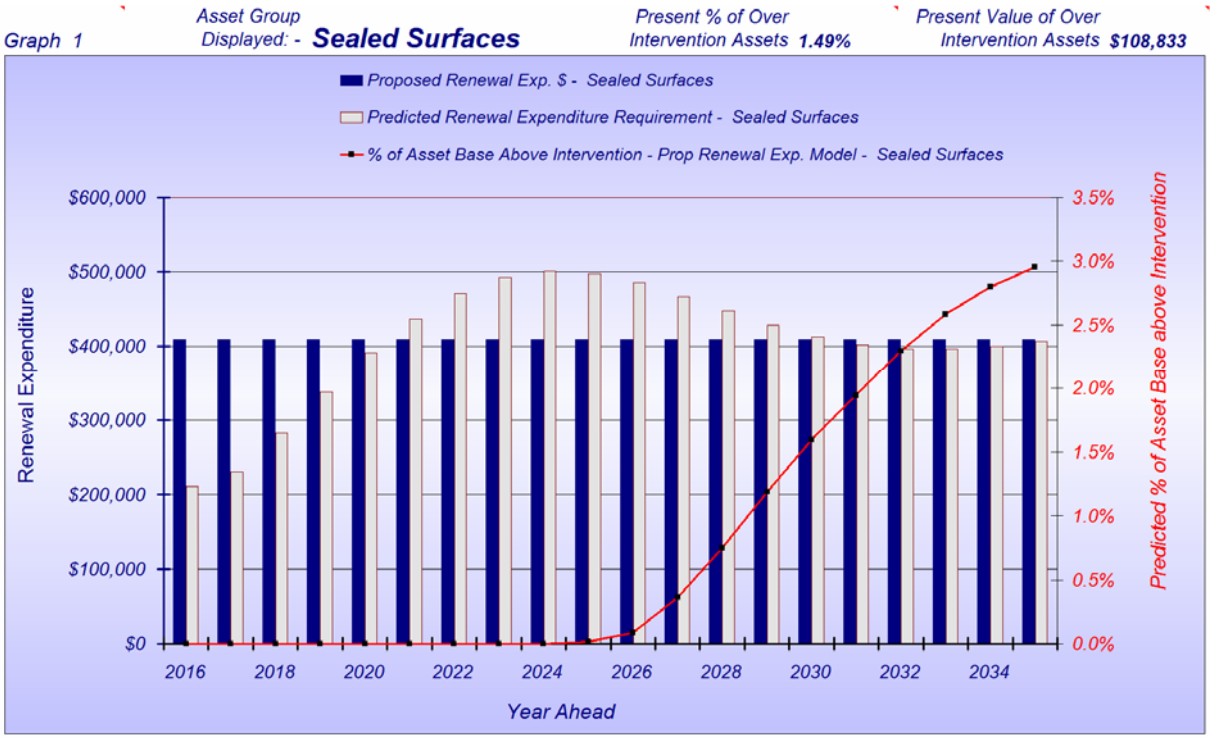


Figure S6 Recommended funding profile

Figure S6 represents the recommended renewal funding profile. The MAMS software has the capacity to develop a proposed 10 - 20 year renewal funding profile that will deliver a designated percentage of the asset base to be over the selected intervention level within a nominated number of years and also allows for an annual percentage increase in renewal expenditure (if required). It does this through an iterative process that amends expenditure until the desired outcome is achieved. There are 3 variables that are used in the development of the recommended expenditure profile.

The three variables used for the sealed surface assets were:

- Desired Percentage of over intervention assets: Same as the present level (1.49%)
- Time to achieve this: 12-Years
- The annual percentage increase in renewal funding: Zero

Figure S6 indicates that a flat renewal expenditure of $410,000 pa for the next 12-years will deliver the desired condition outcome. The present extent of over intervention assets at 1.49% is very low, particularly given the relatively short service life of these assets. Thus if additional savings were required there would be no real problem in lowering the expenditure down to the level of annual depreciation at $366,898 pa.

The one word of caution is that these are very important assets and the reason that the current expenditure is relatively high is that the unit renewal rate has fallen sharply over the last two years but it may not remain at these levels for long. Hence it was felt that a balance should be struck between cutting costs and allowing for a future price rise. Additionally, it would represent sound practice to have a higher reseal rate while the renewal rates are low.

6.3 Sealed Surface Summary

The sealed surface assets were found to be in excellent overall condition with clearly a high priority having been given to them in recent years.

It is recommended that the present renewal expenditure of $450,000 pa be lowered to $410,000 pa for the next 3-4 year and then reviewed again following the next condition survey.

Section 7: Unsealed Pavement Assets

The un-Sealed Road Pavement assets consist of the crushed rock or other granular that is placed on the underlying soil. The purpose of the layer is to spread out the vehicle wheel loads so that when they reach the underlying soil its deformation will be limited. They do have a service life as they tend to be worn away due to traffic movements and the impact of weather events. They tend to need to be replaced on a 15 - 40 year cycle depending on many variables.

7.1 Condition and Performance Indicators for Unsealed Road Pavements

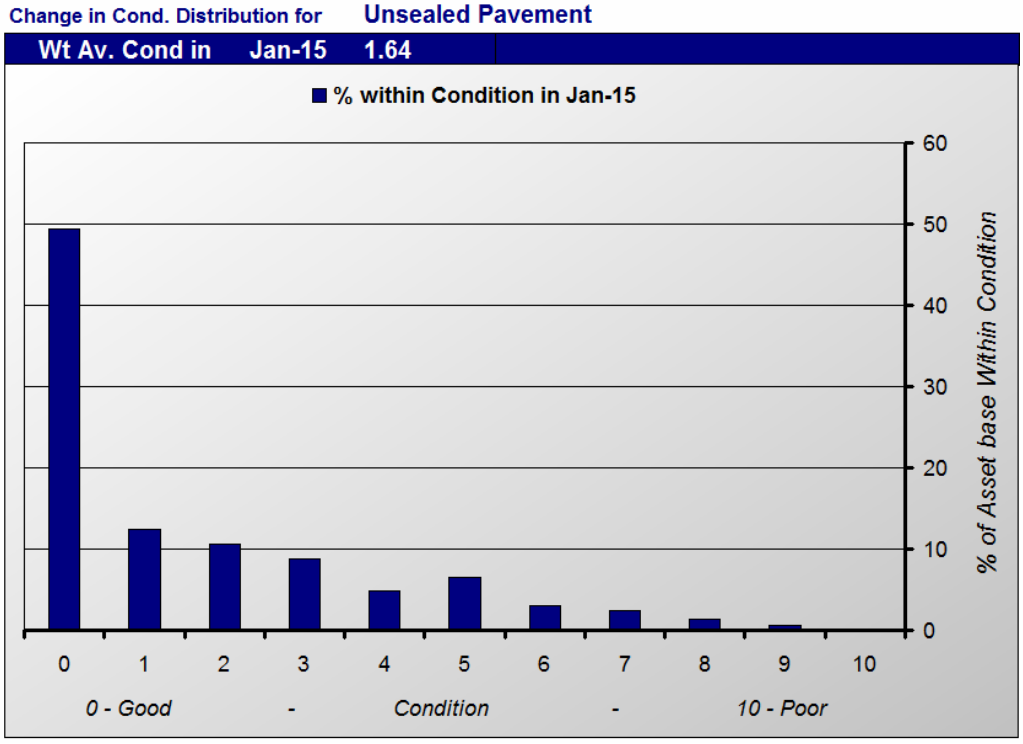


Figure U1 Condition Distribution Comparison Graph – Between Surveys

Figure U1 is a plot of the condition distribution for this sub asset set. Condition commenced at zero when the assets are new and progresses to ten with time. Typically assets will be renewed at around the 6 - 8 condition range.

Key Cond. Indic. No.	Unsealed Pavement Condition Indicator	Mean Indicator for all Councils assessed by MAMS	Figures from Current Survey in Jan-15	Raw Difference Your Figure Less the Mean	% Difference Your Figure to the Mean	Better or Worse than the Mean
1	Weighted Average Asset Condition	2.92	1.64	1.282	43.9	Better
2	% of Pavement Failures	3.03	4.50	-1.467	-48.4	Worse
3	Average Pavement Roughness	3.68	4.83	-1.152	-31.3	Worse
4	Average Pavement Profile	3.44	3.33	0.110	3.2	Better
5	Average Pavement Depth in mm	82	85	3.003	3.7	Better
6	% of Asset Base above Condition 6	15.63	7.54	8.091	51.8	Better
7	% of Asset Base above Condition 7	10.00	4.48	5.518	55.2	Better
8	% of Asset Base above Condition 8	4.88	2.04	2.830	58.1	Better

Renewal Demand Being Met For:	% of Long Term Demand Being Met
UnSealed Rd Pavement Asset Group	71

Figure U2 Condition Change since last survey & Renewal demand being met

Figure U2 details the key performance indicators that are followed by MAMS. It also provides a comparison with the average figures for all 55 councils we have assessed. (See section 5.1 for a detailed explanation of all indicators). At the bottom of the table is recorded the percentage of the consumption rate (annual depreciation) currently being met. This provides a further valuable performance indicator.

Figures U2 above indicate that assets are in excellent overall condition and compare very favourably with the 47 councils assessed by MAMS. Most indicators are far better than the average of the 47 councils assessed with the exception of the isolated pavement failures and the roughness of the pavements.

Roughness is a maintenance condition and with the survey being undertaken in the middle of summer it would be expected to be worse than at other times of the year. The isolated pavement failures are a little more concerning and it is suspected that these are directly linked to the high level of log traffic on the network (as indeed may be the roughness).

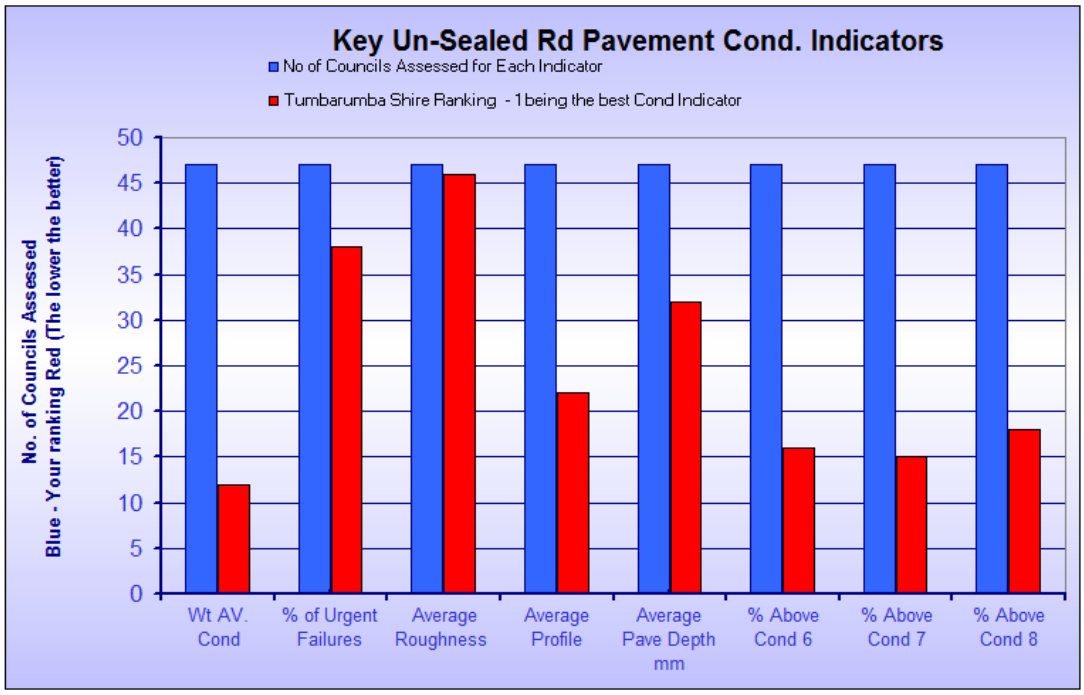


Figure U3 Key performance Indicators as Compared with other Councils surveyed

Figure U3 presents the same performance indicators in a different way. Here the total number of councils that have been assessed by MAMS for each indicator is represented by the blue bars. The red bar represents your ranking against all other councils assessed. The higher the red bar the worse the ranking. If you were the best council assessed for an indicator, your red bar would be at 1. If the worst, your red bar would be at the same level as the blue.

The unsealed road pavement assets were found to be in excellent overall condition as illustrated in Figures U2 and U3 above.

7.2 Unsealed Road Pavement Financial Modelling Analysis

The Unsealed road pavement assets will normally be modelled in three groups with the results aggregated here in one presentation. The table below contains a list of the basic Modelling parameters used. Note that the useable life is the life to intervention; an asset should not remain in service after that point.

7.2.1 Unsealed Road Pavement – Selection of Re-treatment 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 unsealed road pavement condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of re-treatment 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 7 – 9 condition range where most interventions will take place. Unsealed Pavements can be within this condition range for a number of different reasons and the photos will cover only a limited range of situations. They should be considered as a typical situation and not the only situation for that condition rating.

Modelling Parameter	All Urban Unsealed Pavements	All Rural Unsealed Pavements
Asset Quantity in sqm	26,310	912,622
Unit Renewal Rate	$9.00	$9.00
Total Asset Group Renewal Cost	$236,790	$8,213,598
Annual Renewal Exp.	$10,000	$185,000
Retreat. Intervention Condition	6.0	6.0
Life to Condition 10 in Years	30.0	30.0
Life in years to Intervention	21.2	21.2

Figure U4A – Summary of Modelling Input Parameters for Unsealed Rd Pavement Assets

For Tumbarumba Shire we have split these assets into 2 groups based on the rural urban split. It may be worth doing some further work on the rural pavements by splitting them into further functional groups.

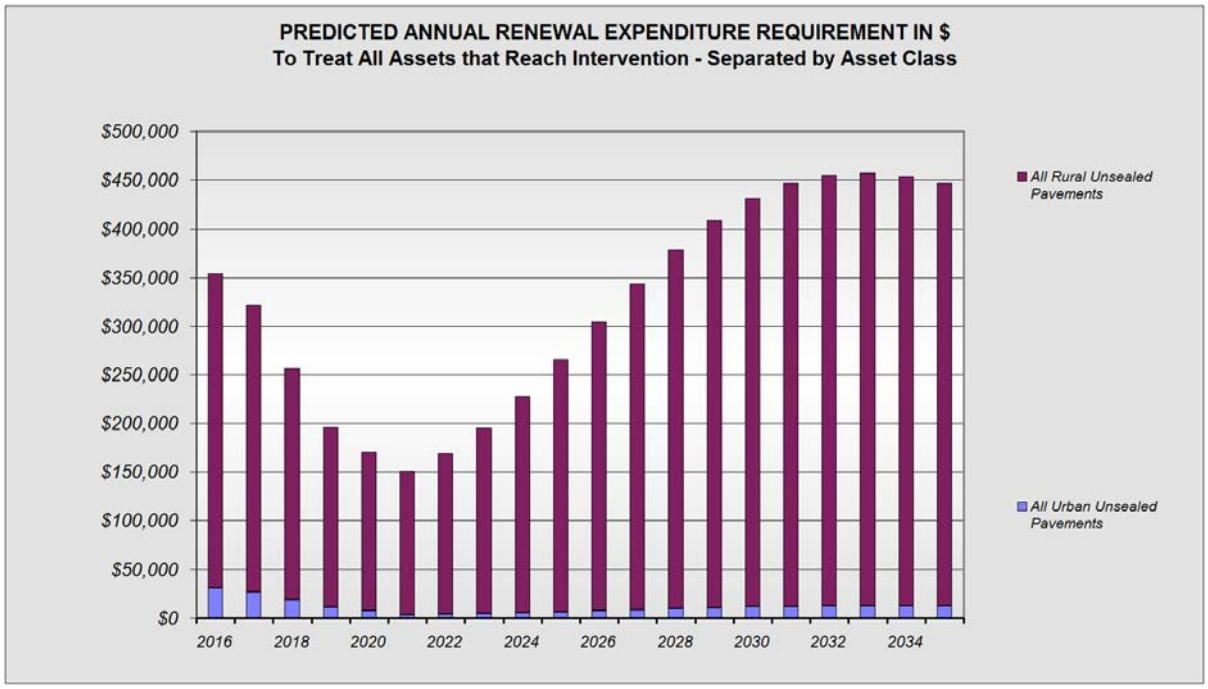


Figure U4 Predicted Capital Requirement Model – Renewal Demand to treat all assets at Intervention

Figures U4 provides a profile of the predicted renewal demand to treat all assets that reach the adopted retreatment intervention level through the degradation process. It also splits the results up based upon the individual sub sets of the data that were modelled separately.

The relatively high early renewal demand over the first 5-years may be linked to some roads that do not warrant resheeting and council may need to identify these roads and redo the model with a lower design standard for such assets.

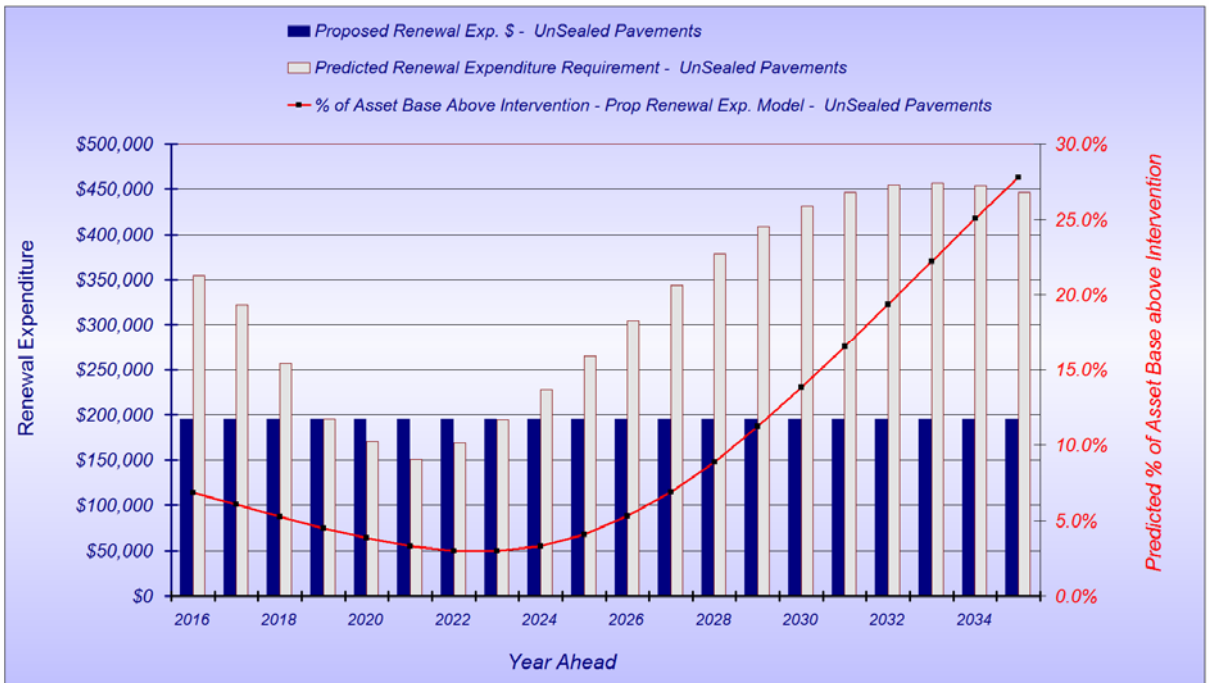


Figure U5 Future Condition Based on Proposed Renewal Expenditure

Figure P5 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the planned expenditure profile or the continuation of the present level of renewal expenditure (blue bars). It also plots the predicted renewal demand to treat all over intervention assets (grey bars) for comparison purposes.

Capital renewal demand is presently sitting at $354,000 pa with the predicted peak demand over the next 20-years at $457,000 pa in the year 2033. Present renewal expenditure at $195,000 pa is below the

present renewal demand but demand is predicted to fall away over the next 5-years and figure U5 indicates that if the present level of funding is maintained then it will continue to lower the extent of over intervention assets for the next 9-years. This does suggest that current funding is at an appropriate total level.

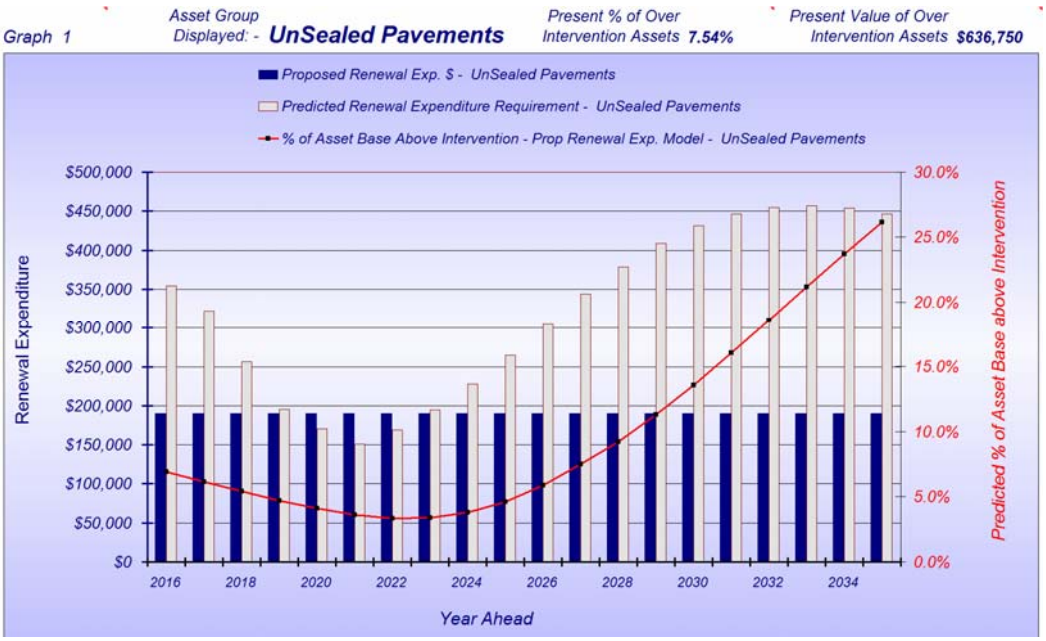


Figure U6 Recommended funding profile

Figure U6 represents the recommended renewal funding profile. The MAMS software has the capacity to develop a proposed 10 - 20 year renewal funding profile that will deliver a designated percentage of the asset base to be over the selected intervention level within a nominated number of years and also allows for an annual percentage increase in renewal expenditure (if required). It does this through an iterative process that amends expenditure until the desired outcome is achieved. There are 3 variables that are used in the development of the recommended expenditure profile.

The three variables used for the un - sealed pavement assets were:

- Desired Percentage of over intervention assets: Same as the present level (7.54%)
- Time to achieve this: 12-Years
- The annual percentage increase in renewal funding: Zero

Figure P6 indicates that a flat renewal expenditure of $195,000 pa will deliver the desired condition outcome and will further continue to reduce the extent of over intervention assets for the next 9-years. However, with the relatively high level of isolated pavement failures we would not recommend a reduction in renewal funding if the isolated failures are being funded from the renewal program.

The survey identifies a backlog of $410,000 in isolated pavement failures on the unsealed network and if this work is to be funded from the same area as pavement re-sheets then funding probably would need to be increased or at the least not lowered substantially.

It is suspected that some of the poor condition roads should be reclassified to a lower design standard (and hence not appear as a renewal demand). Council needs to look at the functional classification of its unsealed road network with perhaps some important roads having a higher design standard and some less important ones a lower standard.

7.3 Unsealed Road Pavement Summary

The Unsealed road pavement assets were found to be in excellent overall condition and were within the best 20% of all councils assessed by MAMS for their overall condition. But a very high extent of isolated pavement failures with an estimated repair value of $410,000 was identified. This does need to be addressed.

It is recommended that the present level of renewal expenditure at $195,000 pa be maintained for the next 3 year and then reviewed again following the next condition survey.

Section 8: Kerb Asset

Kerbs or kerb and channels as they ore often referred to are the concrete drains at the sides of the town streets that collect and remove the excess water from the pavement area. They do deform with time and when they can no longer successfully fulfil their function of removing the excess water they do need to be replaced. Renewal tends to be on a 50 - 100 year basis depending upon their deformation with time.

8.1 Condition and Performance Indicators for Kerb Assets

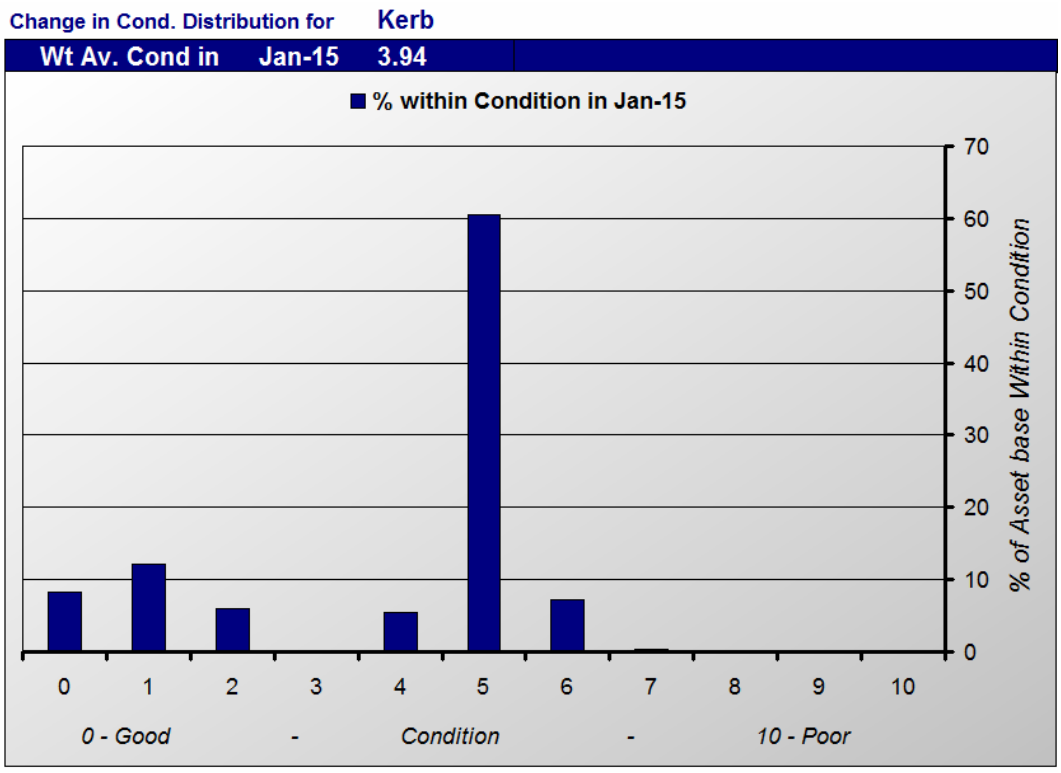


Figure K1 Condition Distribution Comparison Graph – Between Surveys

Figure K1 is a plot of the condition distribution for this sub asset set. Condition commenced at zero when the assets are new and progresses to ten with time. Typically assets will be renewed at around the 7 - 9 condition range.

Key Cond. Indic. No.	Kerb Condition Indicator	Mean Indicator for all Councils assessed by MAMS	Figures from Current Survey in Jan-15	Raw Difference Your Figure Less the Mean	% Difference Your Figure to the Mean	Better or Worse than the Mean
1	Weighted Average Asset Condition	3.226	3.941	-0.715	-22.2	Worse
2	% of Urgent Failures	6.142	0.000	6.142	100.0	Better
3	% of Other Failures	17.729	19.504	-1.775	-10.0	Worse
4	% of Asset Base above Condition 5	23.299	68.097	-44.797	-192.3	Worse
5	% of Asset Base above Condition 6	10.945	7.523	3.422	31.3	Better
6	% of Asset Base above Condition 7	4.769	0.349	4.421	92.7	Better
7	% of Asset Base above Condition 8	1.360	0.000	1.360	100.0	Better

Renewal Demand Being Met For:	% of Long Term Demand Being Met
Kerb Asset Group	47

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

Figure K2 details the key performance indicators that are followed by MAMS. It also provides a comparison with the average figures for all 55 councils we have assessed. (See section 5.1 for a detailed explanation of all indicators). At the bottom of the table is recorded the percentage of the consumption rate (annual depreciation) currently being met. This provides a further valuable performance indicator.

Kerb condition is a little mixed with weighted average asset condition as fair but the extent of poor condition assets at and above condition 8 being the best we have encountered. It is also one of the tightest condition distributions we have ever come across, suggesting a tight construction period.

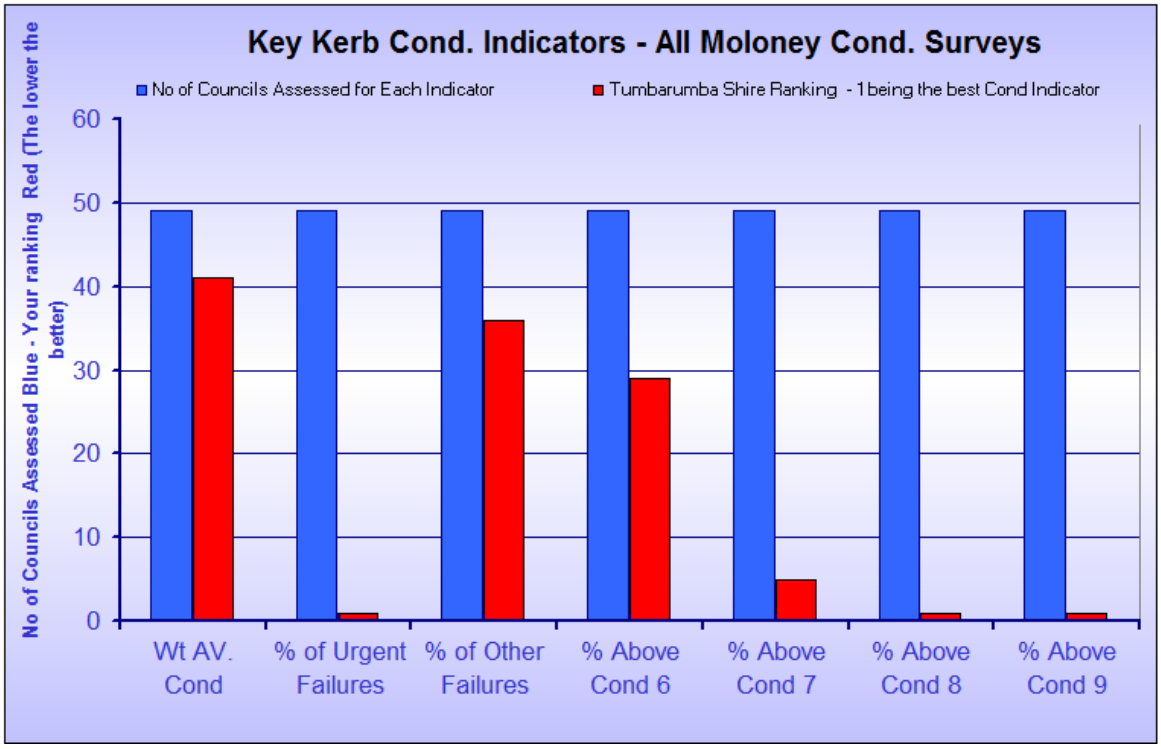


Figure K3 Key performance Indicators as Compared with other Councils surveyed

Figure K3 presents the same performance indicators in a different way. Here the total number of councils that have been assessed by MAMS for each indicator is represented by the blue bars. The red bar represents your ranking against all other councils assessed. The higher the red bar the worse the ranking. If you were the best council assessed for an indicator, your red bar would be at 1. If the worst, your red bar would be at the same level as the blue.

The comparison with other council districts within Figure K3 is very interesting. The assets clearly have a high average age and this is responsible for the relatively poor rating on the weighted average asset condition. However, for both the extent of urgent kerbs failures and the extent of poor condition kerbs at and above condition 7 the results are among the best we have encountered. Council appears to be managing the assets well.

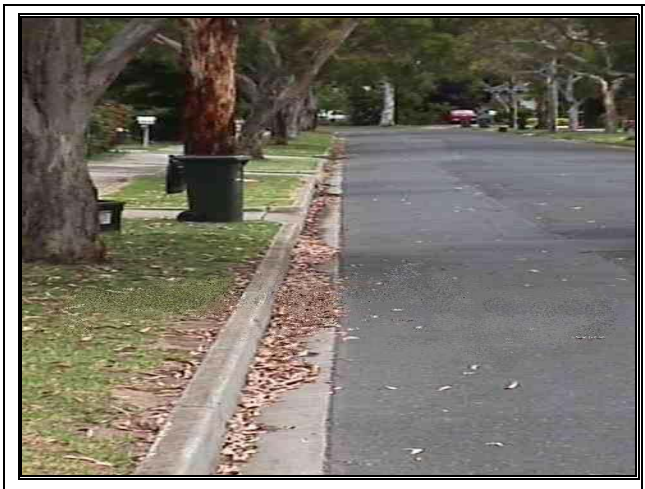
8.2 Kerb Financial Modelling Analysis

The Kerb assets will be modelled as a single asset group. The table below contains a list of the basic Modelling parameters used. Note that the useable life is the life to intervention, an asset should not remain in service after that point.

8.2.1 Kerb Assets – Selection of Re-treatment 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 re-treatment 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 7 – 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 situations. They should be considered as a typical situation and not the only situation for that condition rating.

8.2.2 Kerb Assets – Financial Modelling Results

Modelling Parameter	All Kerbs
Asset Quantity in m	37,300
Unit Renewal Rate	$150.86
Total Asset Group Renewal Cost	$5,626,950
Annual Renewal Exp.	$33,000
Retreat. Intervention Condition	8.0
Life to Condition 10 in Years	80.0
Life in years to Intervention	73.3

Figure K4A – Summary of Modelling Input Parameters for Kerb Assets

Kerbs will be modelled as a single asset set as detailed within figure K4A above.

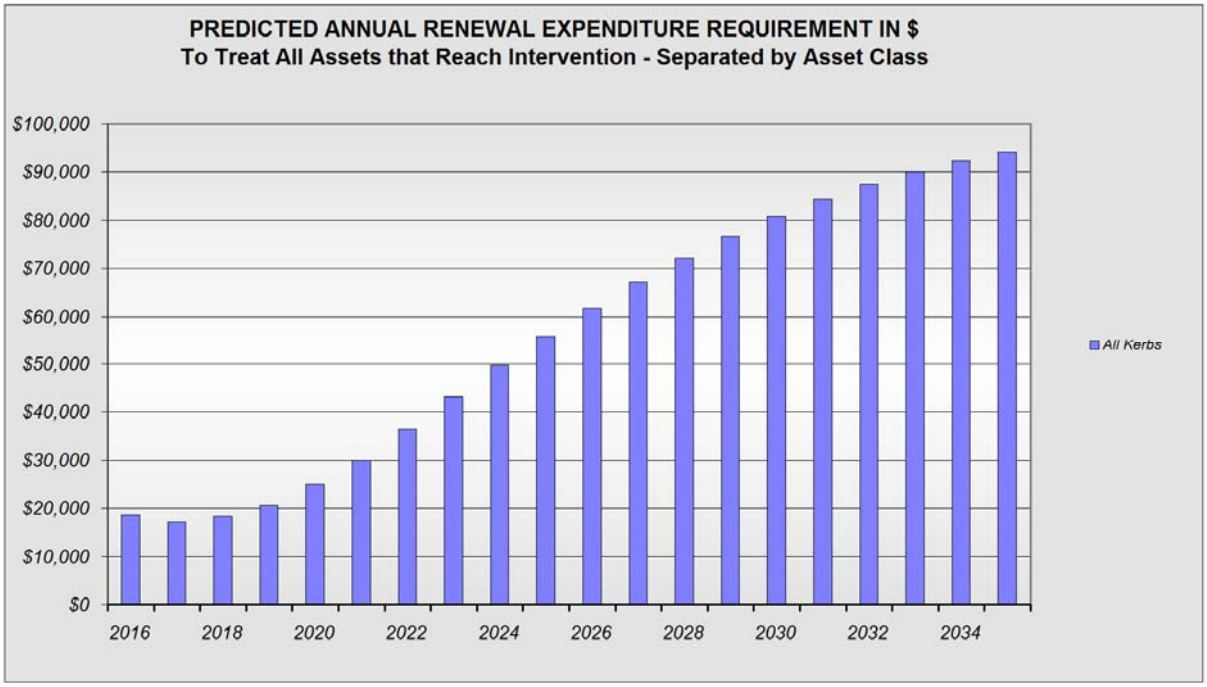


Figure K4 Predicted Capital Requirement Model – Renewal Demand to treat all assets at Intervention

Figures K4 provides a profile of the predicted renewal demand to treat all assets that reach the adopted retreatment intervention level through the degradation process. It also splits the results up based upon the individual sub sets of the data that were modelled separately.

Renewal demand to treat all over intervention assets commences at $18,000 pa and is predicted to peak at $94,000 in the year 2035

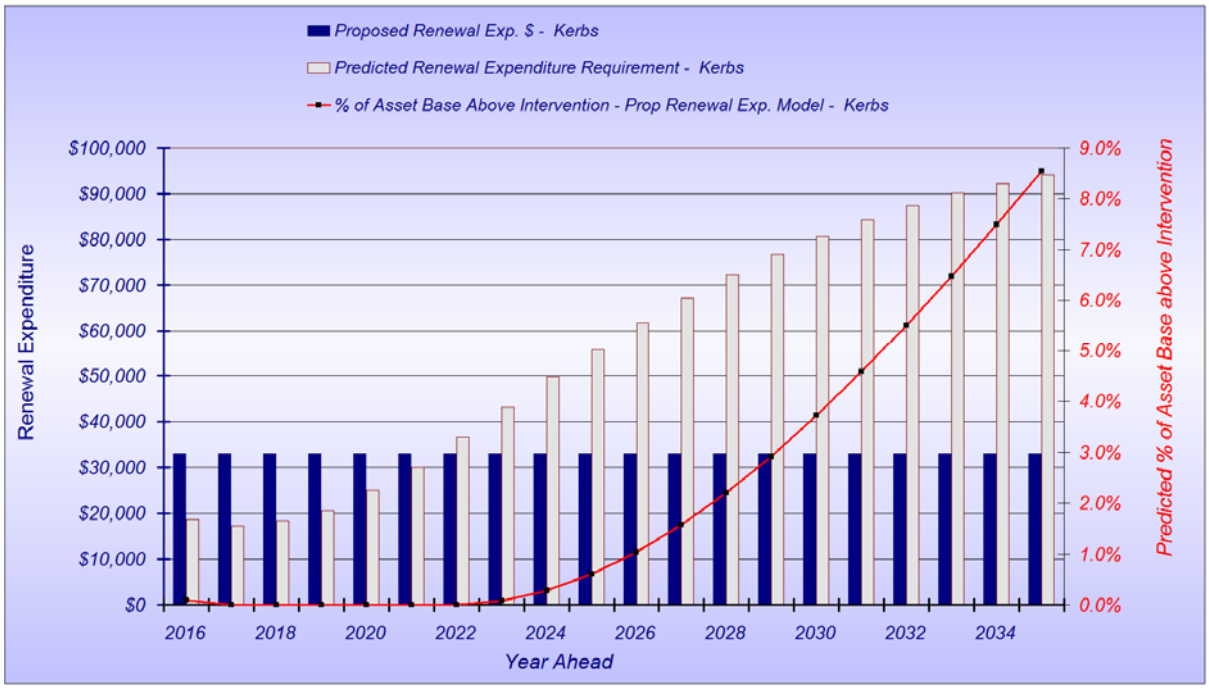


Figure K5 Future Condition Based on Proposed Renewal Expenditure

Figure P5 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the planned expenditure profile or the continuation of the present level of renewal expenditure (blue bars). It also plots the predicted renewal demand to treat all over intervention assets (grey bars) for comparison purposes.

The planned renewal expenditure of $33,000 pa is predicted to deliver a zero level of over intervention assets for the next 7-years. But as can be seen within figure K5 renewal demand is predicted to rise steadily over the next 20-years.

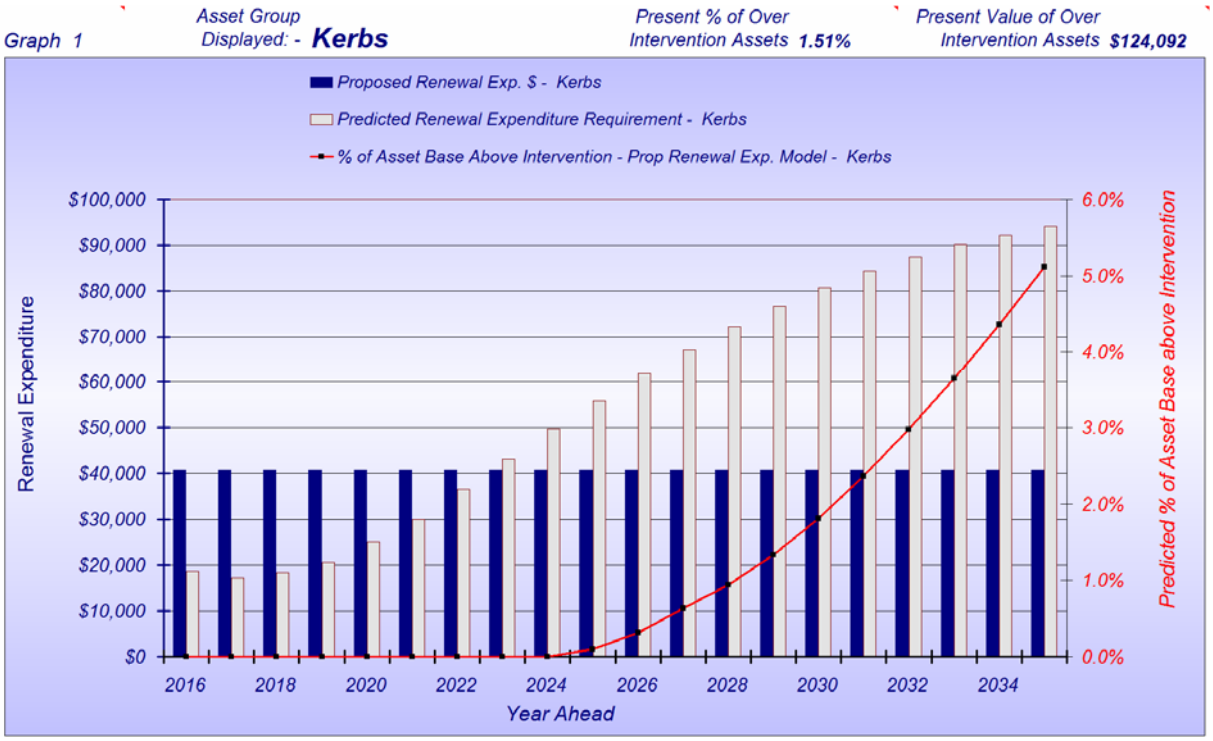


Figure K6 Recommended funding profile

Figure K6 represents the recommended renewal funding profile. The MAMS software has the capacity to develop a proposed 10 - 20 year renewal funding profile that will deliver a designated percentage of the asset base to be over the selected intervention level within a nominated number of years and also allows for an annual percentage increase in renewal expenditure (if required). It does this through an iterative process that amends expenditure until the desired outcome is achieved. There are 3 variables that are used in the development of the recommended expenditure profile.

The three variables used for the sealed pavement assets were:

- Desired Percentage of over intervention assets: Same as the present level (0.59%)
- Time to achieve this: 12-Years
- The annual percentage increase in renewal funding: Zero

Figure K6 represents the year-by-year annual renewal expenditure requirement to achieve the desired condition outcome as outlined within the three variables above.

Figure K6 indicates that a flat renewal expenditure of $40,000 pa will deliver the desired condition outcome. The present level of over intervention assets at 0.59% includes the isolated kerb failures that have been converted to a small extent of poor condition asset. Without that conversion the extent would be zero in line with figure K1.

Note also that the first reporting year in figure K6 is next year (2016) and that the extent of over intervention assets has reduced as a result of the planned spend of $40,000. This is a classic case of the delivery of an average renewal expenditure requirement over the next 12-years. Expenditure could be much lower in the early years but will need to average $40,000 pa over the next 12-years.

8.3 Kerb Summary

The Kerb assets have a high average age and as such are in only fair overall condition. However, the extent of poor condition kerbs and urgent kerb failures is extremely low indicating that council is managing the assets very well

It is recommended that the average renewal expenditure over the next 12-years be set at $40,000 pa. and maintained for the next 3-4 years before being reviewed again following the next condition survey

Section 9: Footpath Asset

Footpath assets are the concrete, sealed and gravel pathways throughout the township areas that provide a very important and valuable walking surface for people of the town as well as any visitors.

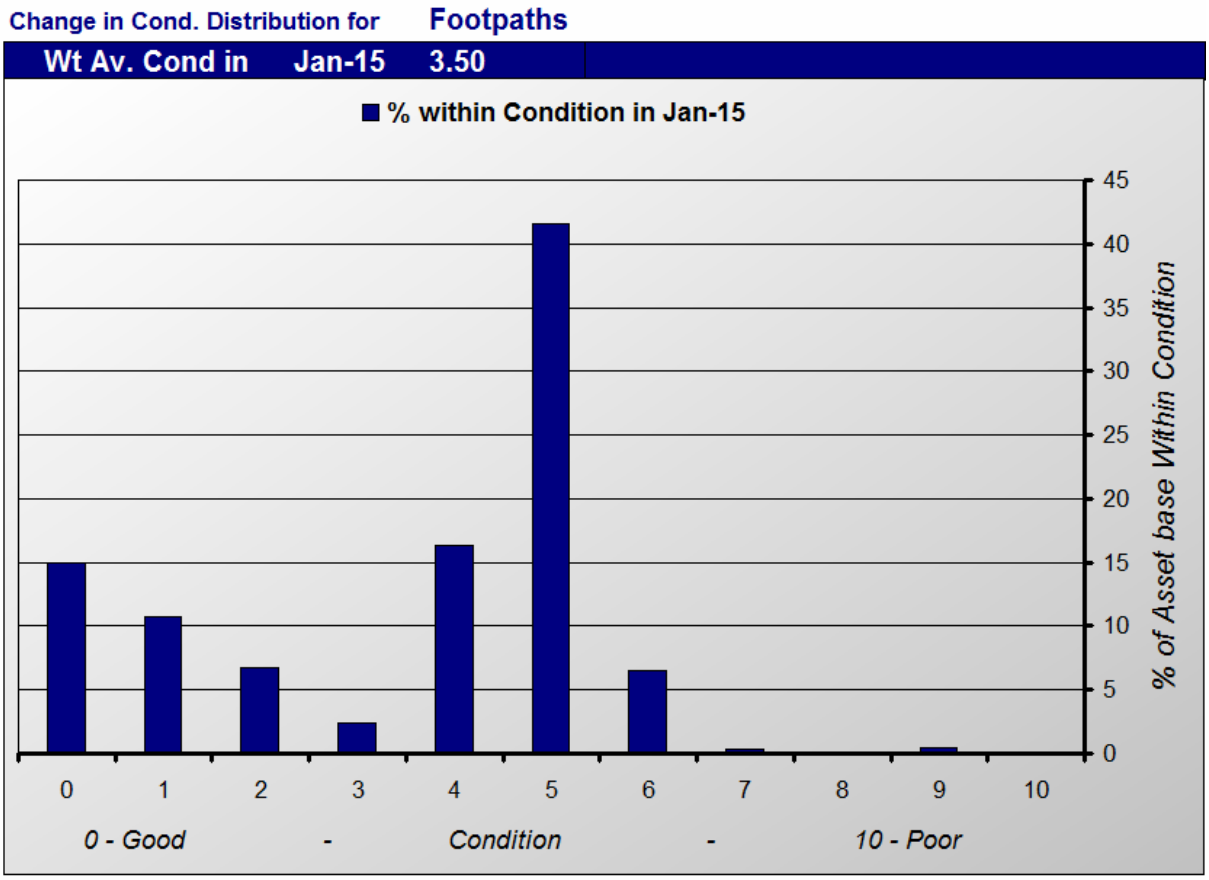


Figure F1 Condition Distribution Comparison Graph – Between Surveys

Figure F1 is a plot of the condition distribution for this sub asset set. Condition commenced at zero when the assets are new and progresses to ten with time. Typically assets will be renewed at around the 7 - 8 condition range.

Key Cond. Indic. No.	Footpath Condition Indicator	Mean Indicator for all Councils assessed by MAMS	Figures from Current Survey in Jan-15	Raw Difference Your Figure Less the Mean	% Difference Your Figure to the Mean	Better or Worse than the Mean
1	Weighted Average Asset Condition	3.00	3.50	-0.50	-16.8	Worse
2	% of Urgent Failures	0.97	0.03	0.94	96.9	Better
3	% of Other Failures	1.39	1.57	-0.18	-13.2	Worse
4	% of Asset Base above Condition 5	19.05	48.88	-29.84	-156.6	Worse
5	% of Asset Base above Condition 6	6.19	7.34	-1.15	-18.6	Worse
6	% of Asset Base above Condition 7	2.09	0.81	1.28	61.4	Better
7	% of Asset Base above Condition 8	0.88	0.41	0.48	53.9	Better

Renewal Demand Being Met For:	% of Long Term Demand Being Met
Footpath Asset Group	133

Figure F2 Table of Key Performance Indicators against Average for all councils Assessed

Figure F2 details the key performance indicators that are followed by MAMS. It also provides a comparison with the average figures for all 55 councils we have assessed. (See section 5.1 for a detailed explanation of all indicators). At the bottom of the table is recorded the percentage of the consumption rate (annual depreciation) currently being met. This provides a further valuable performance indicator.

The key performance indicators within figure F2 above indicate a set of aged assets that are being exceptionally well managed. The key performance measure on footpaths is always the extent of urgent failures and this is the best figure we have encountered in 44 councils surveyed.

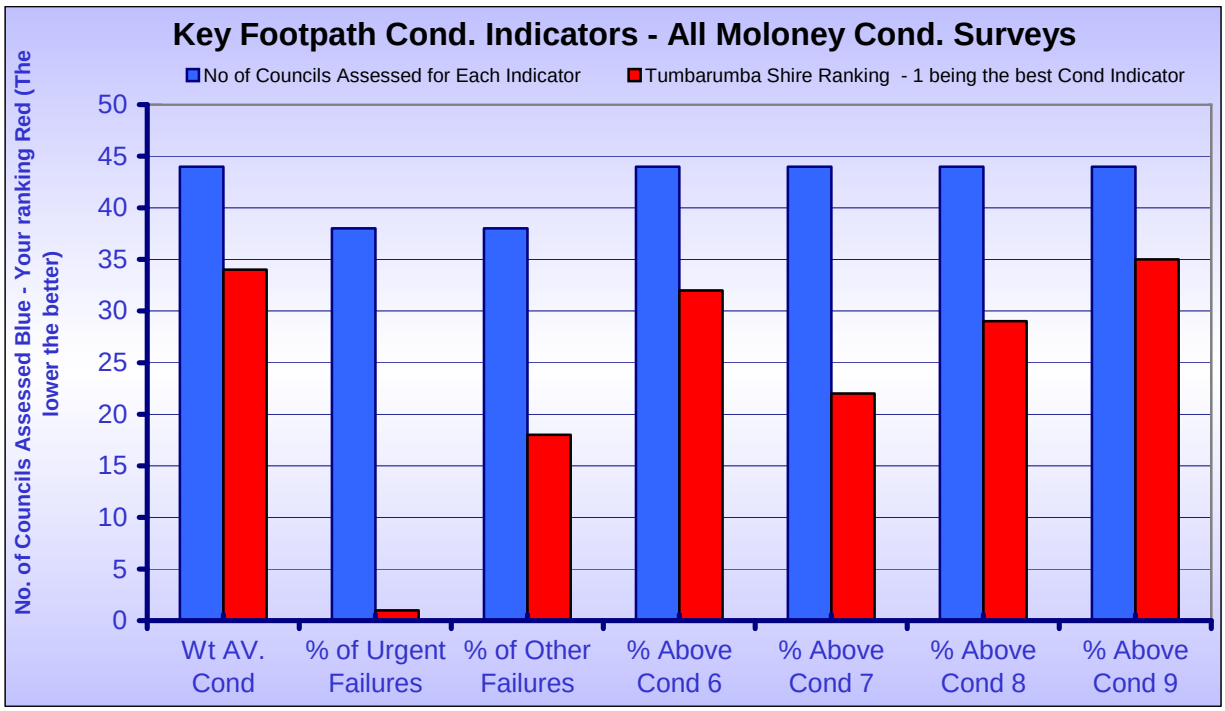


Figure F3 Key performance Indicators as Compared with other Councils surveyed

Figure F3 presents the same performance indicators in a different way. Here the total number of councils that have been assessed by MAMS for each indicator is represented by the blue bars. The red bar represents your ranking against all other councils assessed. The higher the red bar the worse the ranking. If you were the best council assessed for an indicator, your red bar would be at 1. If the worst, your red bar would be at the same level as the blue.

The footpath assets within Tumbarumba Shire were found to be in only fair overall condition, but this is more linked to their age profile of the assets. They are clearly being exceptionally well managed with the lowest level of urgent footpath failures we have ever encountered and a lower than average extent of poor condition assets.

9.1 Footpath Financial Modelling Analysis

The Pathway assets will be modelled in two groups with the results aggregated here in one presentation. The table below contains a list of the basic modelling parameters used.

9.2.1 Footpath 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 sealed Footpath condition ratings. They do not cover the complete condition range but hopefully will provide some guidance to the selection of re-treatment 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 7 – 9 condition range where most interventions will take place.

Modelling Parameter	All Asphalt Footpaths	All Concrete Footpaths	Bike Path Sealed Pavements	Bike Path Concrete Pavements	Bike Path Sealed Surfaces
Asset Quantity in sqm	649	19,834	13,389	7,519	13,017
Unit Renewal Rate	70	132	50	100	5
Total Asset Group Renewal Cost	$45,444	$2,614,476	$669,450	$751,920	$58,577
Annual Renewal Exp.	$1,000	$33,000	$10,000	$0	$0
Retreat. Intervention Condition	8	7.0	7.0	7.0	7.0
Life to Condition 10 in Years	30	80	50	70	70
Life in years to Intervention	27	69	43	60	60

We have split the pathway assets up into five like performing groups as detailed within the table above.

9.2.2 Footpath Financial Modelling Results

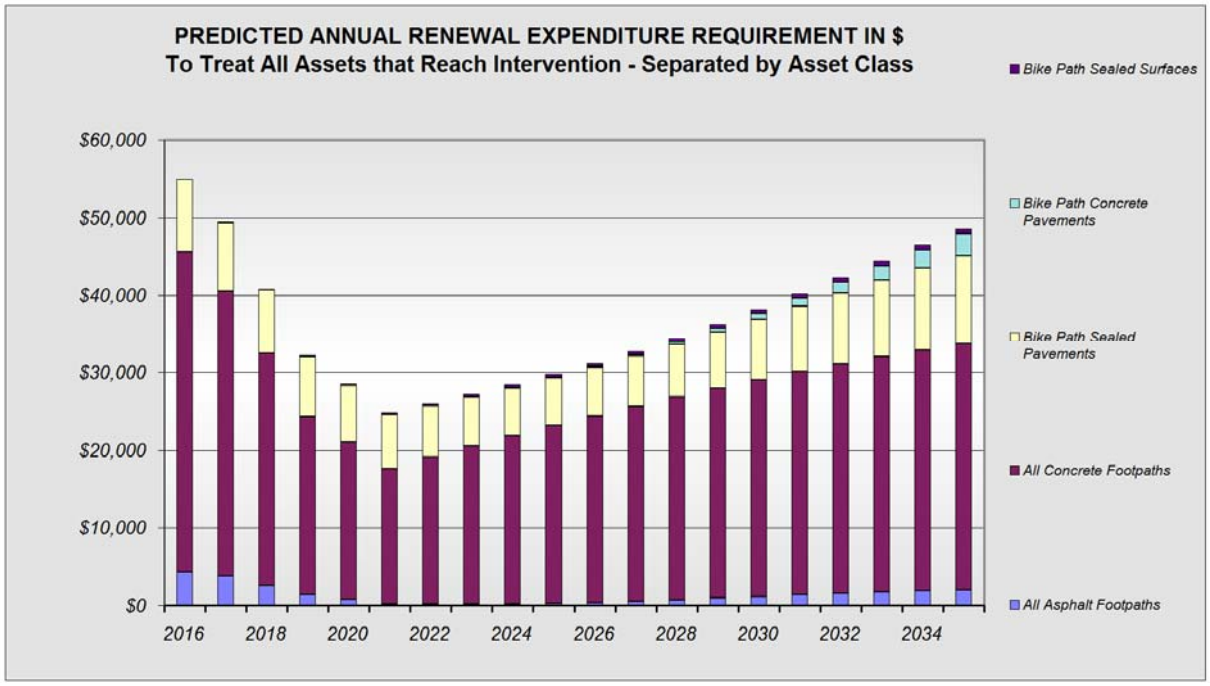


Figure F4 Predicted Capital Requirement Model – Renewal Demand to treat all assets at Intervention

Figures F4 provides a profile of the predicted renewal demand to treat all assets that reach the adopted retreatment intervention level through the degradation process. It also splits the results up based upon the individual sub sets of the data that were modelled separately.

Renewal demand is elevated in the early years because of a backlog of over intervention assets associated with the concrete footpaths. It is the non urgent isolated footpath failures that were converted to small sections of poor condition asset that is causing the problem. Renewal demand sitting at $55,000 pa which also represents the peak demand over the next 20-years.

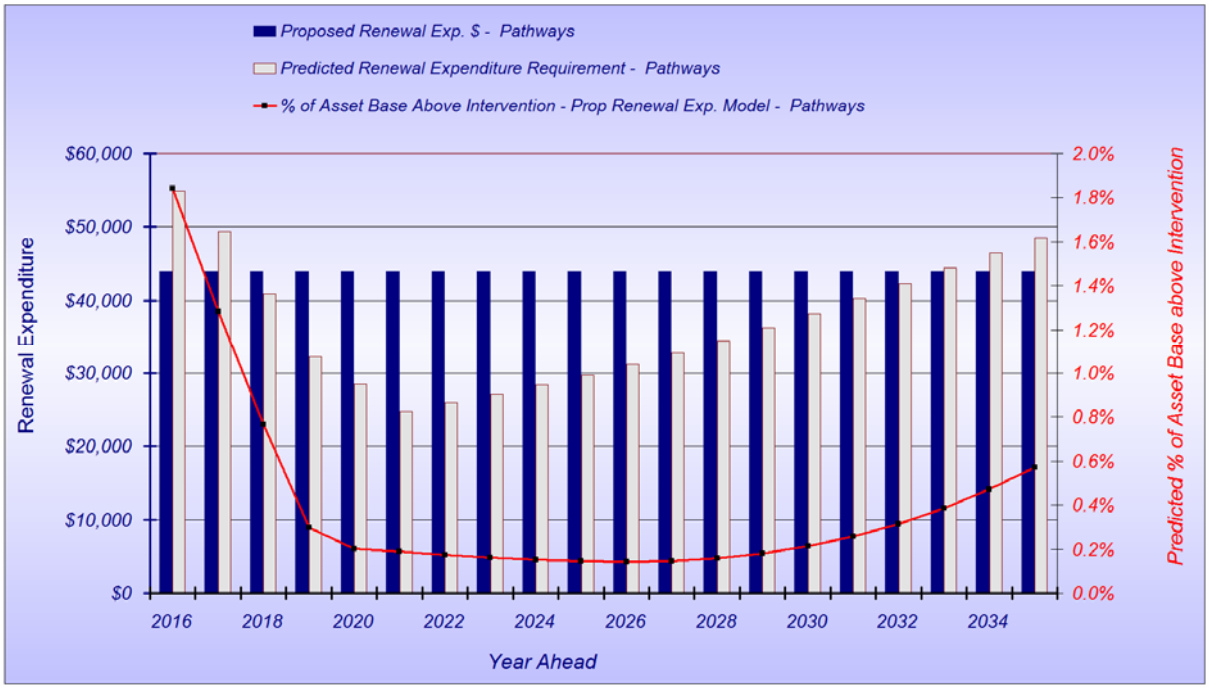


Figure F5 Future Condition Based on Proposed Renewal Expenditure

Figure P5 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the planned expenditure profile or the continuation of the present level of renewal expenditure (blue bars). It also plots the predicted renewal demand to treat all over intervention assets (grey bars) for comparison purposes.

If the current level of renewal expenditure at $44,000 pa is maintained then asset condition will continue to improve for the next 13-years. This also includes the treatment of all isolated footpath failure.

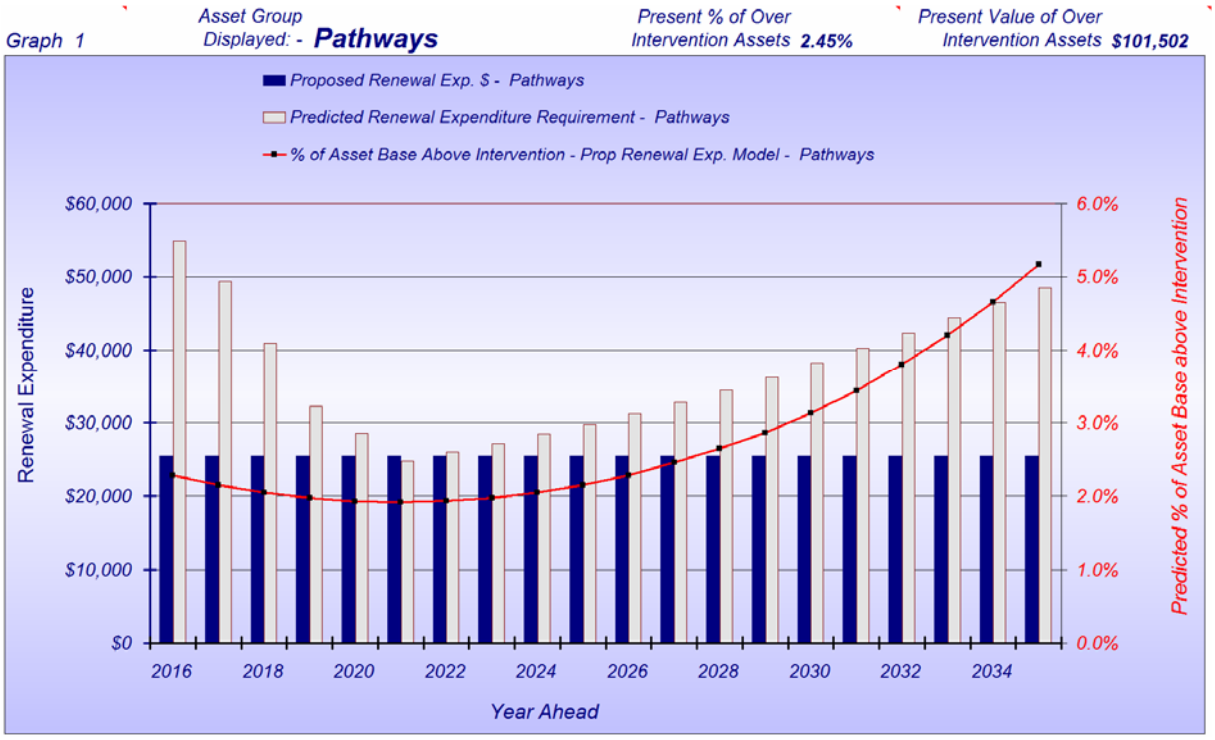


Figure F6 Recommended funding profile

Figure F6 represents the recommended renewal funding profile. The MAMS software has the capacity to develop a proposed 10 - 20 year renewal funding profile that will deliver a designated percentage of the asset base to be over the selected intervention level within a nominated number of years and also allows for an annual percentage increase in renewal expenditure (if required). It does this through an iterative process that amends expenditure until the desired outcome is achieved. There are 3 variables that are used in the development of the recommended expenditure profile.

The three variables used for the Footpath assets were:

- Desired Percentage of over intervention assets: Same as the present level (2.45%)
- Time to achieve this: 12-Years
- The annual percentage increase in renewal funding: Zero

Figure F6 indicates that a flat renewal expenditure of $25,000 pa will deliver the desired condition outcome. Considering that this will also cover all outstanding isolated footpath failures it is considered to be a reasonable expenditure level.

9.2 Footpath Summary

The Footpath assets were found to be in only fair overall condition, but they were found to have no urgent failures which is an outstanding achievement given the age profile of the assets.

It is recommended that the present renewal expenditure of $44,000 pa be lowered to $25,000 pa for the next 3-years before being reviewed again following the next condition survey of the assets.

Section 10: Aggregated Modelling Results for Road Network

Accurate network modelling within the Moloney system depends upon ten 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 individual asset sets or sub sets and to then combine these results into a single aggregated report. This section will deal with the aggregated results of the individual sub asset Modelling operations undertaken in the sub asset sections above. It will deliver a single overall Modelling outcome for the whole roads group.

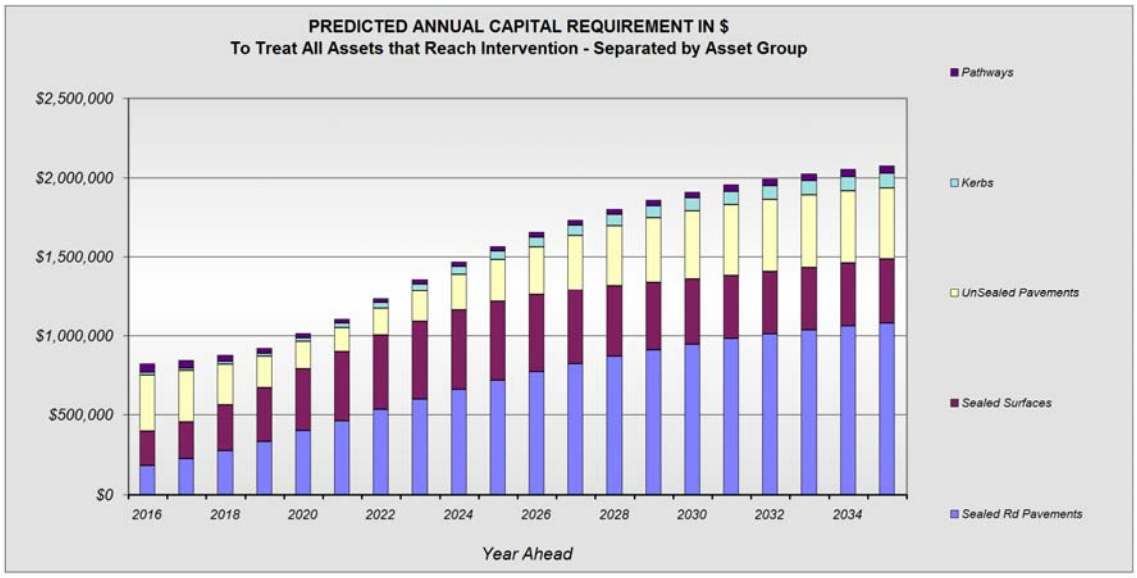


Figure Agg 1 - Predicted Aggregate Capital Expenditure Requirement all Road Sub Assets

Figure Agg 1 represents the annual renewal funding requirement to treat all assets that are predicted to reach the intervention level through the normal degradation process with time. It predicts a present renewal demand at $823,000 pa and a peak demand over the next 20-years of $2,076,000 in the year 2035.

Modelling also indicates that demand is predicted to continue to rise for around 30-years before levelling off and then falling away. Thus while total expenditure could be lowered now, the rising renewal demand will need to be addressed and cutting funding now will result in steeper rises in later years.

Figure Agg 2 – Predicted Overall Condition change based on continuation of present Funding Levels

Figure Agg 2 plots the extent of the asset base that is predicted to rise above the intervention level (red line) based upon the planned expenditure profile or the continuation of the present level of renewal expenditure (blue bars). It also plots the predicted renewal demand to treat all over intervention assets (grey bars) for comparison purposes.

Total present renewal expenditure is actually higher than the immediate requirement to treat all assets predicted to reach the intervention level. However, renewal demand is predicted to continue to rise over the next 20-35 years and as such the total current figure is considered to be at an appropriate level.

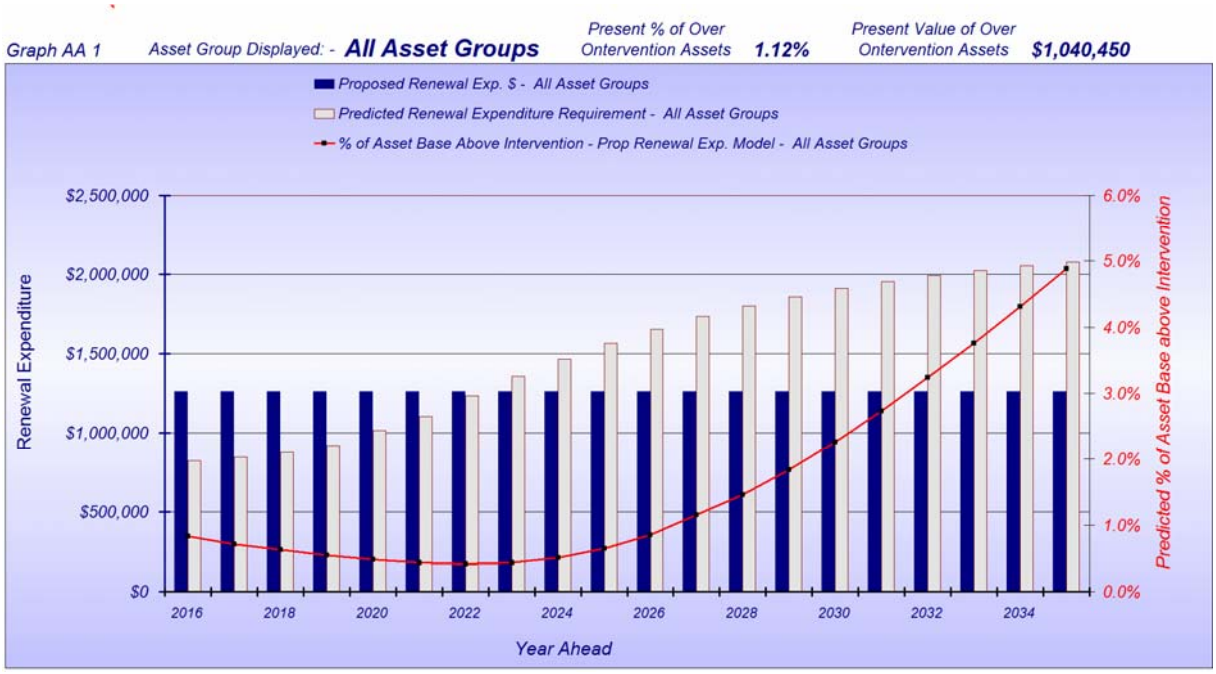


Figure Agg 3 – Recommended 10-year funding profile

Figure Agg 3 represents the recommended renewal funding profile. The MAMS software has the capacity to develop a proposed 10 - 20 year renewal funding profile that will deliver a designated percentage of the asset base to be over the selected intervention level within a nominated number of years and also allows for an annual percentage increase in renewal expenditure (if required). It does this through an iterative process that amends expenditure until the desired outcome is achieved. There are 3 variables that are used in the development of the recommended expenditure profile.

The three common variables used for all assets in this modelling process are as detailed below:

- Desired Percentage of over intervention assets: Same as the present level (1.12%)
- Time to achieve this: 12-Years
- The annual percentage increase in renewal funding: Zero

Figure Agg 3 indicates that a flat total renewal expenditure of $1,260,000 pa will deliver the desired condition outcome. The total present extent of over intervention assets at 1.12% is considered to be a very sound position to be in and thus we have not asked that to be reduced over the 12-year forecast period.

Council could lower its present renewal expenditure level, but the demand would then be pushed off to later years where the task would be greater.

Funding scenario No.	Total % of asset base to be above the intervention level	Years to achieve this	Annual % future increase in funding	Year 1 commencing funding	Comments
1	1.12%	12	0.0	$1,260,000	As per report Recommendation Over Intervention after 20-Years 4.88%
2	1.12%	8	0.0	$1,010,000	Lower Commencing spend but 6.82% over intervention after 20-Years
3	1.12%	5	0.0	$790,000	Lower Commencing spend but 10.14% over intervention after 20-Years
4	1.12%	15	0.0	$1,415,000	Higher start spend but better results out longer
5	1.12%	15	2.0	$1,190,000	Same as 4 with a 2% annual compounding increase each year

Figure Agg 4 – Other funding options

Other funding scenarios can be run to achieve different financial and condition outcomes. Council is encouraged to investigate other funding options within the model in order to arrive at the best solution for their situation. By way of example there are 5 scenarios within the table below commencing with the recommended one.

As a general rule the total percentage of over intervention assets for a road network would be expected to be within the 0.8% - 3.5% range. Tumbarumba is in very good shape with 1.12% and this could be allowed to increase a little. Alternatively, there is a compounding annual increase in the predicted renewal demand (See figure Agg 1) and funding could be structured quite successfully with an annual fixed percentage increase in funding as per scenario 5 above.

NOTE: the figures within this report are all based in today's dollars. Our software does have the capacity to adjust all outputs for inflation and this could be very useful in presenting shorter term outcomes of say 5 - 10 years for financial plans. But there can be real issues in applying inflation figures over a time frame of 20-years as used within this report.

Sub Asset Description	Present total Annual Capital Renewal Expenditure	Annual Depreciation or Average Long term Annual Demand	Present Capital Renewal Demand From Modelling	Peak Capital Renewal Demand From Modelling	Predicted Year of Peak Demand	Recommended Commencing Funding level	% of Annual Depreciation Being Met
Sealed Pavements	**$543,000**	**$731,086**	$185,000	$1,080,000	2035	$590,000	**74**
Sealed Surface	**$450,000**	**$366,898**	$211,000	$500,000	2024	$410,000	**123**
Unsealed Pavement	**$195,000**	**$275,920**	$354,000	$457,000	2033	$195,000	**71**
Kerbs	**$33,000**	**$69,938**	$18,000	$94,000	2035	$40,000	**47**
Footpaths	**$44,000**	**$33,099**	$55,000	$55,000	2016	$25,000	**133**
Totals	**$1,265,000**	**$1,476,940**	$823,000	$2,076,000	2035	$1,260,000	**86**

Figure Agg 45– Summary Table of Current & Required Renewal Expenditure Levels

Figure Agg 5 provides an alternative way of comparing the renewal demand with the present renewal expenditure levels. The key figures within the table are located in the far right column and represent the percentage of the consumption rate that is being met.

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For a detailed Explanation of the Moloney Model its assumptions and operations please refer to the document “Model All file Manual”. This document can be obtained from the "Get Information" tab on our web site without the need to log on as a user. (Ref to web address above).