Sealed Roads Management Plan 2016/17 – 2031/32

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Acknowledgements

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Sealed Roads Management Plan 2016 - 2031

Contents

Purpose

The Sunshine Coast Council Sealed Roads Management Plan 2016/17-2031/32 has been produced to build upon earlier work that identified an increasing catalogue of remedial works required on the road network (Transport, Pavement investment and backlog Briefing Paper 2013). Historic network age data was utilised as well as current road pavement condition data, current intervention levels and treatment costs in a specialist road management software application developed by the Snowy Mountain Engineering Corporation (SMEC). Various modelling scenarios that compare funding profiles against the aggregated network pavement condition indexes over the for coming 15 years are compared.

1 Background

1.1 Introduction

Council provides a Transportation network in partnership with state and federal governments to enable the delivery of the required level of service to existing and future customers in the most cost-effective way. Council is required to produce an Asset Management Plans for assets including the road network, which is updated every 2-3 years that demonstrates how it will achieve this outcome by applying the principles of responsible asset management. The Transportation Asset Management Plan (TAMP) focuses on the two key indicators of cost to provide the transportation asset service, namely life cycle cost and maintenance and capital renewal costs. The projected outlays necessary to provide the services covered by the TAMP including operations, maintenance, renewals are matched against available funds with the aim of achieving a desired sustainability target of approximately 90%.

Sunshine Coast Council manages a sealed roads network in excess of 2,268km with a current asset replacement cost of over $1Billion.

The average age of the road network pavements is 24 years and average surface age is 12 years. In addition, the average annual growth rate in network size over the last 5 years has been 4.69%.

The importance of the road network assets has been acknowledged in recent times by council as budgets for the Road Reseal and Rehabilitation Program has been escalated from around $9.23M in 2009/10 to present values over $20M. This has had a positive impact in preserving the road network.

There has been no specific external community engagement undertaken in relation to this report. However, there is relevant feedback from the 2015 Sunshine Coast Regional Council Community Survey on Services council provides, conducted by IRIS Research. (Appendix 7)

The results from this survey show that the community view maintenance of sealed roads very highly with a score of 4.6 out of 5. They gave a satisfaction rating of 3.38 which was up from the 2012 survey of 2.89 but gives a performance gap of 1.23. This could indicate that whilst the residents believe council's performance is improving there is still work to be done. Also, for a comparative benchmark Sunshine Coast Council (SCC) scored 52 compared to comparable councils at 54. This indicates that SCC certainly isn't seen as better than our neighbouring councils and marginally worse with respect to maintenance of sealed roads. Further research targeting where council is seen to be specifically not achieving the desired high rating desired would be a useful follow up to this survey to assist with future planning.

1.2 Road Pavement Management Modelling

Specialist computer modelling software developed by the Snowy Mountain Engineering Corporation (SMEC) is used by Civil Asset Management branch (CAM) staff to analyse how the road network condition will chance based on assigned budget allocations. The aim is to seek appropriate funding levels to manage the road network as well as identify and prioritise this work. This is usually carried out on an annual basis to meet budgetary timeframes and produce annual programs. However, detailed pavement condition assessments (input data) are typically only carried out every 4 years due to survey expense and the relatively slow deteriation rate of pavements.

A detailed road condition assessment was carried out in 2014 with data uploaded into the SMEC Pavement Management System (PMS). Detailed modelling of the road network was then carried out after refined intervention levels and associated up to date unit costs for treatments were set. This modelling input various budget scenarios over the forthcoming 15 years with output being the average network pavement condition index (PCI). From this analysis, conclusions are drawn and recommendations made.

Whilst the road network is in good shape, on a national average and has benefitted from increased expenditure over recent years, recent analysis is showing that due to an approaching increased number of aged road surfaces, owing in part to sporadic development, additional funds would be needed to preserve the network's current good condition. The road network, with a replacement value of $1B is Council's largest asset base by a large margin and as such, a comprehensive assessment of funding strategies is needed to ensure these assets are managed properly and are not permitted to deteriate significantly.

1.3 Budget Allocation History

Since the 2009/2010 budget year the Road Reseal/ Rehabilitation budget has progressively been increased from $9.23M to $18M in 2014/2015. (Noosa excluded)

This additional funding allocation represents an effective increase in road resealing and rehabilitation funding of 95% over the previous seven years as shown in *Table 2* below. This represents approximately a 13.6% annual increase. However, budget allocations have remained constant over the last three years (except for an additional $2.1M Roads to Recovery allocation) and the current 10 Year Capital Reseal Funding Program is set to only lift to $20M by 2026 i.e. only a 1.1% annual increase which is lower than the network size growth rate and needs to address elevating traffic growth rates on higher order roads.

Budget Year	Allocation
2009/10	$9,234,500
2010/11	$9,922,160
2011/12	$10,585,000
2012/13	$14,600,000
2013/14	$18,000,000
2014/15	$18,000,000
2015/16	$20,055,000*

*Table 2 Annual Reseal and Rehabilitation Budgets * Roads component allocation only*

1.4 Growth and its Effect on the Road Network

It is noted that in sea change localities where high growth is occurring pavements are not achieving their useful lives, especially the busiest main access routes. This is due in part to increased traffic loadings on roads that were never designed or constructed to take the larger traffic volumes being experienced today. This trend is also true on the Sunshine Coast especially in the older centres where pavement lives are closer to forty or fifty years and which were constructed from lower quality pavement materials by today's standards. These older suburbs present maintenance and rehabilitation problems as remediation options are often likely to be expensive as existing pavement thicknesses are typically insufficient meaning expensive full reconstruction can be required.

In addition, council's current development codes require pavement design lives of twenty years which has been standard across south east Queensland to date. However, a number of local authorities are now seeking to amend their codes to lift this design lifespan to 25 to 30 years particularly on the collector roads. It is believed that construction traffic in the earlier stages of a development is accelerating the aging of these roads and many are not even reaching their twenty years. CAM staff are currently working with Strategic Planning staff to pursue amendments to the current Planning Scheme Policy for Development Works Section 6 to lift required standards for road design lives.

Historical growth spurts have also produced an uneven road surface age profile (Figure 2) which subsequently presents a problem to manage as requirements to resurface and rehabilitate cannot be easily accommodated as assigned funding typically cannot be varied radically from year to year. What needs to be understood though is the longer term impacts should funding plans not take these waves of aging roads into consideration. There could be a significant risk exposure to council if this is not taken into consideration and adjustments made. The network could deteriate to an extent that the cost to remediate it would become excessive and unmanageable and in addition, road users may also be exposed to higher travelling risks due to roads in poor condition.

The Pavement Management System used here is a modelling tool which provides information on the current and likely future cost and condition implications for road maintenance, resurfacing and rehabilitation from a strategic perspective. It can inform council as to the strategies required to maintain the network at the best level of serviceability and lowest lifecycle cost that can be achieved within budgetary constraints. It's about getting the right money in the right place at the right time.

2 Modelling the Predicted Road Condition for Various Funding Scenarios

2.1 Pavement Condition Index

Civil Asset Management branch uses a road asset management system developed by the Snowy Mountain Engineering Corporation (SMEC) that is used by many councils across Australia (53). This system looks at a combination of defects along a section of road and uses complex deterioration modelling software to determine what budgets are required to maintain the road network and where annual budgetary allocations should be directed. The SMEC PMS also generates a preliminary Works Program which CAM staff then confirm with physical inspections and subsequently refine further using corporate weighting criteria to then finalise the Program.

The SMEC PMS can optimise the given budget based on five methodologies. The methodologies are as follows:

- Optimise based on **Maximising Asset Value**. Selects the best available treatment to maximise the life of the asset. Primarily will consider asphalts.
- Optimise based on **Minimising Future Recurrent Maintenance Costs**. Primarily considers the cheapest treatments available and only for essential works. Not recommended unless severely cutting the existing budget.
- Optimise based on **Minimising Vehicle Operating Costs**. This method considers roughness as its priority and lowers the costs of the road user rather than agency costs. Basically looks at regulation and reconstruction works to make the roads smoother to lower vehicle operating costs.

- Optimise based on **Minimising Authority and User Costs**. This option looks at utilising the cheapest available treatments and at the same time tries to lower vehicle operating costs to the community. Will consider spray seals with asphalt regulation course as opposed to straight asphalt or reconstructions.
- Optimise based on **Maximising Network PCI**. This option focuses on crack control as it tries to raise the PCI across the network. It will consider the cheapest treatments available in order to maximise the largest amount of pavement area receiving a treatment each year. It will primarily consider spray seals if available or thinner asphalt overlays.

A combination of these methodologies is currently used in CAM's modelling including Minimising Authority and User Costs, Maximising Asset Value, as well as Maximising Network PCI. It also assumes operational budgets are available to cover general pavement failure repairs, pothole filling and crack sealing. In Addition, the system gives more weighting to treating the heavily trafficked roads and if there are insufficient funds, light traffic roads may fail to be considered for treatments.

During optimisation, the system will select treatments which maximise the benefits gained from undertaking the treatments while ensuring that the costs incurred do not exceed the budget available. The PMS modelling software allows for various constraints to be used during the optimisation process. It can be a set budget or it can be setting a target network pavement condition index (PCI). It seeks to allocate funds such that the network Pavement Condition is preserved in the most cost effective way by intercepting deteriating roads and treating them before remediation costs become significantly more. Typically as assets approach the end of their expected life, the rate of deteriation increases disproportionately, as shown in *Figure 1*. It is generally held that earlier interception and treatment (e.g. resurfacing) is much more cost effective than allowing the road to deteriate to the point the rehabilitation is required.

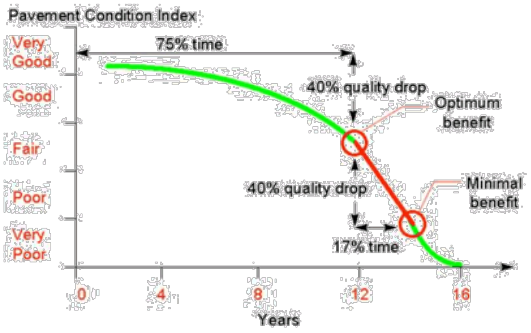

Figure 1 Typical Asset Deteriation Curve

The PCI score is made up components such as road defect types like road roughness (bumps), amount and types of cracks, potholes, rutting and surface stripping, whilst also taking into account the traffic volume on the particular segment of roadway.

This PCI gives an average indication as to what the general condition of the segment is or the whole road or even how the network is travelling. It is not specifically used to determine what road should receive what treatment for a given Annual Reseal / Rehabilitation Budget. Condition data for the entire road network is collected periodically using vehicle mounted radar and accelerometer every 3 to 4 years and the PCI is calculated for each road segment.

The SMEC PCI assumes a ranking of 10 for a road without defects (perfect) and deducts points from this ranking depending on the level and types of distresses present in the pavement. In general terms, the PCI value may be interpreted as shown in *Table 1*.

PCI	Road Condition
8.5 to 10	Excellent
7.0 to 8.5	Very good
5.5 to 7.0	Good
4.0 to 5.5	Fair
2.5 to 4.0	Poor
1.0 to 2.5	Very poor
< 1.0	Failed

Table 1 - PCI by Road Condition

Photos showing typical PCIs of streets are included in the Appendix 2

The average PCI for the Sunshine Coast's Road network is currently 7.86 with relatively little difference across the divisions. (See Appendix 3) In addition, the actual distribution of the current Sealed Road Network PCI of 7.86 is also shown here and it can be noted that whilst the average is in the very good range there are still approximately 100 km in the Fair classification and about 60km classed as poor.

As part of a legislative requirement to produce a Transportation Asset Management Plan (TAMP) a strategic review of the Road Network funding has been undertaken by CAM branch officers. Initially SMEC were engaged to assist with medium to longer term modelling given various scenarios. (Reference 1) This initial review found that to maintain the existing network PCI to current standards, the annual Road Reseal Rehab Program budgets are likely to exceed $30M in early years. This was deemed an unacceptable spike in funding requirements and was found to be due principally to a large number of road being constructed or roads being resurfaced in the past around a similar time (approximately 8 years) and many requiring treatment within the next decade (assuming asphalt surfaces generally last about 15 years). See *Figure 2* below. This shows a hump in the roads of surface age 6 to 10 years in the road network. That is, approximately 630km of the 2268km network (28%) will require resurfacing over a 5 year period within 5 to 10 years. Thus to maintain the current network average condition, funding levels would need to be drastically lifted (Figure 4, Scenario7 – purple). Figure 4 below not only incorporates expenditure required to resurface roads but also those that have dropped in overall condition to the point where rehabilitation and even reconstruction are required. There is, in effect a backlog of road pavements requiring rehabilitation that need urgent attention as well, which requires funding at rates 6 to 10 times that of resurfacing.

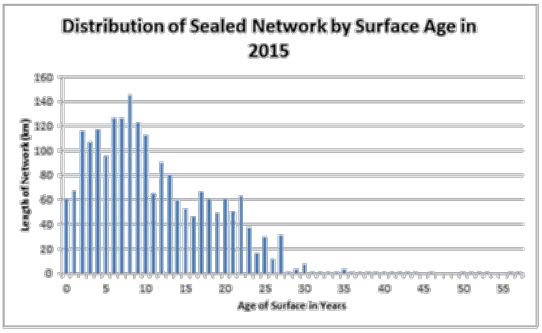

Figure 2 – Road Network Length by Surface Age

SMEC were then asked to carry out further analysis whereby lower order minor roads (residential streets) were allowed to drop their PCIs (left longer before intervention was carried out) as traffic speeds are lower along them and as such, higher roughness can be tolerated. Whilst budgets were contained if was felt that this approach also would be unacceptable as residents will still require their local streets to be of a good standard.

CAM staff then commenced in-house modelling after firstly revising/updating road rehabilitation unit rates and reviewing intervention trigger points and preferred treatment scenarios.

2.2 Scenarios Analysed

There were six separate funding scenarios that were analysed for comparison purposes. These were:

- **Scenario 1**. Maintain original Budget until 2031 (with 2% CPI allowance)
- **Scenario 2**. Models the current adopted 10 Yr. Reseal Rehabilitation Subprogram budget outlined in the Transport Asset Management Plan (TAMP) which commits $20M annually until 2022 and $21M for years 2023 & 2024. The scenario then proceeds increasing the budget annually by CPI 2% until 2031
- **Scenario 3.** Models initial $25 M then $2 M annual increases for 5 years then continual annual increases of $1M to budget until 2031.

- **Scenario 4.** Models initial $24.5 M then $1.5 M annual increases for 5 years then continual annual increases of $1M to budget until 2031.
- **Scenario 5A** models initial $24 million, then $1 million annual increases until 2031.
- **Scenario 5B** maintain current budget until 2020 (2 years) then $1 million annual increases until 2031.
- **Scenario 6**. Models initial $26 M then $3 M annual increases for 5 years then continual annual increases of $1M to the budget until 2031.
- **Scenario 7** – maintain current PCI levels each year for 15 years.

All scenarios begin in the year of 2016 and reported through to the year 2031. (Appendix 4) For each of the different funding scenarios an optimised works program over the next fifteen (15) years was determined. Each of these optimised programs was modelled back to the database so that effect of the treatments on the overall condition of the network could be determined and compared.
It should be noted the budgets that were analysed only included costs associated with reseals and rehabilitation of the modelled roads. Funds required for routine maintenance (e.g. pothole patching, localised heavy patching and crack filling etc.) are allowed for separately in the modelling. SMEC set this routine maintenance intervention at 6% of distressed areas/failures treated this way. A sensitivity analysis was also carried out with areas attended to ranging from 3-12%. This had negliable effect on the network PCI. However, additional funding would need to be allocated for ancillary works such as drainage, unsealed shoulders, kerbs, roundabouts, traffic islands etc. and would be subject to annual evaluation for submission to the annual budget process. Also, funding for Council owned parking lanes adjacent to State owned Main Roads have not been modelled in this analysis nor car parks but these areas are small amounts percentage wise. (Less than 2%) In addition, modelling can only be carried out on existing road pavement segments and as such as the network grows over the next decade there will actually be more roads to competing for the available funds. This analysis should therefore be carried out every few years to take into account the growth that has actually happened. However, these "new" roads should be in top condition for this period and as such they might actually distort upward the average network PCI as they will most likely all remain in the very good category. Therefore leaving out growth estimation would be appropriate for this investigation but needs to be borne in mind.

Lastly, all scenarios were modelled using a discount rate of 4% to bring future benefits back to Net Present Value (NPV).

2.3 Results and Discussion

The Network PCI results for each Scenario of this modelling over the next 15 years are highlighted in *Figure 3* and the associated Scenario budgets for this timeframe shown in *Figure 4*

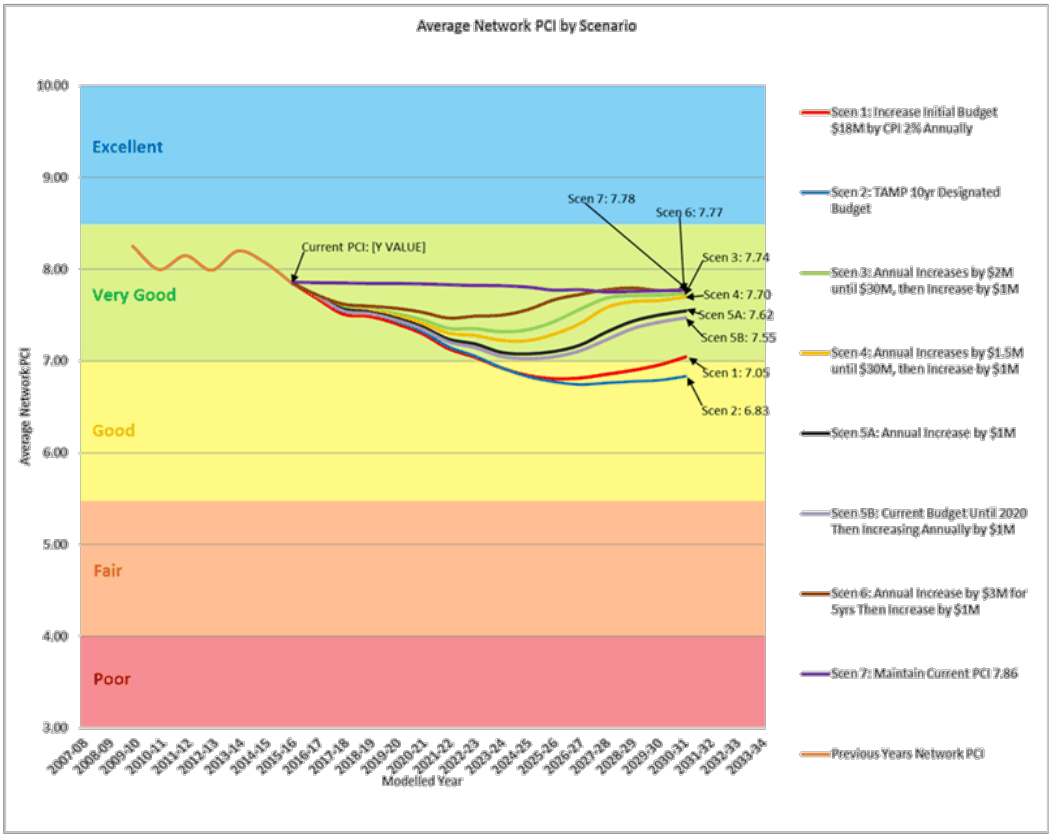

Figure 3 - Average Network PCI by Scenario

This graph also shows PCI values in the very good range prior to today's date. In addition note, the current modelling includes an extra injection of $5 million (Total $8.07M) for Scenarios 3-6 from the Federal Government Roads to Recovery Program which has been allocated to the Sunshine Coast Council for the 2016/17 year. The above *Figure 2* shows that for all scenarios the network condition drops under the pressure of a wave of aging pavements arriving at the point of needing resurfacing. For both Scenarios 1 and 2 the network PCI never recovers and drops from very good to good condition. In Scenarios 3, 4, 5A, 5B and 6 the PCIs lift back up to almost the current condition and remains in the very good range on average. However, due to some levels of uncertainty with respect to road pavement depths, subgrade strengths and traffic loading, as mentioned earlier, across the full 2,268km of sealed roads it is felt that it would be sensible to adopt a measured approach recommending a moderate lift in funding allocation (Scenario 5A) and review this in two years after the next network road condition survey. Whilst 5B delays the annual $1M ramping and only drops 0.14 in PCI over 15 years modelling shows that in returning the network condition back up for both options, Scenario 5B will require potentially approximately $61M more over a decade. (Appendix 6)

Figure 4 below tracks the annual budgets required in each scenario over the 15 year period ahead as well as showing the increasing allocations over the last 7 years (excluding Noosa). It should also be noted that whilst modelling out fifteen years has less accuracy it is apparent that continuing with the current funding plan will see the network PCI drop and not recover. From this it can clearly be seen that an injection of additional funds will be required over the next decade to address the wave of aging roads if the network average PCI is to be retained. Scenario 7 as seen in *Figure 4* requires a wildly fluctuating budget to maintain the set current PCI. This is obviously an unmanageable funding plan but is included for comparison purposes.

In addition, it should also be highlighted that for all but the fictional Scenario 7 (only included for comparison purposes) average network PCIs drop over the next decade. Whilst the PCI drops for these scenarios looks dramatic in *Figure 3* above, the drop in the average network condition may not be perceived by general road users. However, this said, without an injection of funding the network will deteriate to a lower condition (Scenario 2) with a network PCI score over one point lower than today's value, and costs to remediate it and lift it back up to the current PCI, will escalate significantly.

Whilst these PCIs are network averages and some road will deteriate slower than others it is clear that the current funding model (Scenario 2) will lead to a network average condition noticeably below that currently. By a recent benchmarking comparison with 32 other councils using the SMEC software this would put SCC in the lowest 20% with respect to average network PCI.

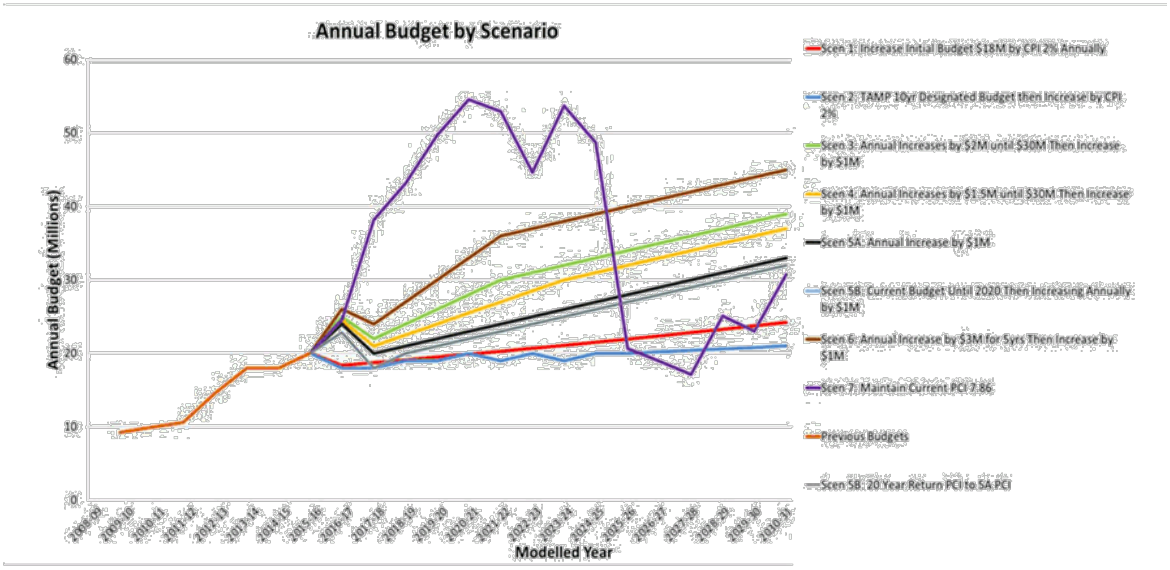

Figure 4 - Annual Budget by Scenario

From *Figures 3 and 4* it is evident that whilst Scenario 6 gives the best result Scenario 5A still keeps the network PCI in the very good range. Whilst this modelling is detailed there still is a level of uncertainty as to how the network will actually perform as over the 2,268km not all pavement depths and subgrade strengths are known. With this in mind it is proposed to recommend Scenario 5A initially ($1M additional funding allocation ramped) and reassess after the next network condition survey in two years (2018/19). *Table 2* below outlines annual and total budgets over the first 10 year period (as normally shown in Capital Forward Programs.

10 year Road Reseal and Rehabilitation Funding Plan and Total by Scenario

Estimated Budget by Year ($M)											
Scenario	2016 / 2017	2017 / 2018	2018 / 2019	2019 / 2020	2020 / 2021	2021 / 2022	2022 / 2023	2023 / 2024	2024 / 2025	2025 / 2026	10 Yr Total
1	20.05	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	182.05
2	20.05	18.00	19.00	19.00	20.00	19.00	20.00	19.00	20.00	20.40	194.45
3	25.01	22.00	24.00	26.00	28.00	30.00	31.00	32.00	33.00	34.00	285.00
4	24.51	21.00	22.50	24.00	25.50	27.00	28.50	30.00	31.00	32.00	266.00
5A	24.01	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	240.00
5B	23.46	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	221.46
6	26.01	24.00	27.00	30.00	33.00	36.00	37.00	38.00	39.00	40.00	330.00
7	24.54	38.15	43.14	49.67	54.54	52.94	44.63	53.67	48.68	20.65	430.61

Table 2 – Annual Budget Amounts by Scenario

It should also be highlighted that this analysis is based on current methodologies for pavement resurfacings and rehabilitations. Products such as Micro asphalt surfacing, asphalt rejuvenation (Liquid Road) and under asphalt / unbound pavements geogrids are currently being trialled. These all have the potential to take some stress off the budgetary allocation in the future if they prove value for money.

Similarly CAM branch staff are currently focusing on sustainable road rehabilitation methods, where possible, such as insitu stabilisation using foamed bitumen or cement / fly ash blends. These treatment types are seen as less disruptive to the road user community as well as more cost effective as existing materials are made use of and little material is carted from site as waste.

As new technologies emerge in the future that provide for more sustainable cost effective approaches these could allow for relaxation of the funding requirements predicted, and as such Scenario 3 is the recommended approach. Detailed graphs for each Scenario are shown in the Appendix 4. Furthermore, it is anticipated that Civil Asset Management Branch has sufficient capacity to plan, design and deliver the additional works required in an expanded program.

In Addition, to the above road pavement modelling, CAM officers are currently arranging for the completion of a detailed condition survey of the adjacent kerb and channel network which is approximately 2,440 km in length. This will then provide a strategic view of the kerb and channel network condition as a whole and better inform for appropriate annual funding allocations under the accompanying Transportation Renewals Capital Subprogram.

Previously, only damaged kerb and channel on roads identified for Rehabilitation were targeted for removal and replacement, as part of preparatory maintenance. This intervention is focused on meeting stormwater management functional requirements and minimise possible water ingress damage to adjacent pavements.

In the last two years, in addition to this reinstatement, separate funds have been allocated under the Transportation Renewals Capital Sub program specifically for identified damaged kerb and channel. This year it was approximately $250k. However, the whole of network condition survey being carried out and the subsequent associated analysis will advise appropriate longer term funding allocations required.

Additionally, CAM staff are working to upgrade current kerb and channel placement standards from a slurry surfaced kerb mix (low toughness) to a higher cost but considerably more robust slip form structural concrete requirement as seen on highway median barriers. Moving forward, this is likely to significantly lower the whole of life costs of this asset (replacement value $150M)

Together, the strategic survey analysis and improved standards will ensure sustainability of this asset as well as recognise that aesthetic considerations need to also be included in higher profile locations.

Lastly, Civil Asset Management staff have are working with Planning and Environment Department staff to review the current Planning Scheme Policy for Development Works. Recent benchmarking has ratified field evidence that current Road pavement design lives currently set at 20 years appears insufficient particularly on collector roads. Extension of these design life requirements to 25 – 30 years is being sought to ensure premature remediation is not required and existing budgets aren't overstressed.

3 Conclusions and Recommendations

The sealed road network on the Sunshine Coast is, on a national average, in good shape. It is ranked 16th amongst SMEC's 53 client councils.(SMEC Report) However, due to increased growth there is a wave or bulge of additional aging road pavement and surfacings requiring attention over the next decade. Both

external modelling by SMEC and internal modelling has indicated that lifting the current capital funding is required to arrest the slide in average network road condition. It is recommended that an amended funding allocation (Scenario 5A) that rises $1M per annum be approved and that the forward funding plan be reassessed in 2 years (2018/19) after the next network condition survey is carried to determine whether recalibration of the annual allocations be made. This is seen as a prudent approach.

Notwithstanding the above, it is also appropriate that the all the Roads to Recovery allocation funded by the Federal Government for 2016/17, in the amount of $8.07M be fully allocated to this Road Reseal Rehabilitation Program (as included in modelling) to ensure a head start to assist in the mitigation network deteriation overall.

References

- Transportation Asset Management Plan 2016
- SMEC Sunshine Coast Council PMS Analysis 2016-2040
- Memo – Road Pavement Condition across Divisions 11/12/2015
- Sunshine Coast Regional Council Community Survey – Services Draft report IRIS Research

. Appendix 1

10 Year Adopted Capital Works Program for Road Reseals and Rehabilitation

2015/16 10 Year Adopted Capital Works Program for Reseals and Rehabilitation													
SubProgram	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	Grand Total
Reseals & Rehabilitation ($M)	21.1	22.8	18.0	19.0	19.0	20.0	19.0	20.0	19.0	20.0	**189.1**

Note - Year 2015/16 (0nly $20.05M directed to roads only – balance to pathways/K&C – Total $21.1M)

Appendix 2
Pavement Condition Index Photo Examples

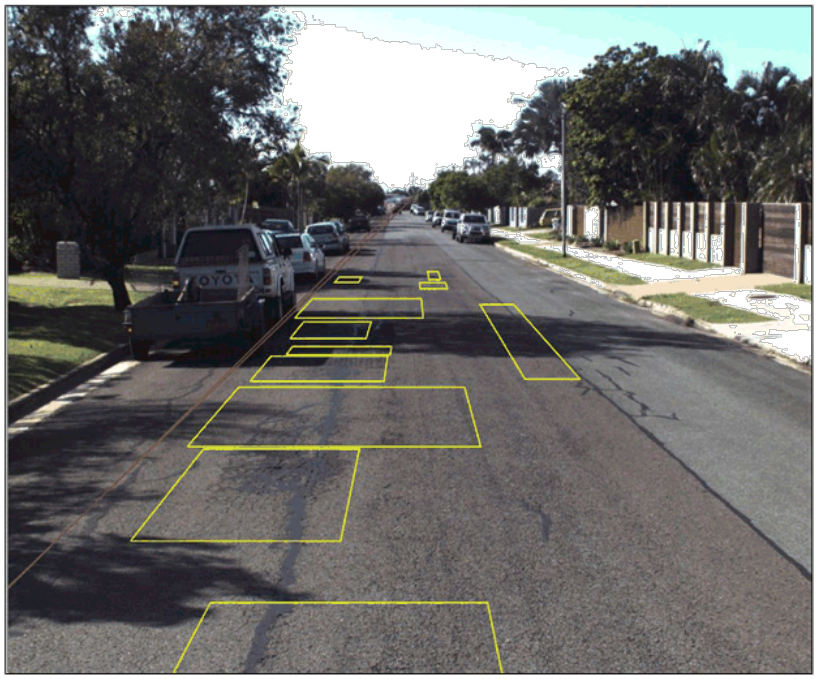

Figure 1: Pavement Condition Index 5

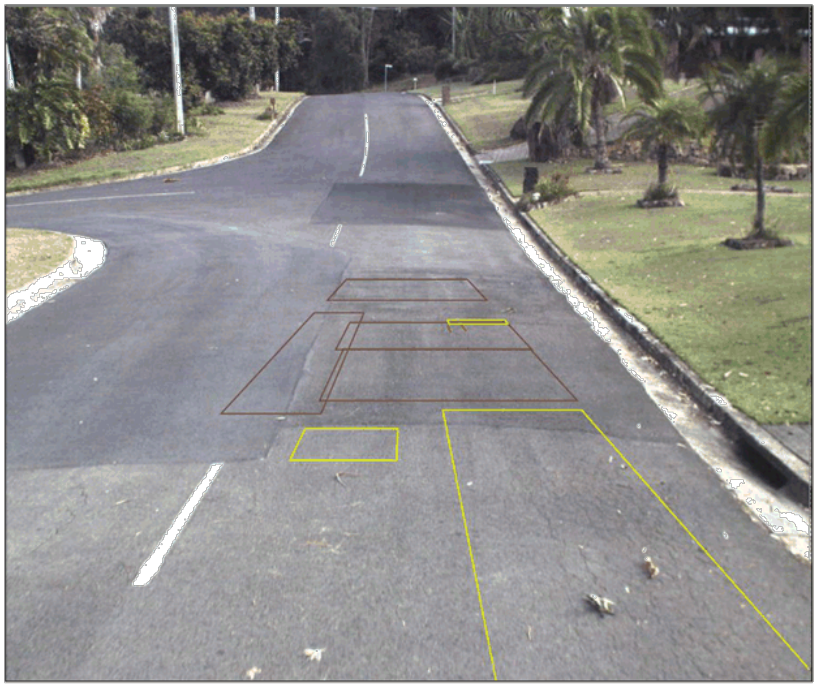

Figure 2: Pavement Condition Index 6

Figure 3: Pavement Condition Index 7

Figure 4: Pavement Condition Index 8

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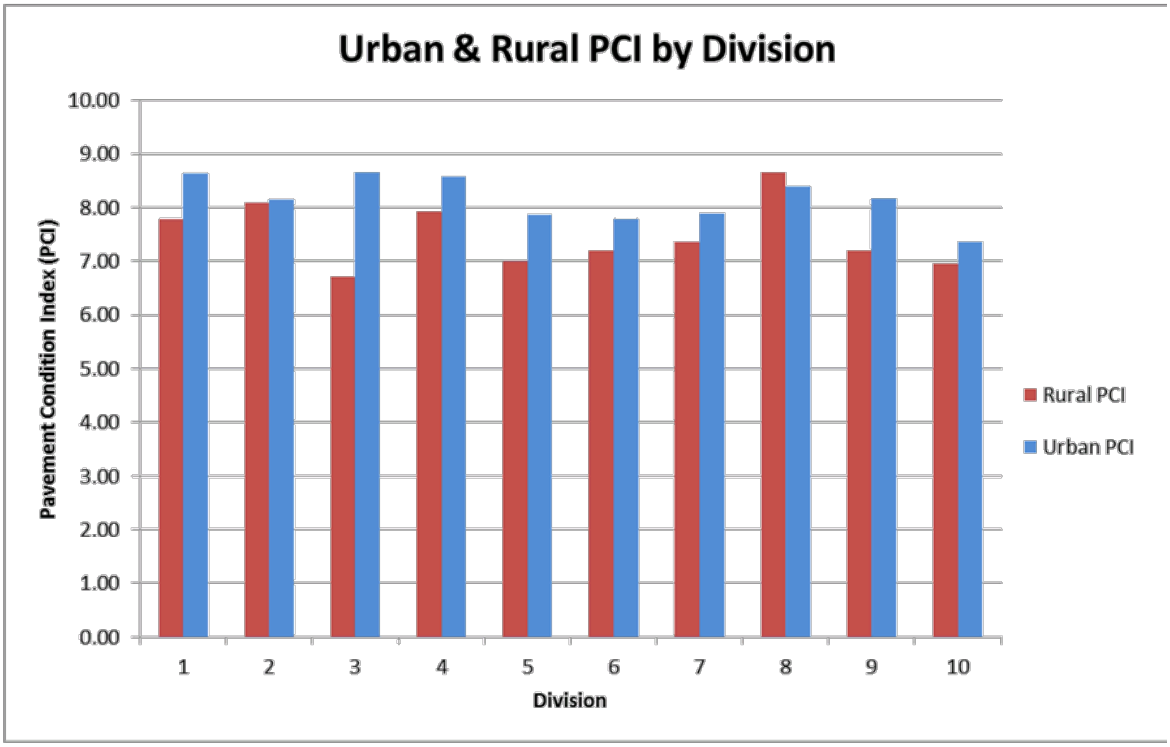
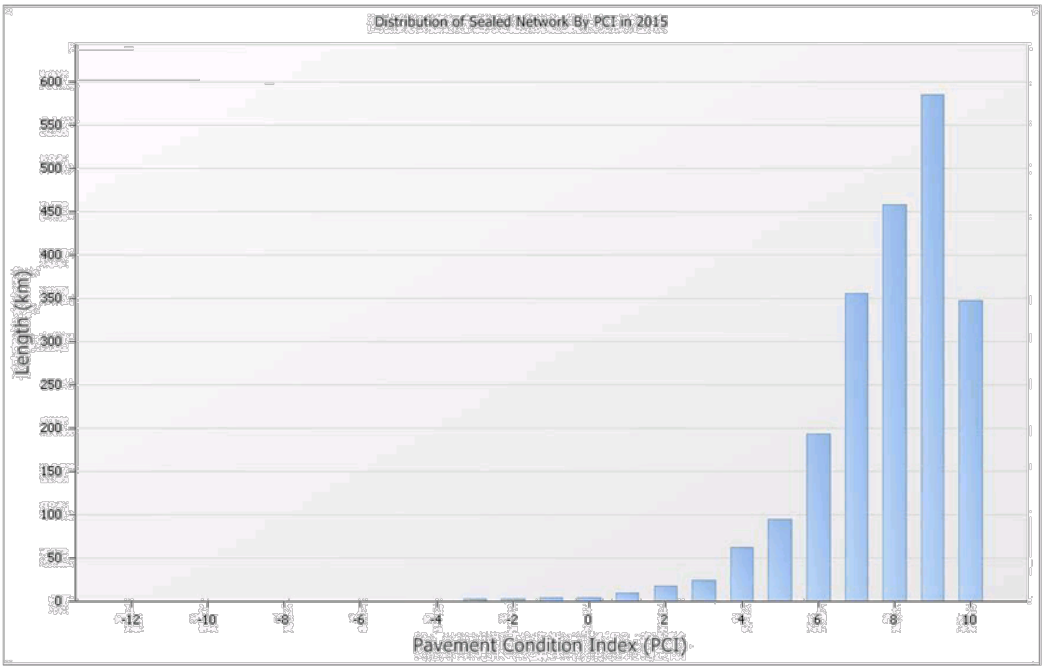
Figure 5: PCI Pavement Condition Index 9

Appendix 3

Road Network Pavement Condition Index by Division (Urban and Rural) and Distribution of Sealed Road Network by PCI 2015





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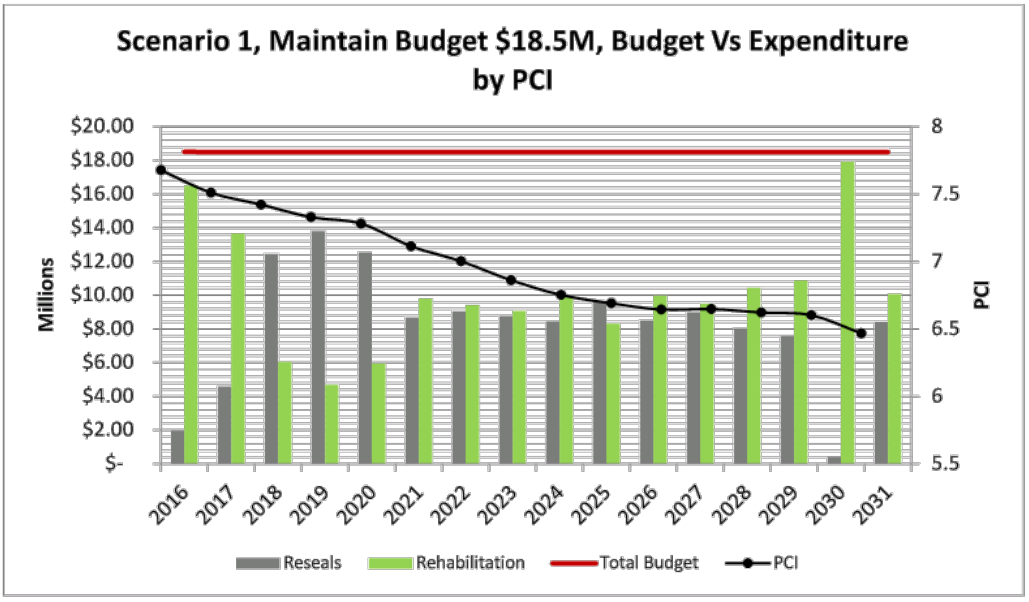
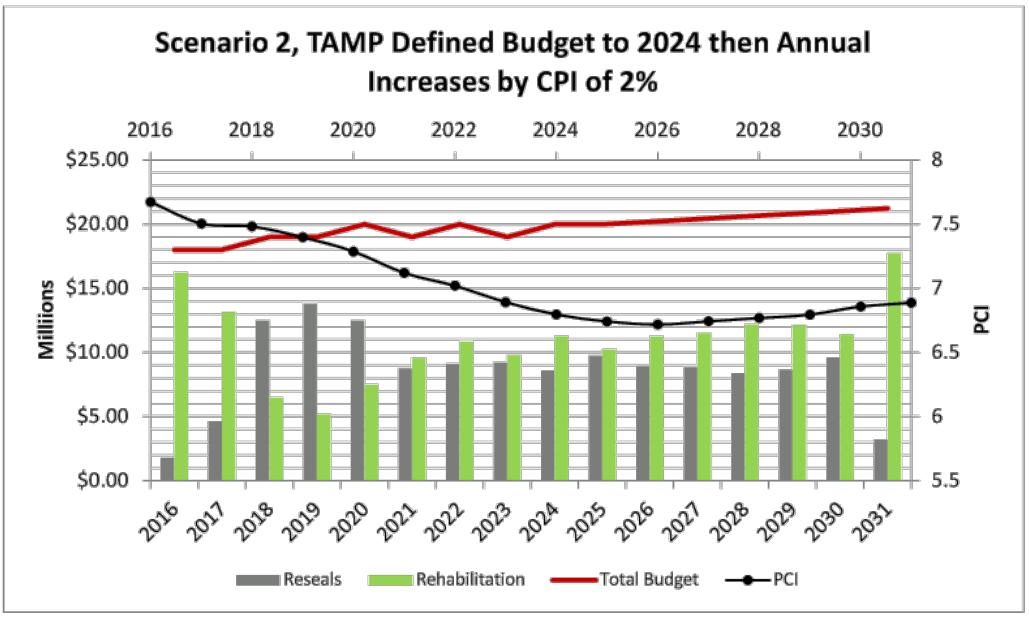
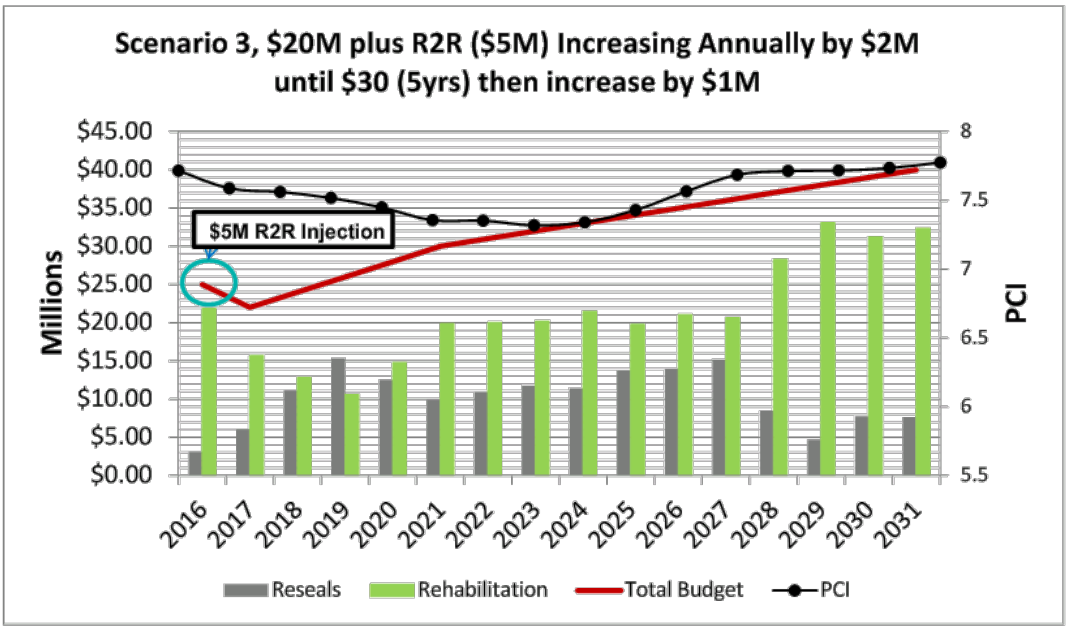
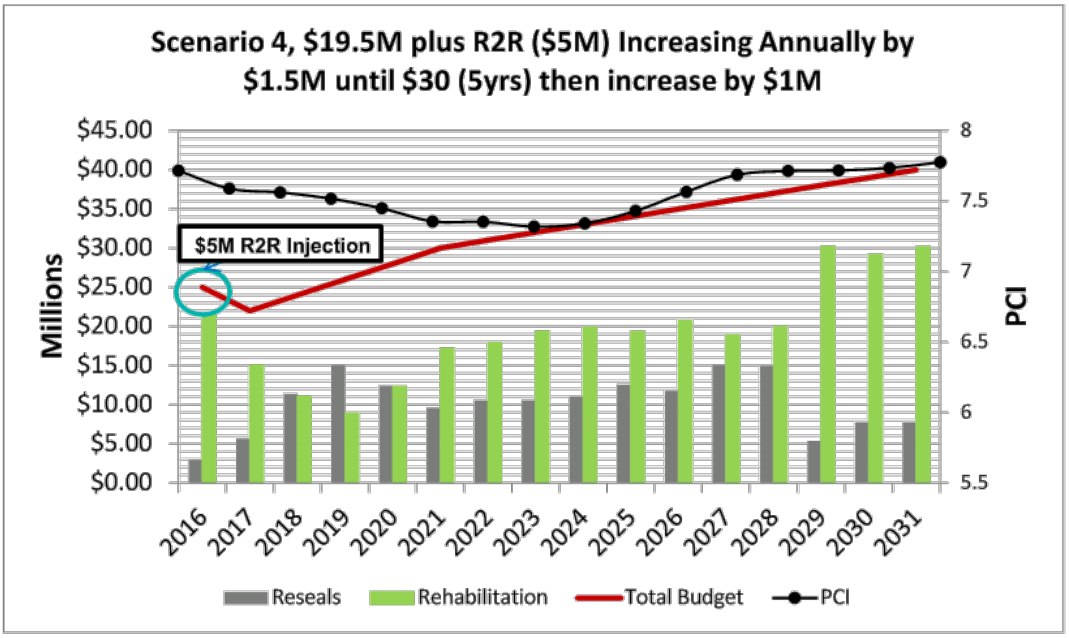
Appendix 4

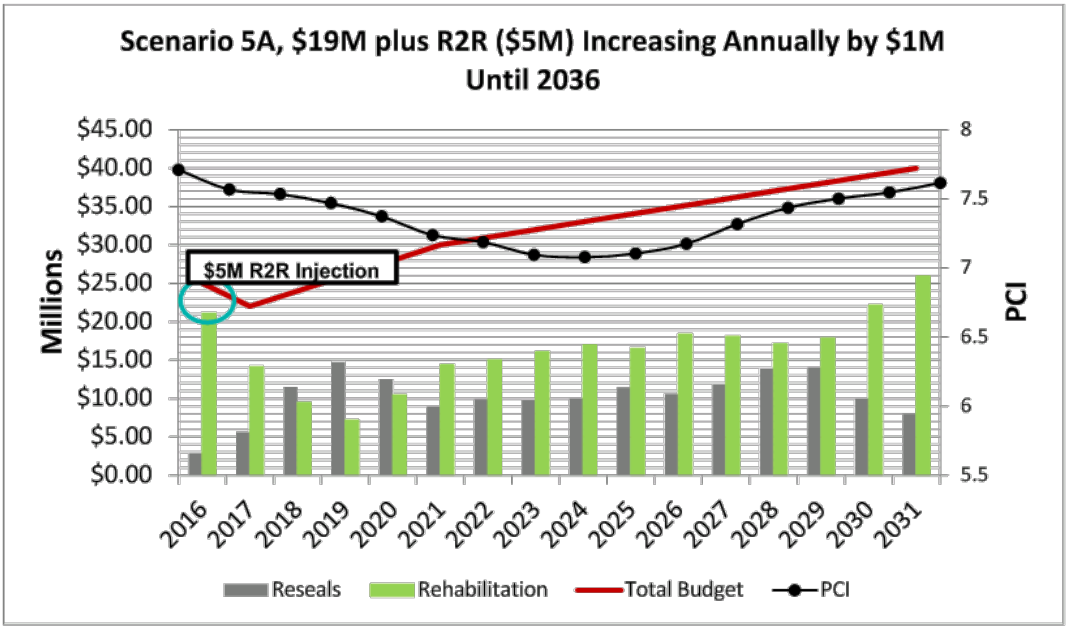
ROAD NETWORK PAVEMENT CONDITION INDEX MODELLING SCENARIOS

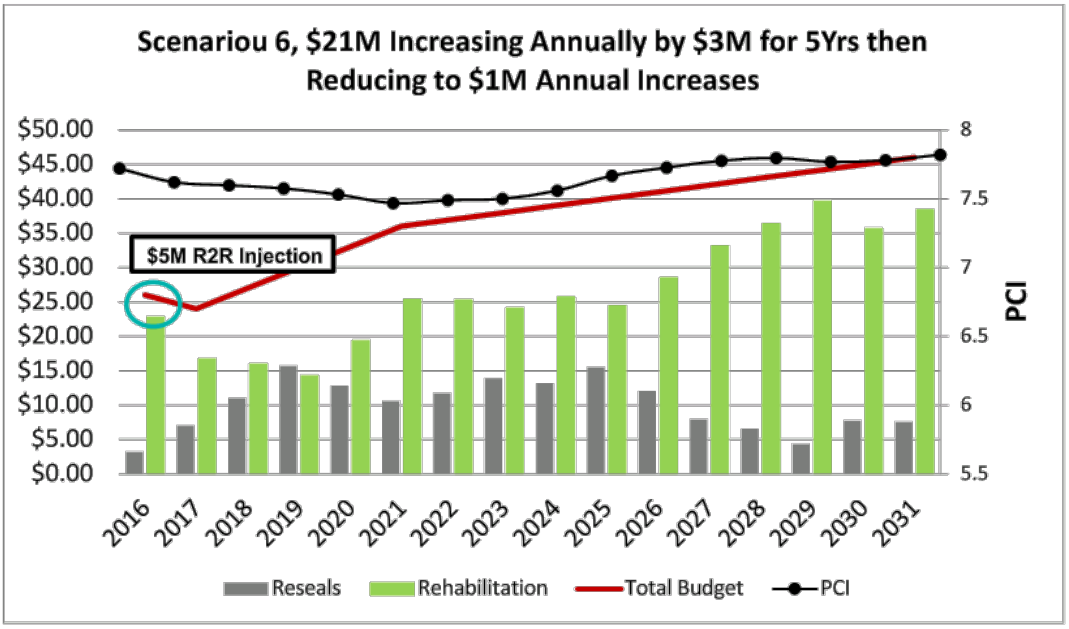


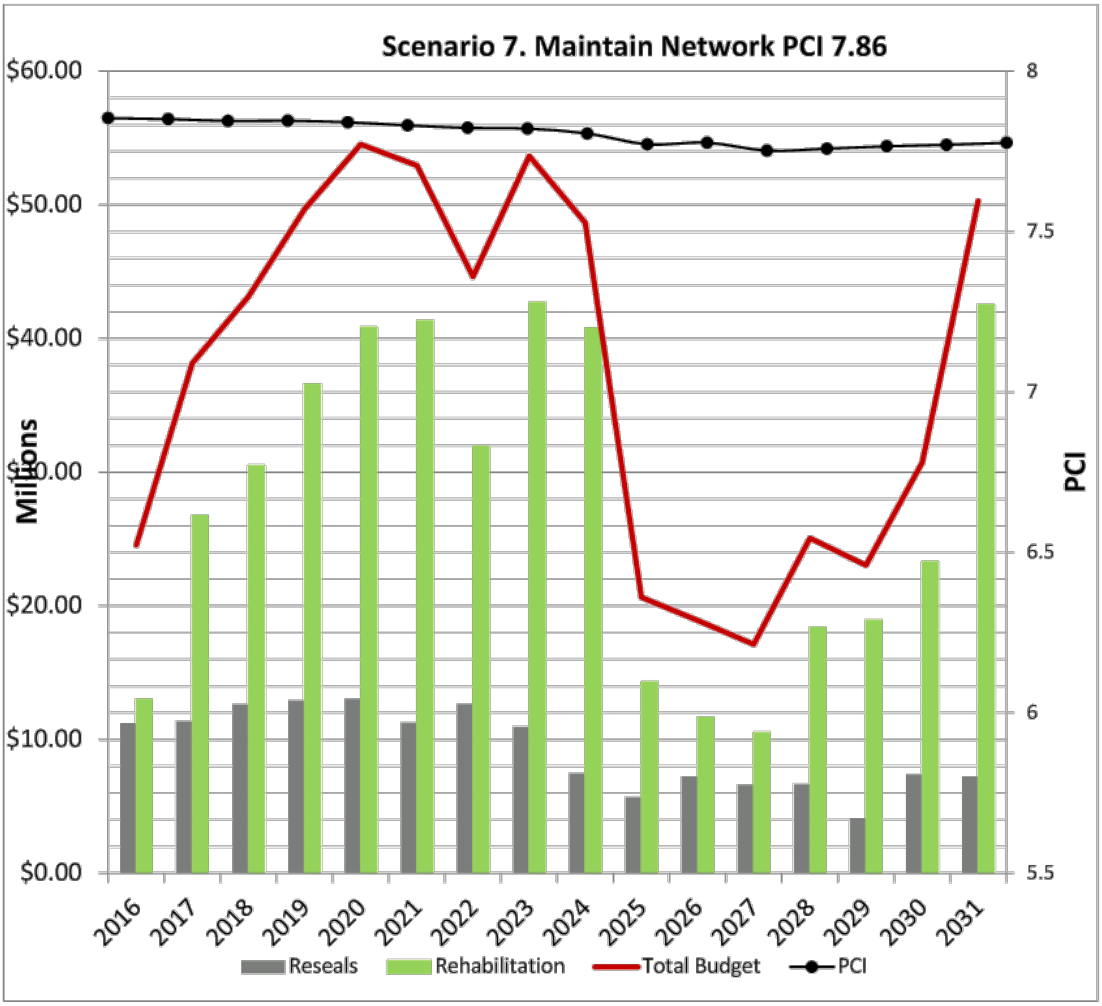



Scenario 3, $20M plus R2R ($5M) Increasing Annually by $2M until $30 (5yrs) then increase by $1M
$45.00
$40.00
$35.00
$30.00
$25.00
$20.00
$15.00
$10.00
$5.00
$0.00
Millions
8
7.5
7
6.5
6
5.5
PCI
$5M R2R Injection
2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031
Reseals
Rehabilitation
Total Budget
PCI


Scenario 4, $19.5M plus R2R ($5M) Increasing Annually by $1.5M until $30 (5yrs) then increase by $1M
$45.00
$40.00
$35.00
$30.00
$25.00
$20.00
$15.00
$10.00
$5.00
$0.00
Millions
8
7.5
7
6.5
6
5.5
PCI
$5M R2R Injection
2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031
Reseals
Rehabilitation
Total Budget
PCI


Scenario 5A, $19M plus R2R ($5M) Increasing Annually by $1M Until 2036
$45.00
$40.00
$35.00
$30.00
$25.00
$20.00
$15.00
$10.00
$5.00
$0.00
Millions
8
7.5
7
6.5
6
5.5
PCI
$5M R2R Injection
2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031
Reseals
Rehabilitation
Total Budget
PCI


Scenariou 6, $21M Increasing Annually by $3M for 5Yrs then Reducing to $1M Annual Increases
$50.00
$45.00
$40.00
$35.00
$30.00
$25.00
$20.00
$15.00
$10.00
$5.00
$0.00
8
7.5
7
6.5
6
5.5
PCI
$5M R2R Injection
2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031
Reseals
Rehabilitation
Total Budget
PCI


Scenario 7. Maintain Network PCI 7.86
$60.00
$50.00
$40.00
$30.00
$20.00
$10.00
$0.00
Millions
8
7.5
7
6.5
6
5.5
PCI
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
Reseals
Rehabilitation
Total Budget
PCI

Appendix 5

10 year Road Reseal and Rehabilitation Funding Plan and Total by Scenario

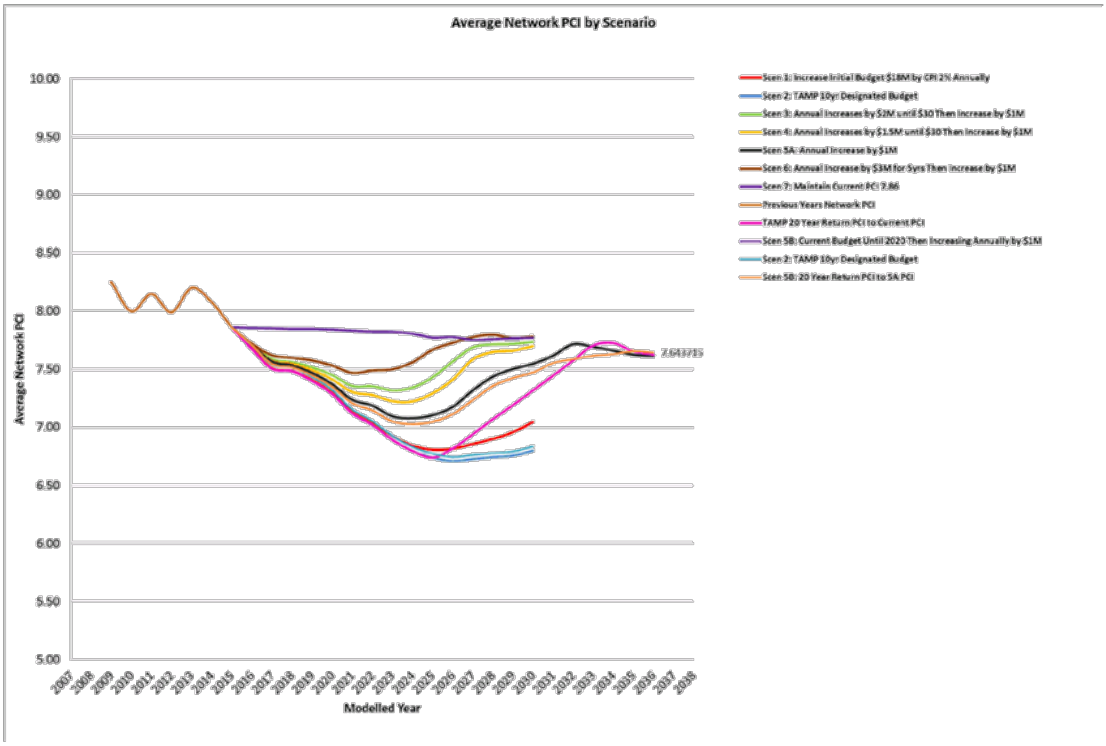
Estimated Budget by Year ($M)											
Scenario	2016 / 2017	2017 / 2018	2018 / 2019	2019 / 2020	2020 / 2021	2021 / 2022	2022 / 2023	2023 / 2024	2024 / 2025	2025 / 2026	10 Yr Total
1	20.05	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	182.05
2	20.05	18.00	19.00	19.00	20.00	19.00	20.00	19.00	20.00	20.40	194.45
3	25.01	22.00	24.00	26.00	28.00	30.00	31.00	32.00	33.00	34.00	285.00
4	24.51	21.00	22.50	24.00	25.50	27.00	28.50	30.00	31.00	32.00	266.00
5A	24.01	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	240.00
5B	23.46	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	221.46
6	26.01	24.00	27.00	30.00	33.00	36.00	37.00	38.00	39.00	40.00	330.00
7	24.54	38.15	43.14	49.67	54.54	52.94	44.63	53.67	48.68	20.65	430.61

15 year Road Reseal and Rehabilitation Funding Plan and Total by Scenario

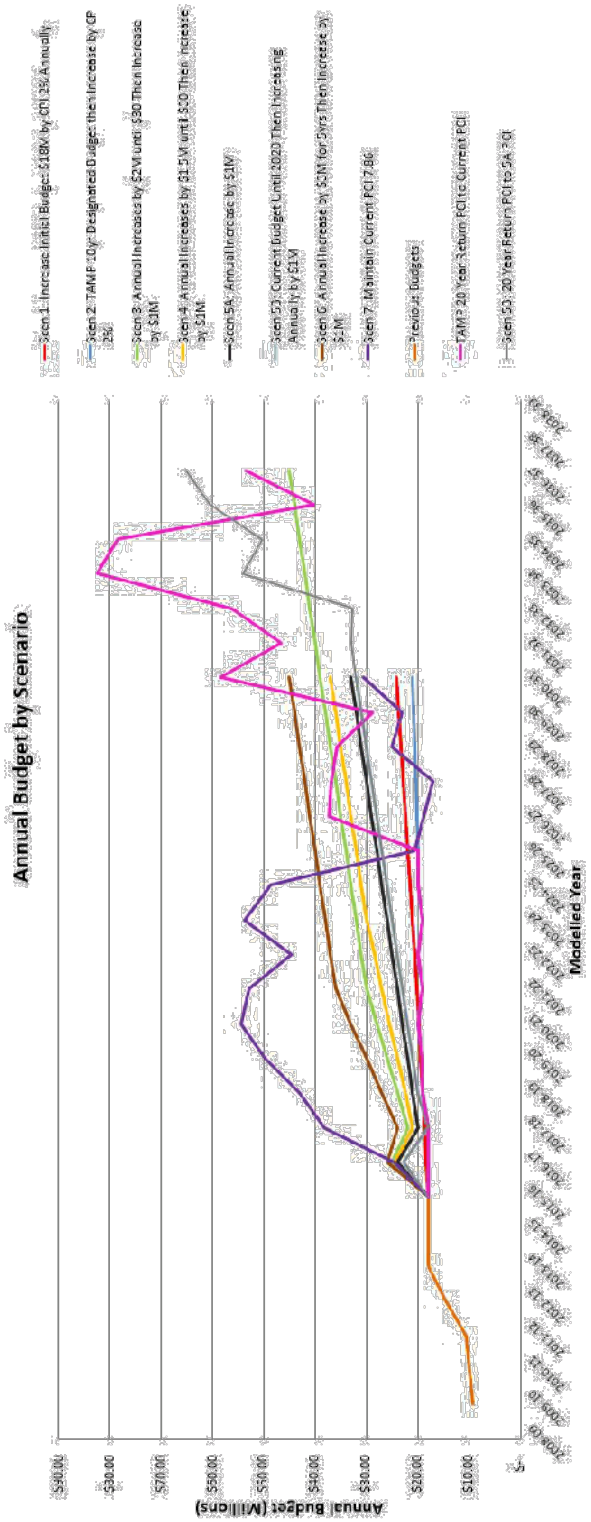
Estimated Budget by Year ($M)																
Scenario (comm. July)	2016 / 2017	2017 / 2018	2018 / 2019	2019 / 2020	2020 / 2021	2021 / 2022	2022 / 2023	2023 / 2024	2024 / 2025	2025 / 2026	2026 / 2027	2027 / 2028	2028 / 2029	2029 2030	2030 / 2031	15 yr Total Budget
1	20.05	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	270.00
2	20.05	18.00	19.00	19.00	20.00	19.00	20.00	19.00	20.00	20.40	20.81	21.22	21.65	22.08	22.52	300.68
3	25.01	22.00	24.00	26.00	28.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00	38.00	39.00	470.00
4	24.51	21.00	22.50	24.00	25.50	27.00	28.50	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00	441.00
5A	24.01	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	395.00
5B	23.46	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	395.00
6	26.01	24.00	27.00	30.00	33.00	36.00	37.00	38.00	39.00	40.00	41.00	42.00	43.00	44.00	45.00	545.00
7	24.54	38.15	43.14	49.67	54.54	52.94	44.63	53.67	48.68	20.65	18.93	17.14	25.07	23.05	30.73	545.52

Appendix 6

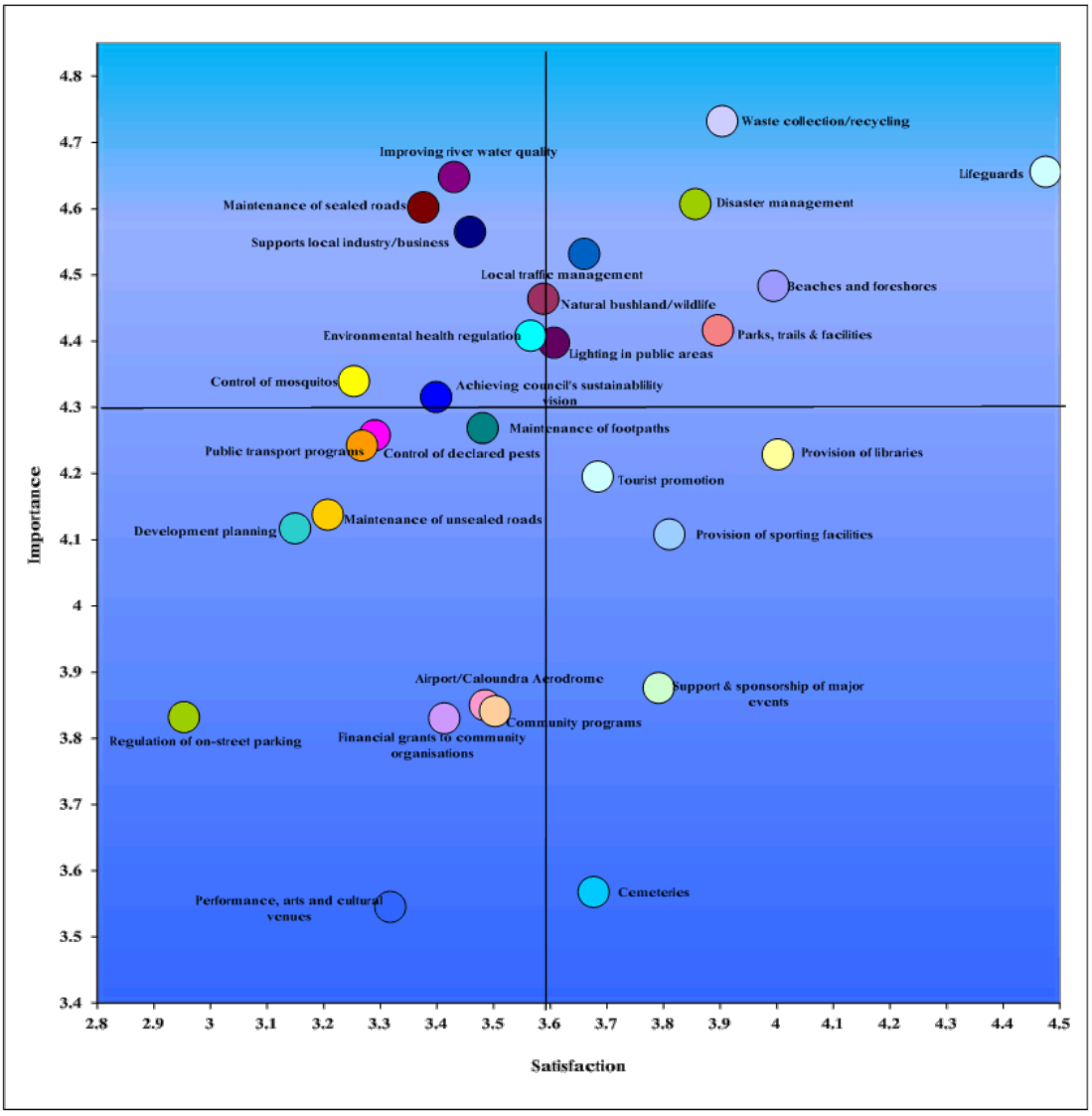
Year	Scen 5B: 20 Year Return PCI to 5A PCI		Scen 5A: Annual Increase by $1M		Difference
2016/17	7.71	$ 22,845,659	7.71	$ 24,005,091	-$ 1,159,432
2017/18	7.55	$ 17,999,675	7.57	$ 19,999,443	-$ 1,999,768
2018/19	7.52	$ 19,999,784	7.53	$ 20,999,654	-$ 999,870
2019/20	7.45	$ 20,999,716	7.47	$ 21,999,697	-$ 999,981
2020/21	7.35	$ 21,999,662	7.37	$ 22,999,364	-$ 999,702
2021/22	7.21	$ 22,999,814	7.24	$ 23,999,651	-$ 999,837
2022/23	7.15	$ 23,999,825	7.19	$ 24,999,838	-$ 1,000,013
2023/24	7.05	$ 24,999,721	7.10	$ 25,999,532	-$ 999,811
2024/25	7.03	$ 25,999,741	7.08	$ 26,999,725	-$ 999,984
2025/26	7.05	$ 26,999,434	7.10	$ 27,999,833	-$ 1,000,399
2026/27	7.11	$ 27,999,644	7.18	$ 28,999,429	-$ 999,785
2027/28	7.23	$ 28,999,786	7.32	$ 29,999,734	-$ 999,948
2028/29	7.36	$ 29,999,516	7.44	$ 30,999,750	-$ 1,000,234
2029/30	7.42	$ 30,999,813	7.50	$ 31,999,609	-$ 999,796
2030/31	7.47	$ 31,999,737	7.55	$ 32,999,861	-$ 1,000,124
2031/32	7.55	$ 32,999,776	7.62	$ 33,999,771	-$ 999,995
2032/33	7.59	$ 32,717,571	7.71	$ 34,999,846	-$ 2,282,275
2033/34	7.62	$ 54,126,085	7.69	$ 35,999,522	$ 18,126,563
2034/35	7.63	$ 50,314,410	7.66	$ 36,999,680	$ 13,314,730
2035/36	7.66	$ 60,656,352	7.63	$ 37,999,911	$ 22,656,441
2036/37	7.64	$ 65,215,195	7.62	$ 38,999,831	$ 26,215,364
Total		$ 674,870,916		$ 613,998,772	**$ 60,872,144**



26Sealed Roads Management Plan 2016/17 – 2031/32


Scen 1: Increase Initial Budget $18M by CPI 3% Annually
Scen 2: TAMP 10yr Designated Budget then Increase by CPI 3%
Scen 3: Annual Increases by $2M until $30 Then Increase by $1M
Scen 4: Annual Increases by $1.5M until $30 Then Increase by $1M
Scen 5A: Annual Increase by $1M
Scen 5B: Current Budget Until 2020 Then Increasing Annually by $1M
Scen 6: Annual Increase by $0.5M for 5yrs Then Increase by $1M
Scen 7: Maintain Current PCI 7.86
Trend of Budgets
TAMP 20 Year Return PCI to Current PCI
Scen 5B: 20 Year Return PCI to 5A PCI
Annual Budget by Scenario
Modelled Year
Annual Budget (Millions)
$90.00
$80.00
$70.00
$60.00
$50.00
$40.00
$30.00
$20.00
$10.00

Appendix 7



Quadrant analysis for all services and facilities

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