Campbelltown City Council's (CCC) Sustainable Pavement Management Strategy

Mahbub Hossain, Coordinator, Asset Management
Campbelltown City Council, NSW

city environment lifestyle

campbelltown city council

Introduction To Campbelltown, NSW

- Location: 55Km southwest of Sydney
- Land Size: 354Sqare Kilometers
- Population: 170,000 people
- 350,000 Assets In the System
- 740Km of Roads
- 224 Buildings
- 340 Parks
- 24,000 SW Pits
- 105 Play Equipment
- 620Km SW Pipes Etc.

Pavement Management Issues

- 740 km of roads (4300 segments) with $280m Replacement Value.
- 88% is urban, 12% Rural
- Community Expectation: Smooth Surfacing
- Budget Constraint: requires significant investment to maintain the whole network at acceptable standard.
- **Overall Challenge is to ensure all roads are fit over long periods of time at a minimum lifecycle cost.**

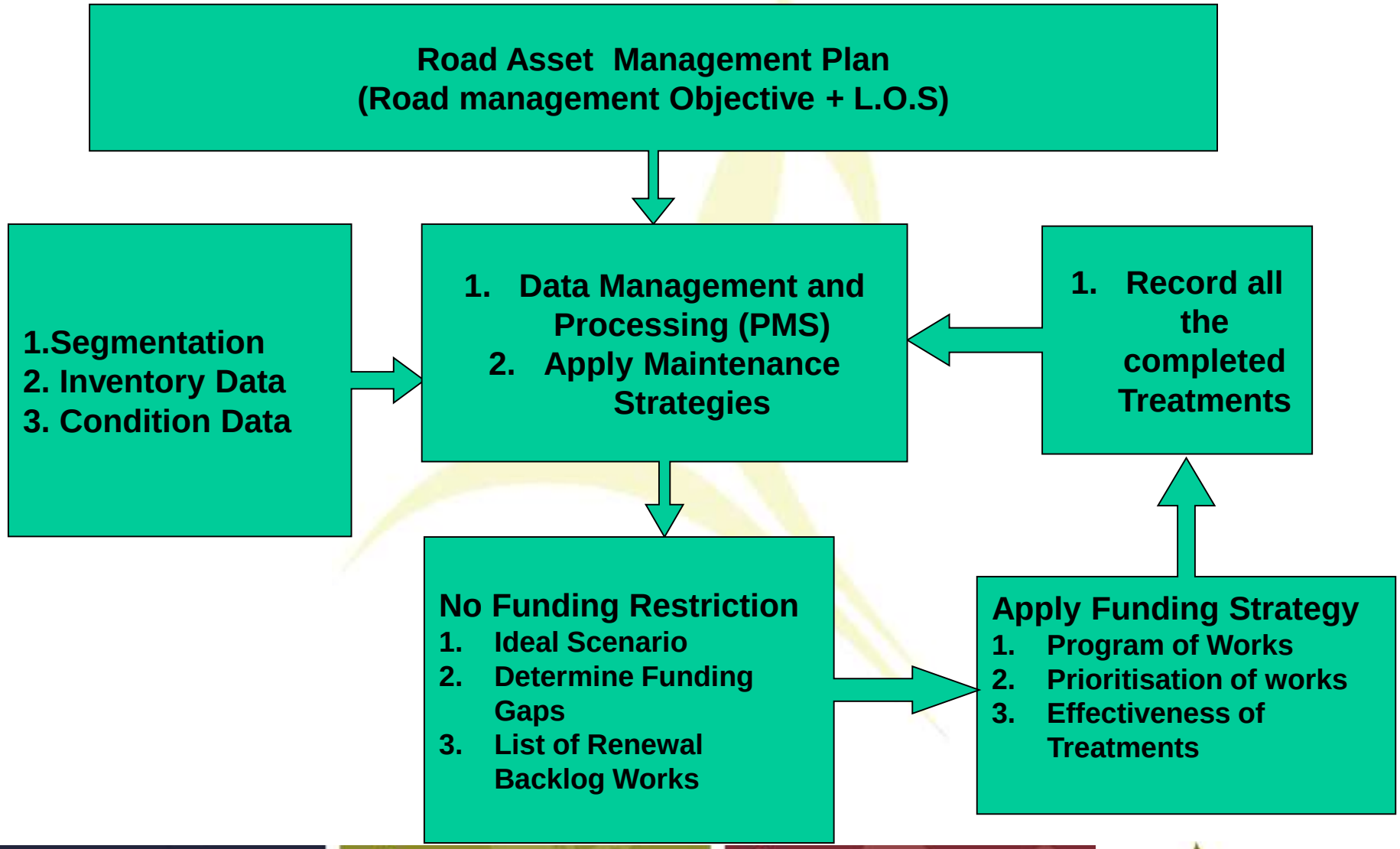
Factors Considered

Considering

- **Transparent Levels of Services**
- **engineering suitability,**
- **minimum life-cycle cost,**
- **budget Constraint**
- **community expectations for smooth and safe roads.**

Council developed and adopted a sustainable pavement management strategy to ensure that the most appropriate treatment type is selected in the future for each road.

CCC Road Management Process



CCC-Road Condition Data Collection

- **Condition Survey: 20% network annually.**
- **Data Collected: Visual, Roughness, Rutting, Deflection (Remaining Life), GPR information.**
- **Data stored in PMS.**
- **Condition Data: Used for**
  - **Asset Valuation, Renewal Backlog Calculation**
  - **Pavement Management Strategy Development**
  - **Project/ Network Level Modelling.**
  - **developing Technical Levels of Services.**

Road Condition: PCI (-100 to 10)

Condition is measured by Pavement Condition Index-PCI, Range: -100 to 10

PCI Range	Condition Description	NAMS Condition
Less than 0.2	Very Poor Condition	5
0.2 to 1.5	Poor Condition	4
1.5 to 4.5	Average Condition	3
4.5 to 8	Good Condition	2
8 to 10	Very Good Condition	1

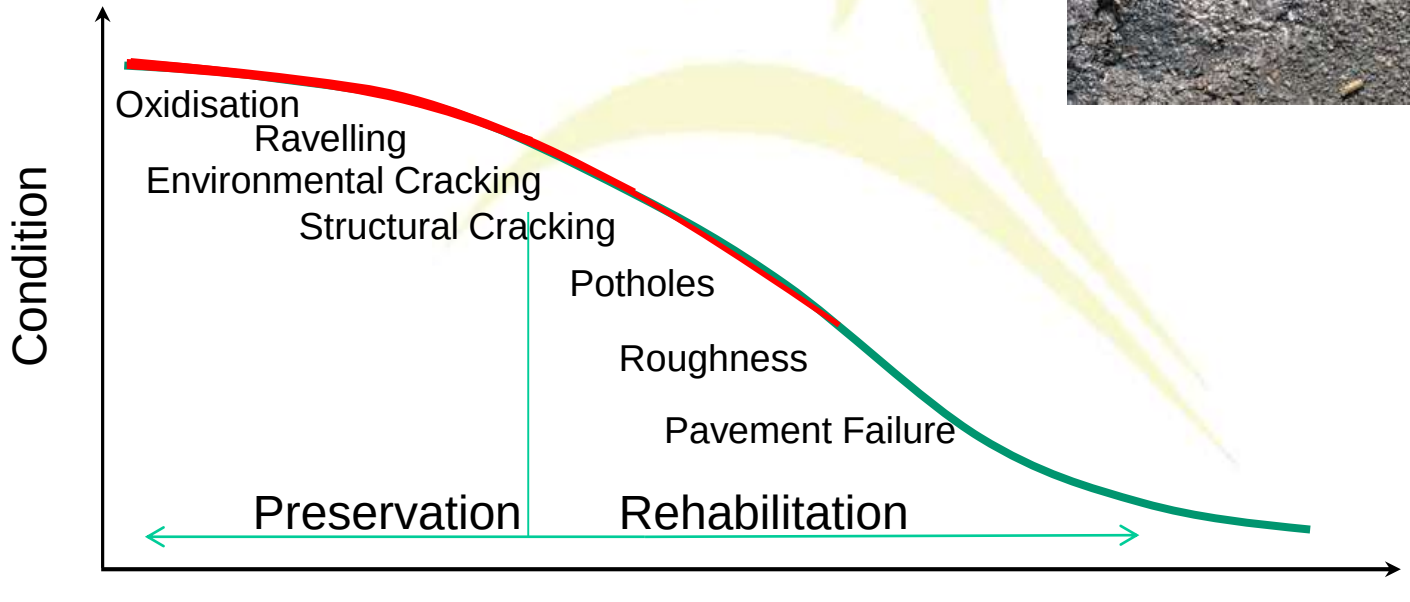
Acceptable PCI (LOS)

Naasra Class	Hierarchy	Urban Class	Acceptable PCI
Class 6	Regional Road	Urban	7.0
Class 6	Regional Road	Rural	6.5
Class 7	Collector Road	Urban	6.75
Class 7	Collector Road	Rural	6.5
Class 8	Residential Street	Urban	6.5
Class 8	Residential Street	Rural	6
Class 9	Cul De Sac	Urban	6.5
Class 9	Cul De Sac	Rural	6

Council's Acceptable: average network PCI = 6.75

Pavement Condition Life Cycle Curve

A variety of failure modes or intervention triggers are assessed as part of the council strategy to link life cycle to whole of life extension.



CCC Road Maintenance Applications

Crack Seal

Heavy Patching

CCC Road Maintenance Applications

Rejuvenation

Reseal

CCC Road Maintenance Applications

Thin Asphalt Overlay

Asphalt Overlay

CCC Road Maintenance Applications

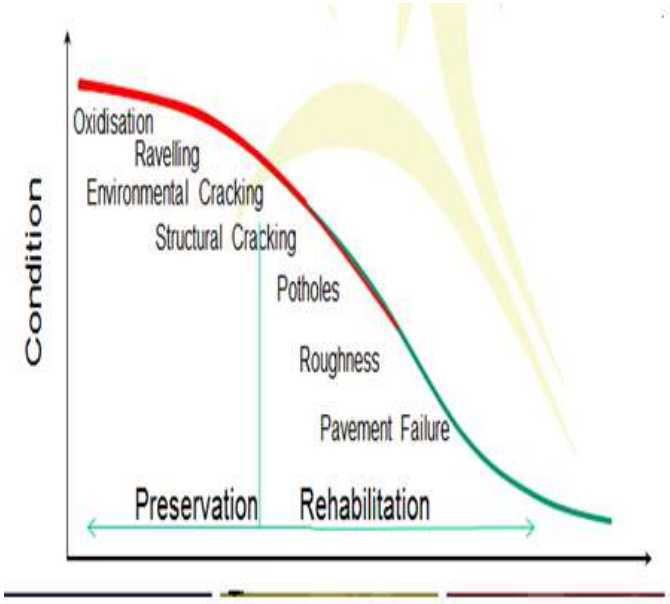
Mill and Fill

Insitu Stabilisation

Strategy Development

Combine

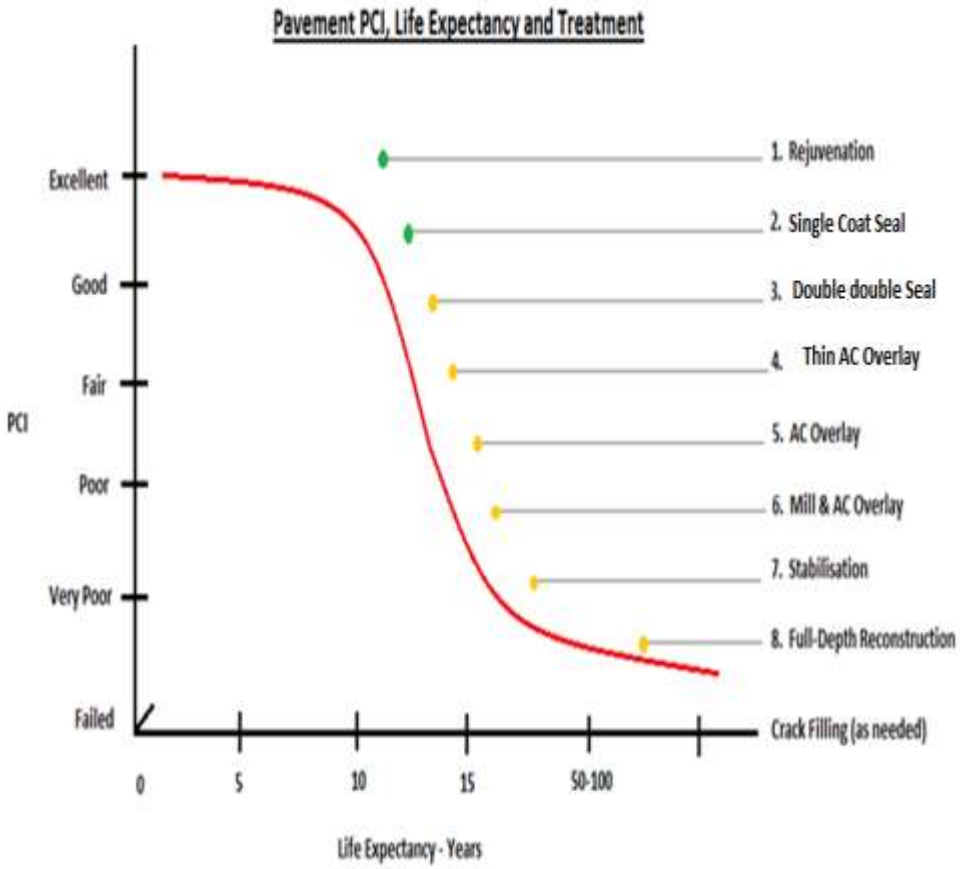
Condition/Defects with



Maintenance Applications

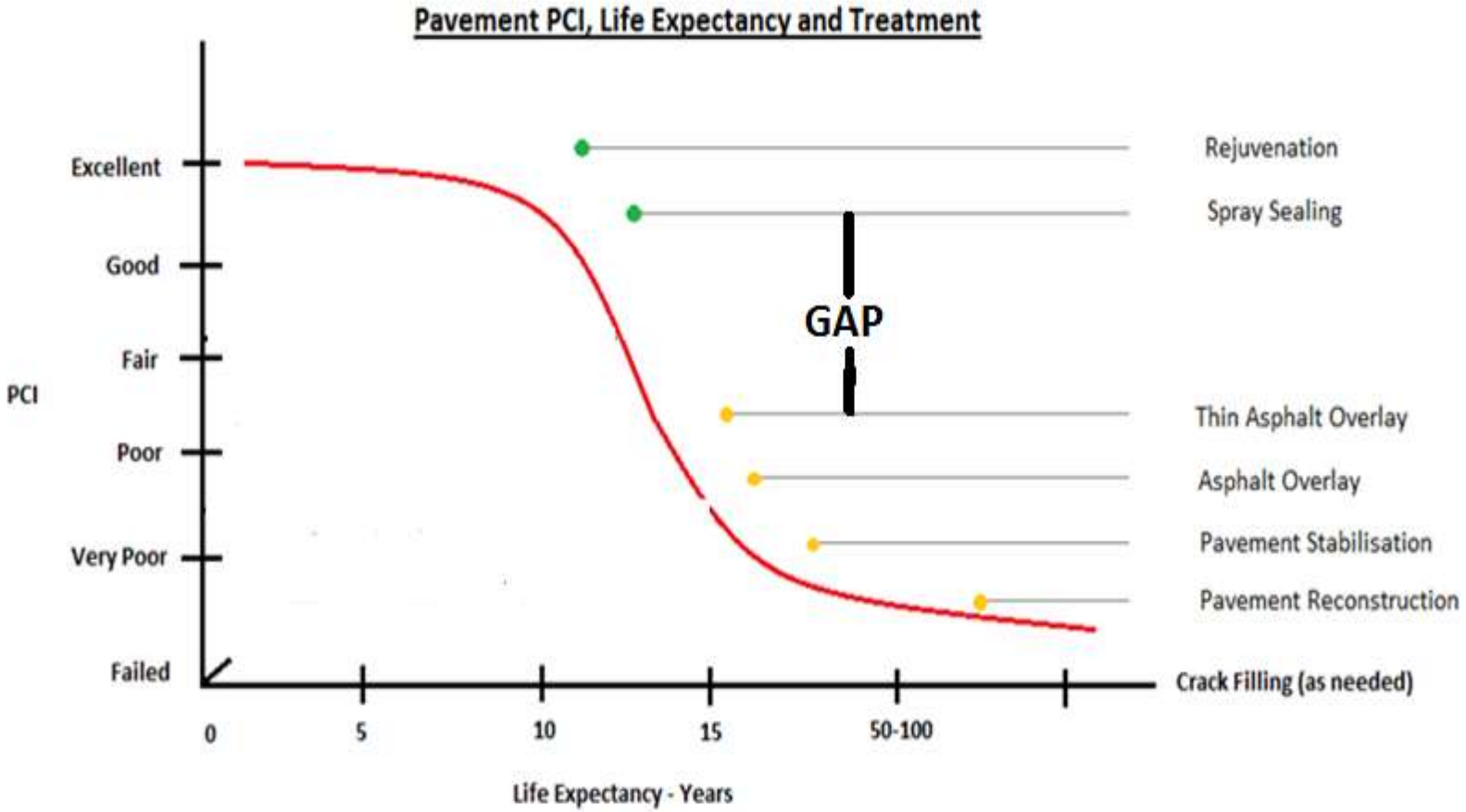
- Rejuvenation
- Microsurfacing
- Reseal
- Asphalt Resurfacing
- Rehabilitation

Maintenance Strategy (combined Product)



CCC selects and Uses a broad range of treatments based on failure modes (intervention Level), PCI & life extensions outcomes.

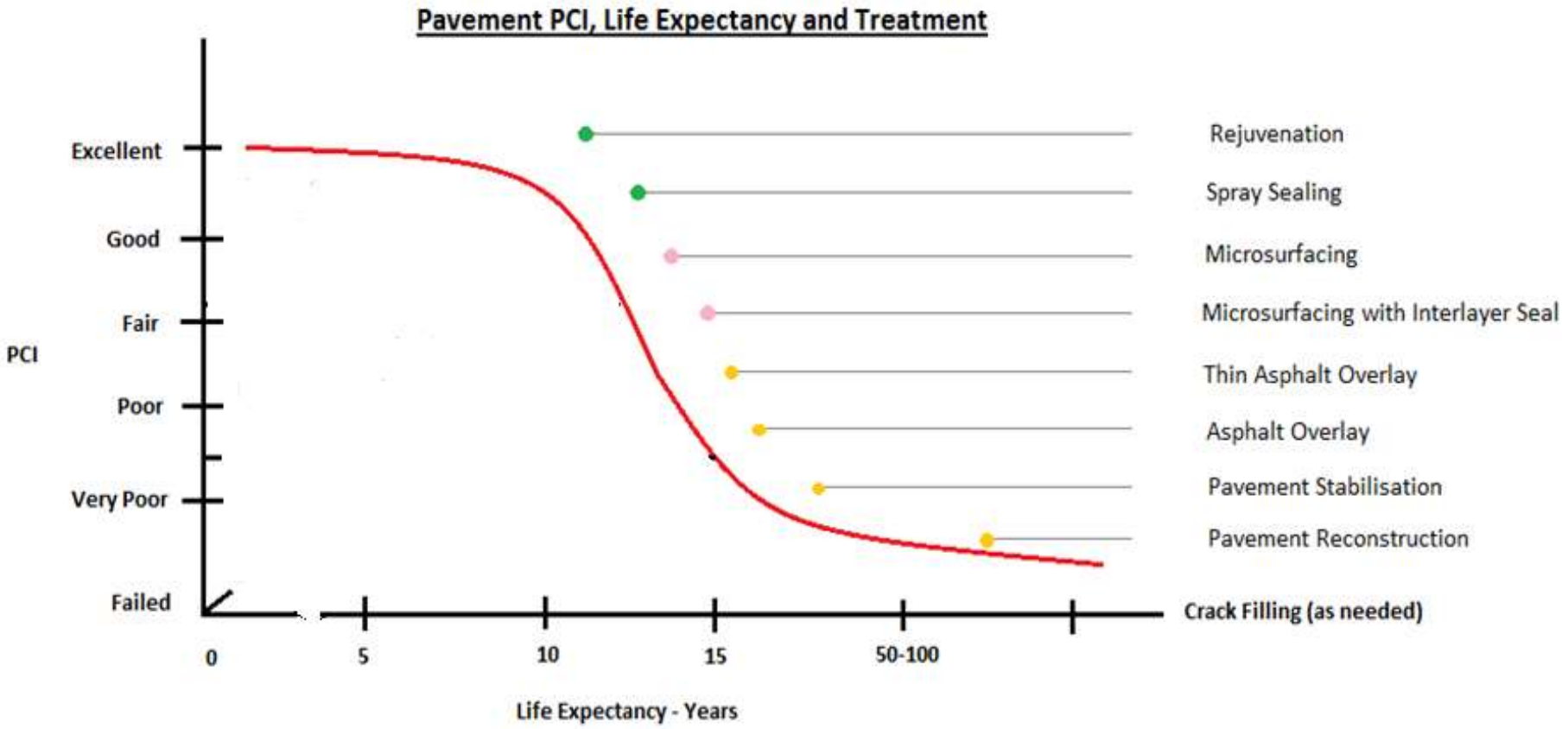
Treatment Gap (Identified in 2012)



Introduced New Treatment (Microsurfacing) to fill up the Gaps

Microsurfacing

Revised Maintenance Strategy from 2013

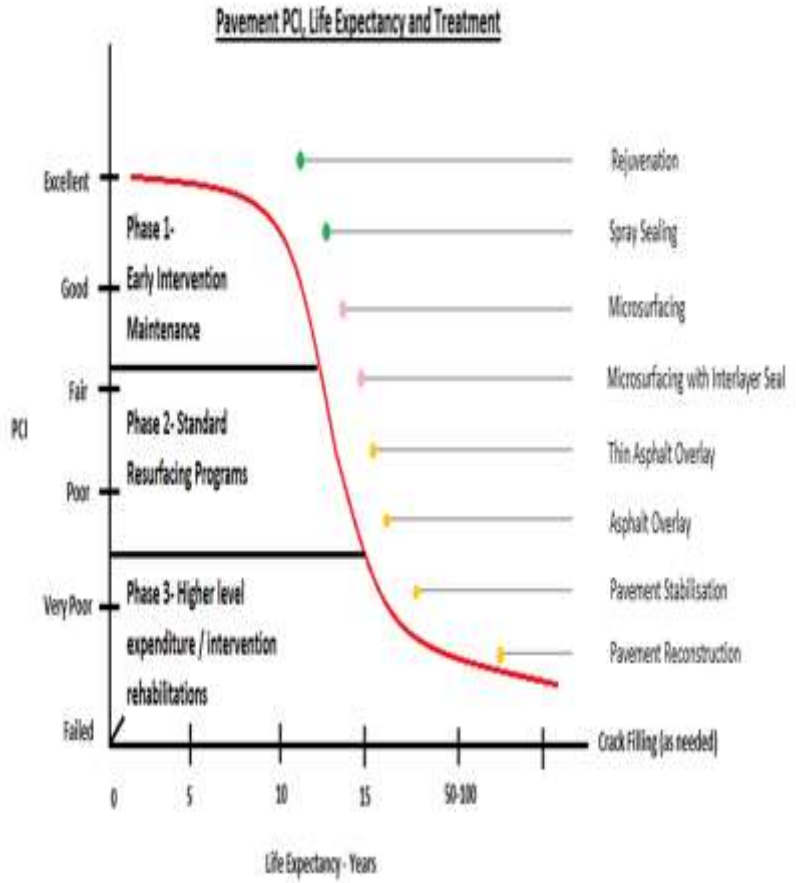


Treatment Selection Broken into 3 distinct Phases

Phase1: Preservation *(early intervention maintenance)*

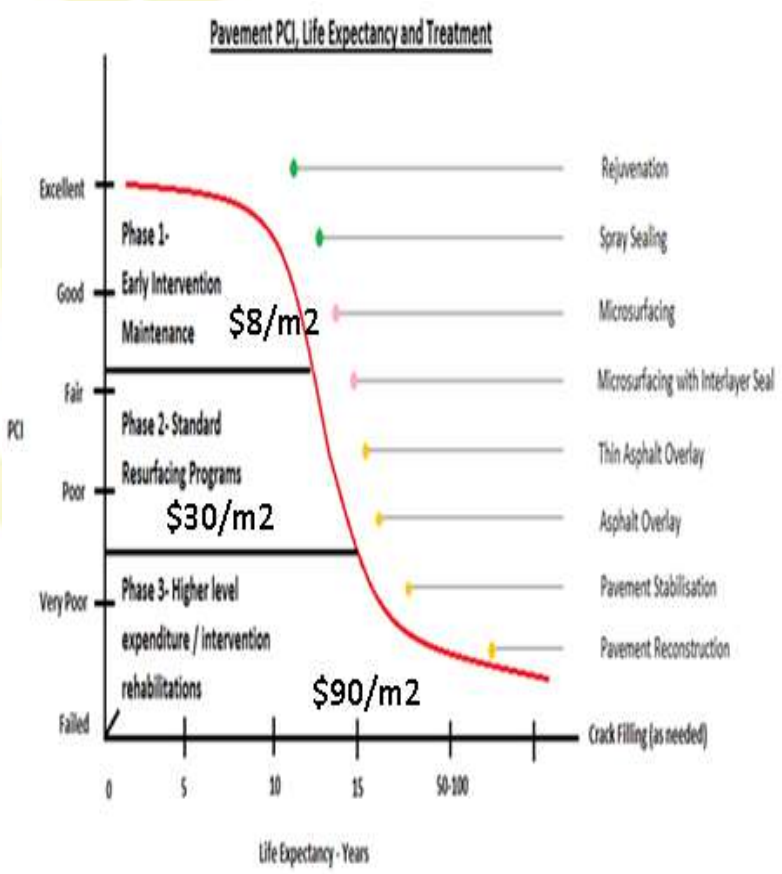
Phase2: Standard Resurfacing Program

Phase3: Rehabilitation *(higher Level expenditure/intervention).*



Funding Strategy

- **Phase 1: 100% funded, cheaper and keep the good conditioned road in good condition for a long time. (allocation 20%)**
- **Phase 2: Maximum projects in this category; Fund the worst projects first so that remaining projects do not go to Phase 3 (allocation 65%)**
- **Phase 3: Long term Planning. Eliminate this in 5/10 years. No increase in number. Allow some funding for reactive (allocation 15%)**



Phase 1:

Pavement Preservation Program

- **Treatments: Rejuvenation, Enrichment, Reseal and Microsurfacing**
- **Rejuvenation: Cost $2/m2, expected life 4 to 6 years**
- **Micorsurfacing: Cost $7.75/m2, Asphalt-like surface, good in shape correction, expected Life from 10 to 12 years**
- **Saved significant amount of money in comparison to Thin Asphalt ($7.75/m2 Vs $20/m2)**

PMS Outputs-Phase 1

Treatments selected by PMS model.

CAMPBELLTOWN **Works Program**

Scenario : 21 2018-19 works program
Sub network : SUB_ALL_MOD ALL ROAD SECTIONS MODELLED
Rule Base : TREAT_2018_PRESERVATION RULEBASE FOR PHASE 1 TREATMENT

Works program for : 2019 # 3
Optimisation method : Maximise Network PCI

Road No	Block	Road Name	Block Name	Code	Description	Cost
1008.00000	10.0000	JET PLACE	AQUAMAR - END CUL	PS2	2 Coat Rejuvenation with fine aggr	$1,240.00
1023.00000	10.0000	ARGO WAY	RIVERSI - END CUL	MS1	Microsurfacing 5mm	$5,236.00
1071.00000	10.0000	DELAGE PLACE	BUGATTI - FIAT PL	PS2	2 Coat Rejuvenation with fine aggr	$1,708.00
1106.00000	10.0000	BOWERS PLACE	AMUNDSE - END CUL	PS2	2 Coat Rejuvenation with fine aggr	$1,931.00
1141.00000	10.0000	HAWKER PLACE	MIRAGE - END CUL	MS1	Microsurfacing 5mm	$3,492.00
1163.00000	10.0000	COSMOS PLACE	HELICIA - END CUL	MS1	Microsurfacing 5mm	$2,696.00
1186.00000	10.0000	TUROSS PLACE	WYANGAL - END CUL	PS1	1 coat PMB Rejuvenation with fine aggr	$1,441.00
1208.00000	10.0000	CARTER PLACE	DOBELL - T-JUNCT	MS1	Microsurfacing 5mm	$2,768.00
1234.00000	130.0000	GLENROY DRIVE	RAMSAY - NORMAN	MS4	Microsurfacing with 7mm aggregates	$8,323.00
1248.00000	20.0000	HARROW ROAD	GAZELLE - BULOLO	MS4	Microsurfacing with 7mm aggregates	$7,956.00
1248.00000	50.0000	HARROW ROAD	KARIUS - CHAMPIO	MS4	Microsurfacing with 7mm aggregates	$17,340.00
1279.00000	10.0000	LACOCKE WAY	MERINO - END CUL	PS1	1 coat PMB Rejuvenation with fine aggr	$813.00
1337.00000	10.0000	COOBA PLACE	EUCALYP - END CUL	MS1	Microsurfacing 5mm	$4,095.00
1388.00000	10.0000	MULGA PLACE	BERRIGA - END CUL	MS1	Microsurfacing 5mm	$3,063.00
1405.00000	10.0000	APPLE PLACE	FUCHSIA - END CUL	MS1	Microsurfacing 5mm	$2,339.00
1452.00000	10.0000	BUNYA PLACE	EUCALYP - END CUL	PS2	2 Coat Rejuvenation with fine aggr	$1,366.00
1475.00000	10.0000	ALFA PLACE	LANCIA - END CUL	PS2	2 Coat Rejuvenation with fine aggr	$1,103.00
1609.00000	10.0000	LINUM STREET	GROUNDS - END CUL	PS2	2 Coat Rejuvenation with fine aggr	$7,151.00
1613.00000	10.0000	HOWE STREET	END CUL - BROWNE	PS1	1 coat PMB Rejuvenation with fine aggr	$1,033.00
1679.00000	10.0000	RANGERS ROAD	WEDDERB - LYNWOOD	H10	10mm High Stress Seal S35E	$12,920.00
1683.00000	10.0000	HANSENS ROAD	JUNCTIO - WESTMOR	H10	10mm High Stress Seal S35E	$27,180.00
1683.00000	30.0000	HANSENS ROAD	BEN LOM - MORETON	H10	10mm High Stress Seal S35E	$24,008.00
1683.00000	50.0000	HANSENS ROAD	GROVES - DUNCAN	MS4	Microsurfacing with 7mm aggregates	$23,256.00
1683.00000	60.0000	HANSENS ROAD	DUNCAN - END CUL	HS7	7mm High Stress Seal S35E	$13,794.00
1685.00000	60.0000	BELMONT ROAD	HARROW - HIDES S	MS4	Microsurfacing with 7mm aggregates	$10,853.00
1703.00000	10.0000	PLUME CLOSE	FUCHSIA - END CUL	MS1	Microsurfacing 5mm	$2,485.00
1721.00000	10.0000	RELIANCE WAY	GREENGA - END CUL	PS1	1 coat PMB Rejuvenation with fine aggr	$1,300.00
1766.00000	10.0000	ANTILL WAY	GREENGA - END CUL	MS1	Microsurfacing 5mm	$6,331.00
1781.00000	10.0000	ROMNEY WAY	SOUTHDO - END CUL	MS1	Microsurfacing 5mm	$5,171.00
1814.00000	10.0000	SAUTERNES PLACE	EPPING - END CUL	PS2	2 Coat Rejuvenation with fine aggr	$7,322.00

Microsurfacing Program (Progressive Increase)-450 Streets -13% of our network

Financial year	Area of microsurfacing
2014-2015	157,792m^2
2015-2016	179,566m^2
2016-2017	206,877m^2
2017-18	252,327m2

Microsurfacing – Campbelltown Council

Microsurfacing-Sedgwick Street, Leumeah

Before

After

Microsurfacing-Norfolk Street, Ingleburn

Before

After

Rural Road-Seal with Microsurfacing

Mercedes Road, Ingleburn

Phase 2: Standard Resurfacing Program

Treatments:

- **Interlayer Seal with Microsurfacing-$12/m2**
- **Interlayer Seal with Asphalt Overlay-$30/m2**
- **Hot In Place Asphalt Recycling-$18/m2**

Phase 2:

Standard Resurfacing Program

Treatment selected by PMS Model

CAMPBELLTOWN — Works Program

Scenario : 21 2018-19 works program
Sub network : SUB_BACKLOG SECTIONS WITH UNACCEPTABLE PCI
Rule Base : TREAT_2018_RESURFACING RULEBASE FOR PHASE 2 TREATMENT

Works program for : 2019 # 2
Optimisation method : Maximise Network PCI

Road No	Block	Road Name	Block Name	Code	Description	Cost
1011.00000	10.0000	MAY PLACE	RUTHERG - END CUL	SM7	HP+ 7mm SBS Seal with 30mm AC10	$5,242.00
1028.00000	10.0000	HELMAN PLACE	WILKINS - END CUL	FA2	HP + 10mm Fibredeck Seal+50mm AC14	$5,875.00
1083.00000	10.0000	HUMBER PLACE	END CUL - BUGATTI	SM7	HP+ 7mm SBS Seal with 30mm AC10	$12,667.00
1115.00000	10.0000	SINGER PLACE	BUGATTI - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$5,990.00
1129.00000	10.0000	SHRIKE PLACE	KINGS R - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$9,235.00
1150.00000	10.0000	JARLEY PLACE	CRISPSP - END CUL	SM7	HP+ 7mm SBS Seal with 30mm AC10	$6,962.00
1168.00000	10.0000	AMANDA PLACE	SACKVIL - CLIFFOR	MS2	HP + Microsurfacing with Emulsion Seal	$8,366.00
1179.00000	10.0000	CRINUM PLACE	FIFTH A - END CUL	SM7	HP+ 7mm SBS Seal with 30mm AC10	$4,381.00
1211.00000	10.0000	CELTIS PLACE	MELALEU - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$5,782.00
1213.00000	20.0000	CROTON PLACE	CROTON - END CUL	SM7	HP+ 7mm SBS Seal with 30mm AC10	$5,678.00
1233.00000	10.0000	MCLEAN ROAD	CHAMBER - ROSALIN	SM7	HP+ 7mm SBS Seal with 30mm AC10	$9,576.00
1233.00000	20.0000	MCLEAN ROAD	ROSALIN - RONALD	SM7	HP+ 7mm SBS Seal with 30mm AC10	$21,798.00
1233.00000	30.0000	MCLEAN ROAD	RONALD - MERIEL	SM7	HP+ 7mm SBS Seal with 30mm AC10	$11,214.00
1234.00000	160.0000	GLENROY DRIVE	JULIAN - FULLWOO	FA2	HP + 10mm Fibredeck Seal+50mm AC14	$29,325.00
1244.00000	20.0000	BROOKS ROAD	KEATING - FREEWAY	MS2	HP + Microsurfacing with Emulsion Seal	$15,523.00
1247.00000	10.0000	OBERON ROAD	JUNCTIO - KANANGR	MS2	HP + Microsurfacing with Emulsion Seal	$13,030.00
1255.00000	10.0000	LOFTUS ROAD	FAWCETT - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$14,268.00
1303.00000	330.0000	THE PARKWAY	ASH PLA - OLYMPIC	FA2	HP + 10mm Fibredeck Seal+50mm AC14	$14,800.00
1326.00000	10.0000	MANAM PLACE	END CUL - TROBRIA	MS3	HP + Microsurfacing with Fibredeck Seal	$14,689.00
1339.00000	10.0000	REIBY PLACE	ALLIOTT - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$7,690.00
1346.00000	10.0000	FINCH PLACE	WAGTAIL - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$12,295.00
1350.00000	10.0000	VALDA PLACE	LYNDIA - END CUL	SM7	HP+ 7mm SBS Seal with 30mm AC10	$12,365.00
1364.00000	10.0000	ELLEN PLACE	LYNDIA - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$6,374.00
1378.00000	10.0000	WALER PLACE	CLYDESD - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$5,753.00
1379.00000	10.0000	DAWES PLACE	SIRIUS - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$6,611.00
1390.00000	10.0000	WONGA PLACE	KOOKABU - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$7,344.00
1399.00000	10.0000	ROBIN PLACE	END CUL - GREBE S	MS2	HP + Microsurfacing with Emulsion Seal	$9,072.00
1460.00000	10.0000	EXLEY ROAD	LYSAGHT - END CUL	SBD	HP+ 10/7mm 3% SBS D/DOUBLE SEAL	$33,588.00
1496.00000	10.0000	DOVE PLACE	KINGFIS - END CUL	SM7	HP+ 7mm SBS Seal with 30mm AC10	$6,321.00
1505.00000	10.0000	POPE PLACE	BYRON A - END CUL	MS3	HP + Microsurfacing with Fibredeck Seal	$6,191.00
1534.00000	10.0000	EARN PLACE	ABERFEL - END CUL	MS2	HP + Microsurfacing with Emulsion Seal	$6,178.00

2017: Introduced New Treatment in Phase 2

Hot in Place Asphalt Recycling

Phase 2 Examples

- HIPAR-Junction Road

- AC Overlay-Eagleview Road

Phase 3:
Pavement Rehabilitation

- **Treatments: Mill & Fill, Stabilisation and Reconstruction**

- **99% cases we use pavement Stabilisation for pavement rehabilitation as it is the most cost effective pavement rehabilitation treatment.**

Phase 3 Treatments: Rehabilitation

- Treatment selected by PMS model

CAMPBELLTOWN **Works Program**

Scenario : 21 2018-19 works program
Sub network : SUB_BACKLOG SECTIONS WITH UNACCEPTABLE PCI
Rule Base : TREAT_2018_REHABILITATIO N RULEBASE FOR PHASE 3 TREATMENT

Works program for : 2019 # 1
Optimisation method : Maximise Network PCI

Road No	Block	Road Name	Block Name	Code	Description	Cost
1213.00000	10.0000	CROTON PLACE	SAYWELL - END CUL	RC6	IN-SITU CEMENT STABILISATION	$24,310.00
1303.00000	350.0000	THE PARK WAY	LAWN AV - APPIN R	RC6	IN-SITU CEMENT STABILISATION	$46,398.00
1655.00000	10.0000	WARRINA ROAD	PINAROO - THE PAR	RC6	IN-SITU CEMENT STABILISATION	$105,083.00
1672.00000	10.0000	DICKSON ROAD	CAMPBEL - END CUL	RC8	Reconst with widening	$62,370.00
2239.00000	20.0000	MEMPHIS STREET	VICTORI - END [KA	RC6	IN-SITU CEMENT STABILISATION	$41,250.00
2538.00000	30.0000	COACHWOOD CRESCENT	CALEY R - UTHER A	RC6	IN-SITU CEMENT STABILISATION	$47,124.00
2548.00000	80.0000	KINGSCLARE STREET	TERALBA - O'SULLI	RC6	IN-SITU CEMENT STABILISATION	$37,433.00
2670.00000	30.0000	BIRDSVILLE CRESCENT	SONDER - WYANGAL	RC6	IN-SITU CEMENT STABILISATION	$166,023.00
2843.00000	10.0000	GEARY STREET	KELLICA - MENANGL	RC6	IN-SITU CEMENT STABILISATION	$140,140.00
3752.00000	40.0000	GLENQUARIE CENTRE SERVICE	GLENQUA - PETROL	RC6	IN-SITU CEMENT STABILISATION	$94,380.00
						$764,511.00

Railway Parade Stabilisation Project

Example: Road Rehabilitation

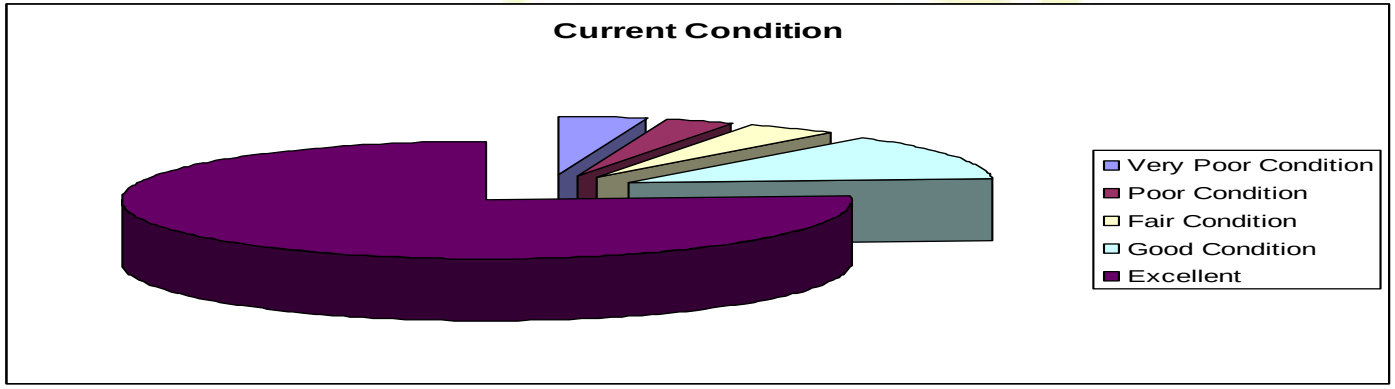
- Before

- After

Pavement Stabilisation at Benham Road, Minto

Performance Data for 281 Projects

- Stabilised 281 projects in the last 18 years
- The current condition of 281 Projects
  - 81% is still in Very Good condition
  - 13% in Good Condition
  - 4% in Average Condition
  - 2% are in a Poor Condition.

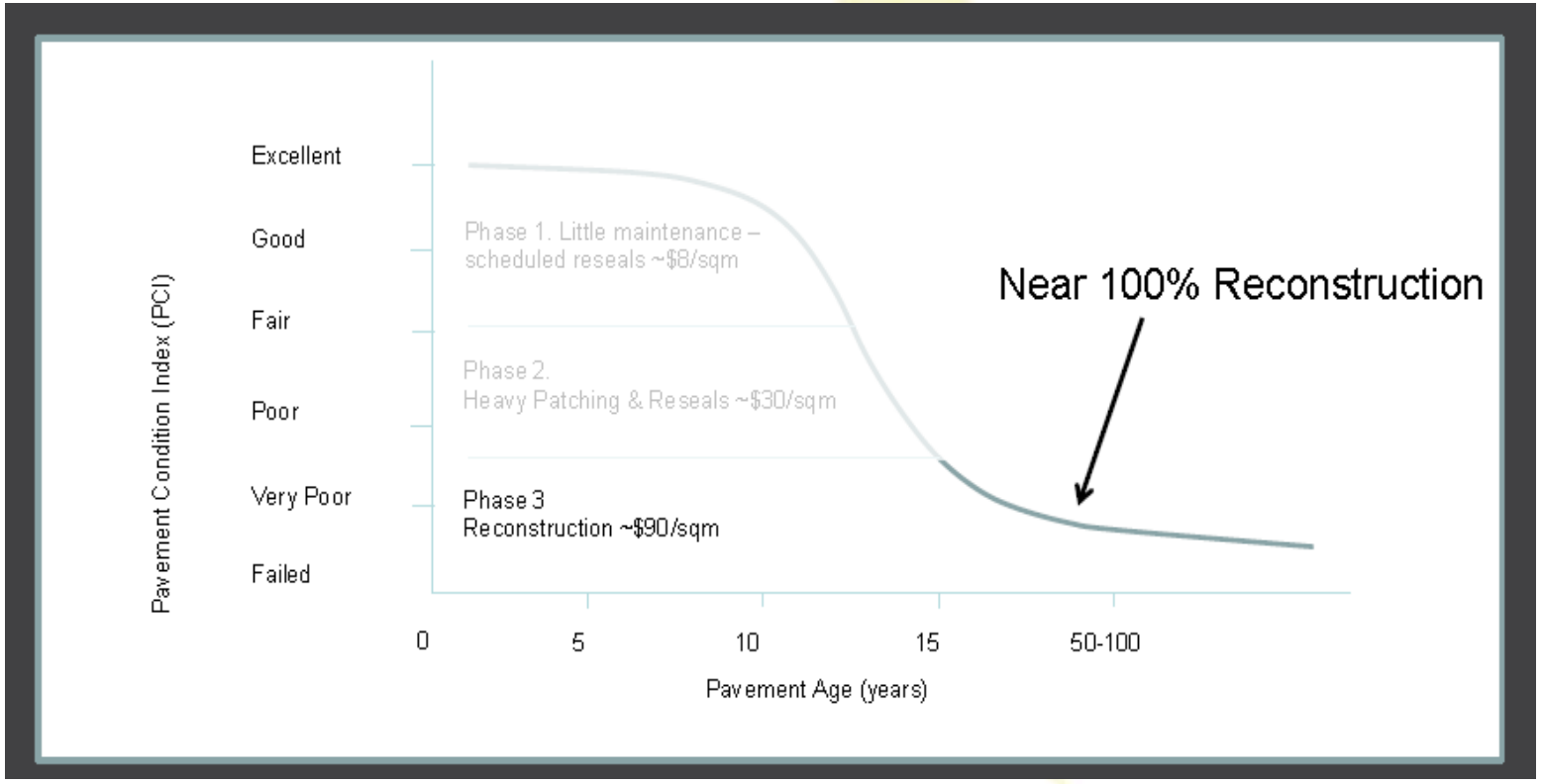


Savings Achieved from 281 Stabilisation Projects

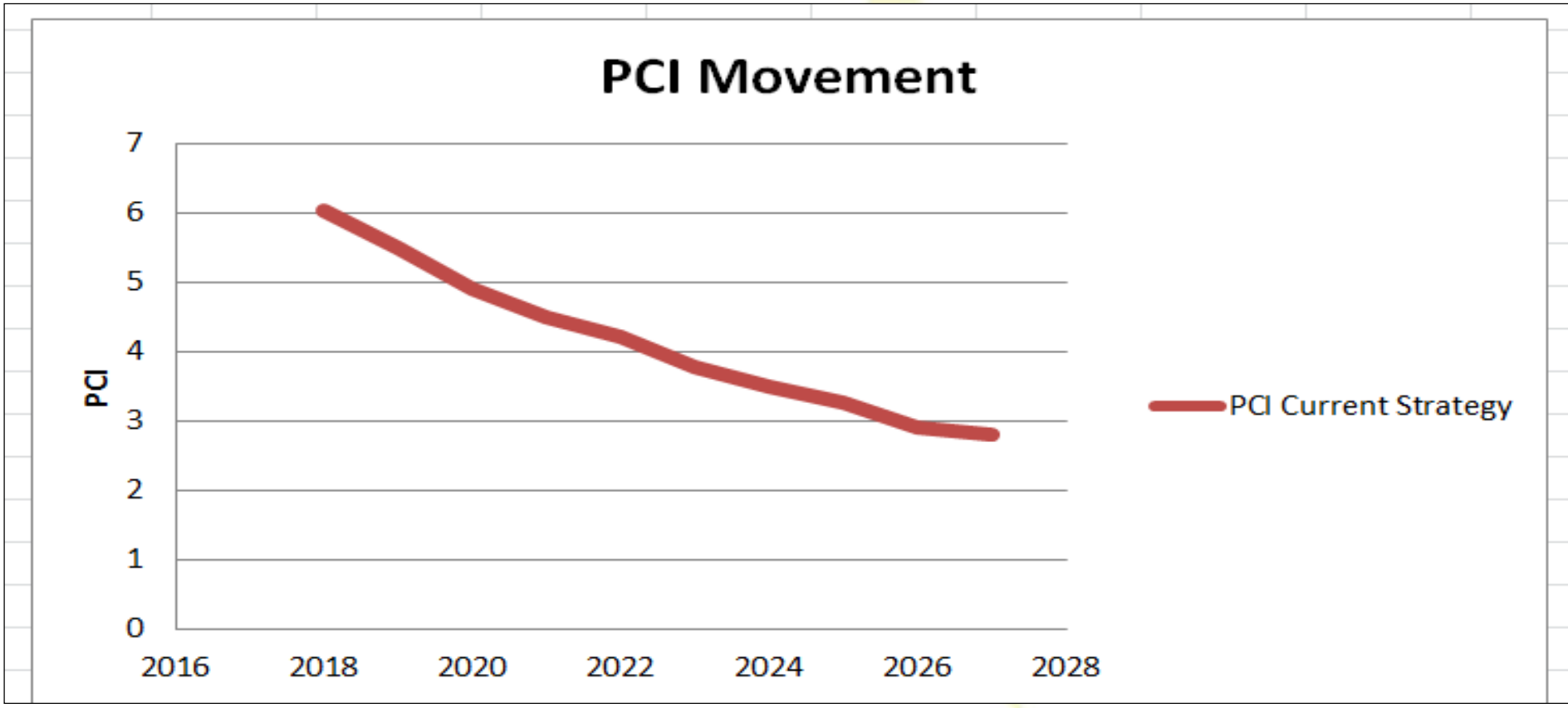
Wollondilly Shire Council

STRATEGY TESTING

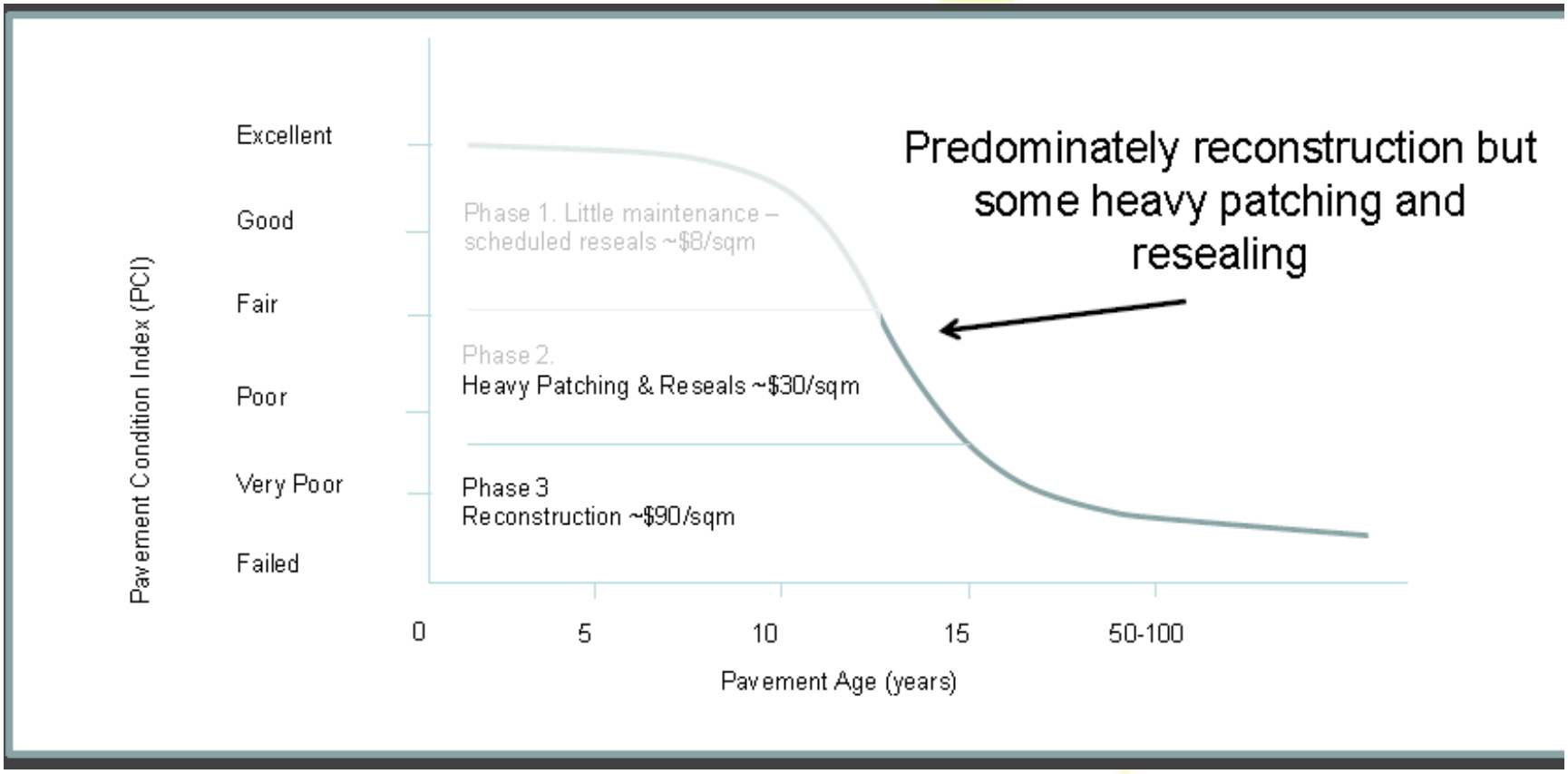
WSC: Existing Strategy
What they have been doing?



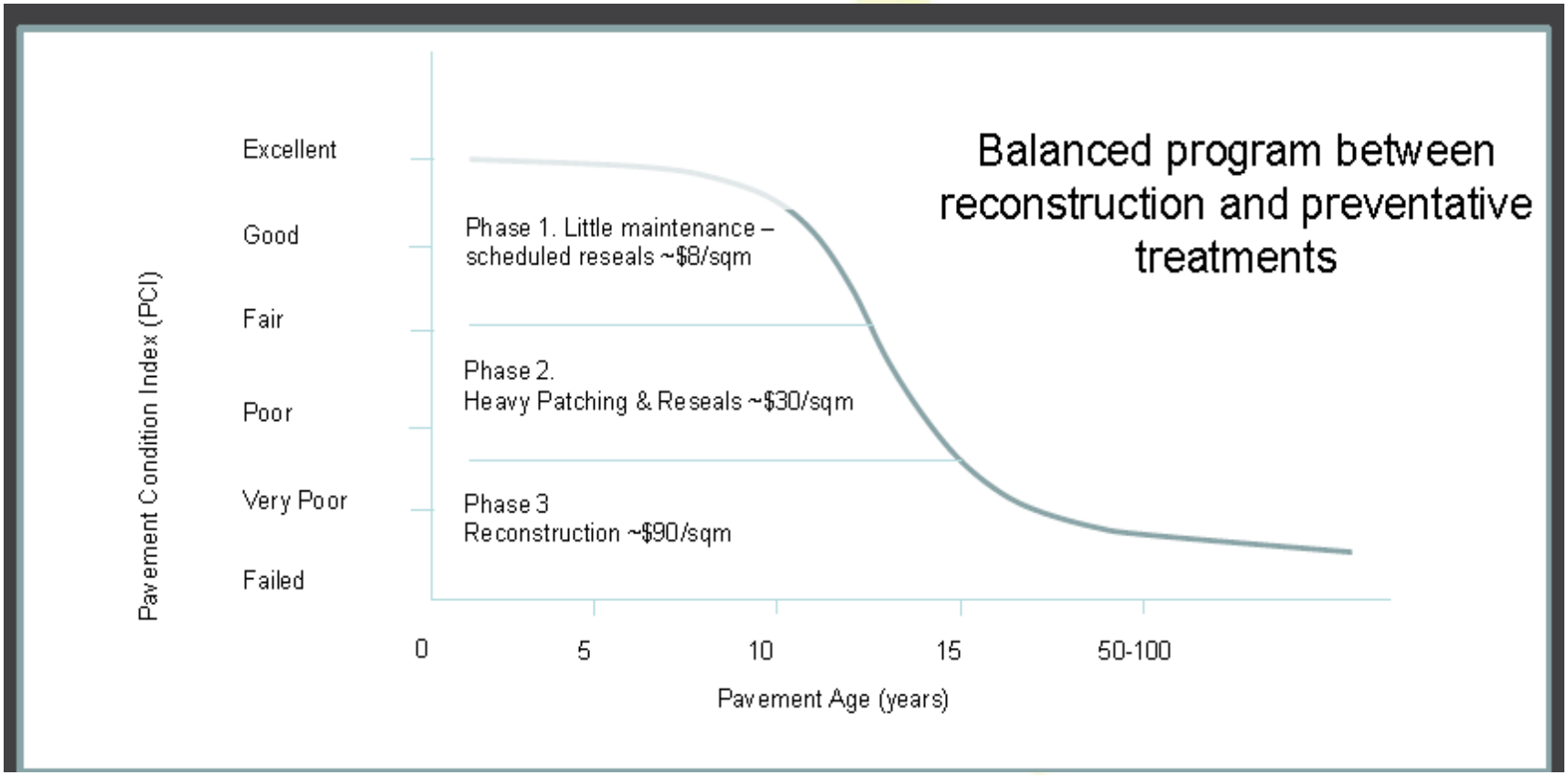
Modeled Existing Strategy for Consequences



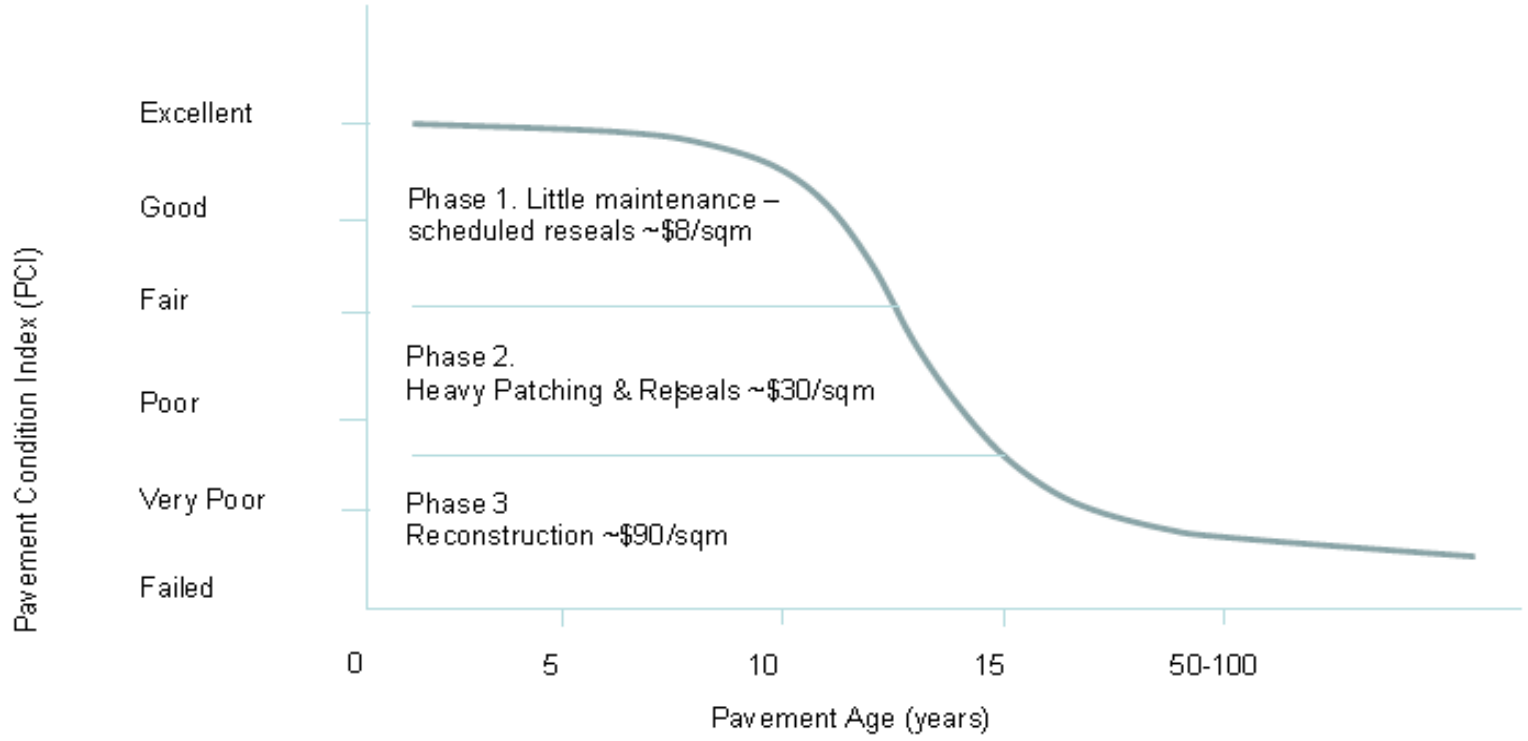
Immediate Change in Strategy



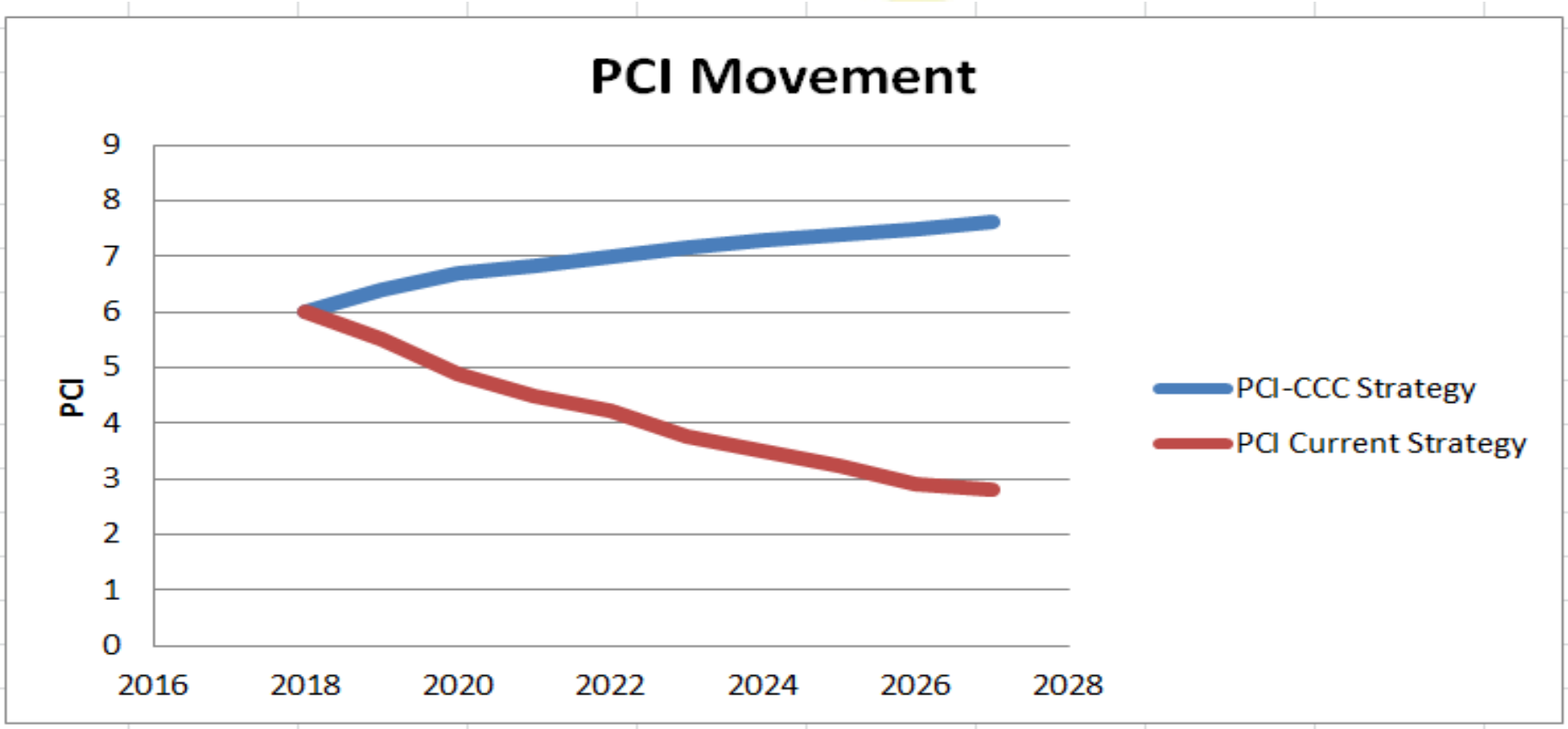
Strategy for 2018-19



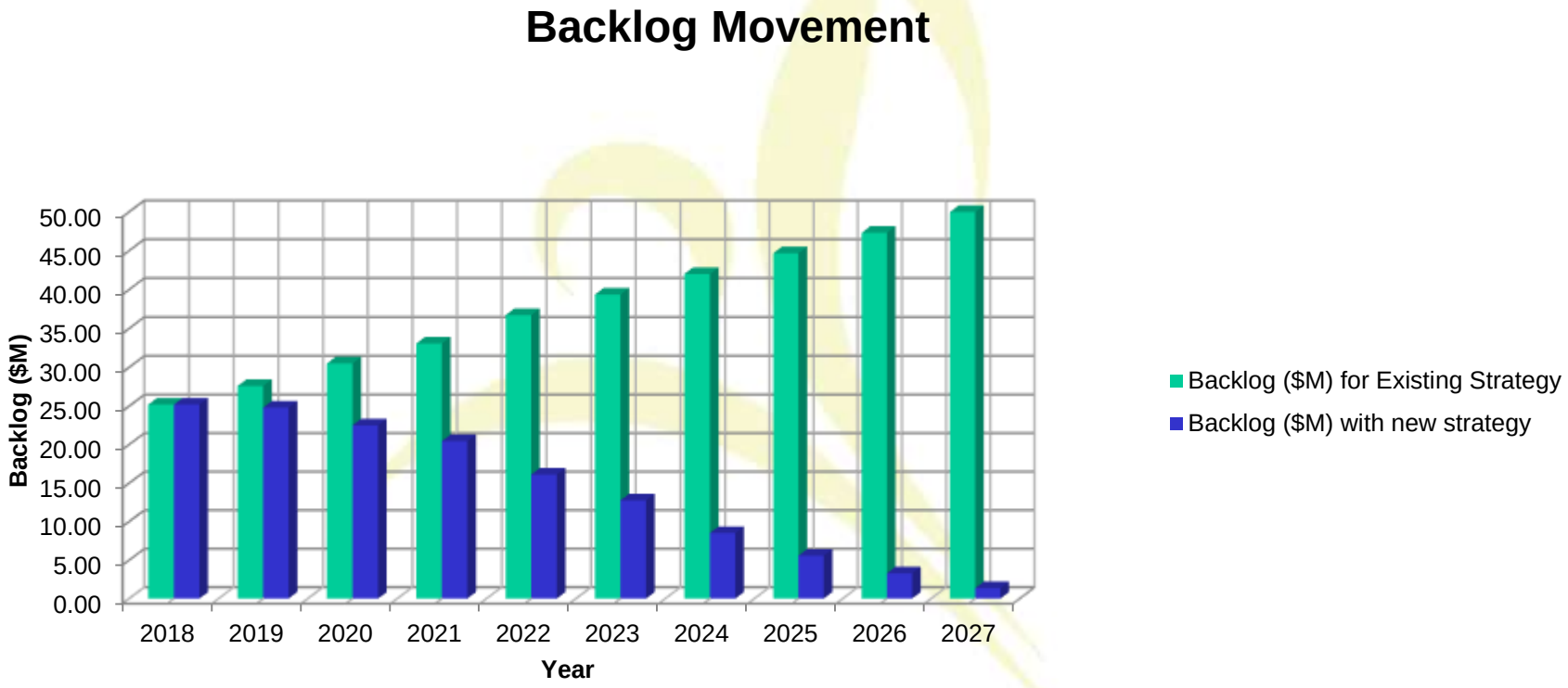
Long Term Strategy



PCI Movement with Strategy



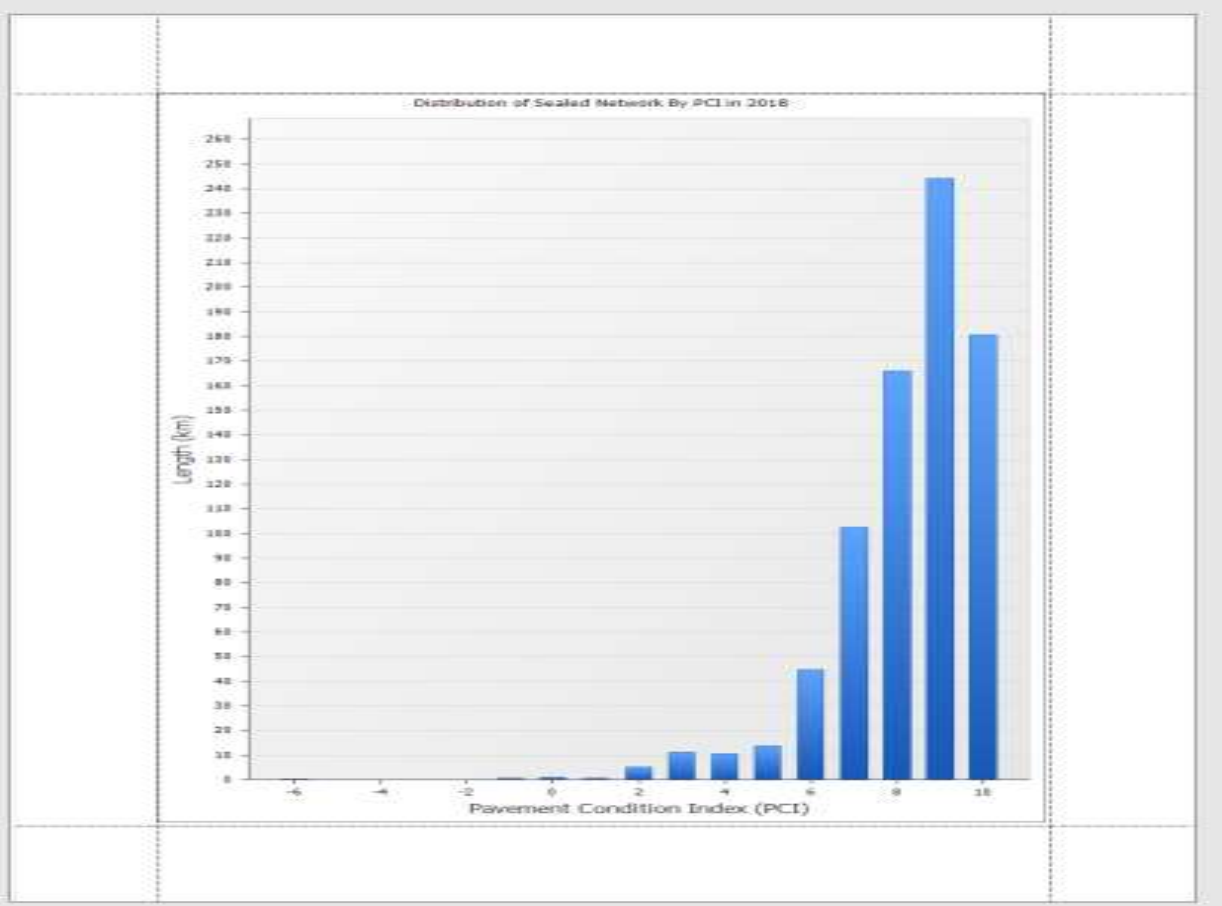
Backlog Increase/Reduction with no Funding Increase



Pavement Management Strategy- Campbelltown City Council

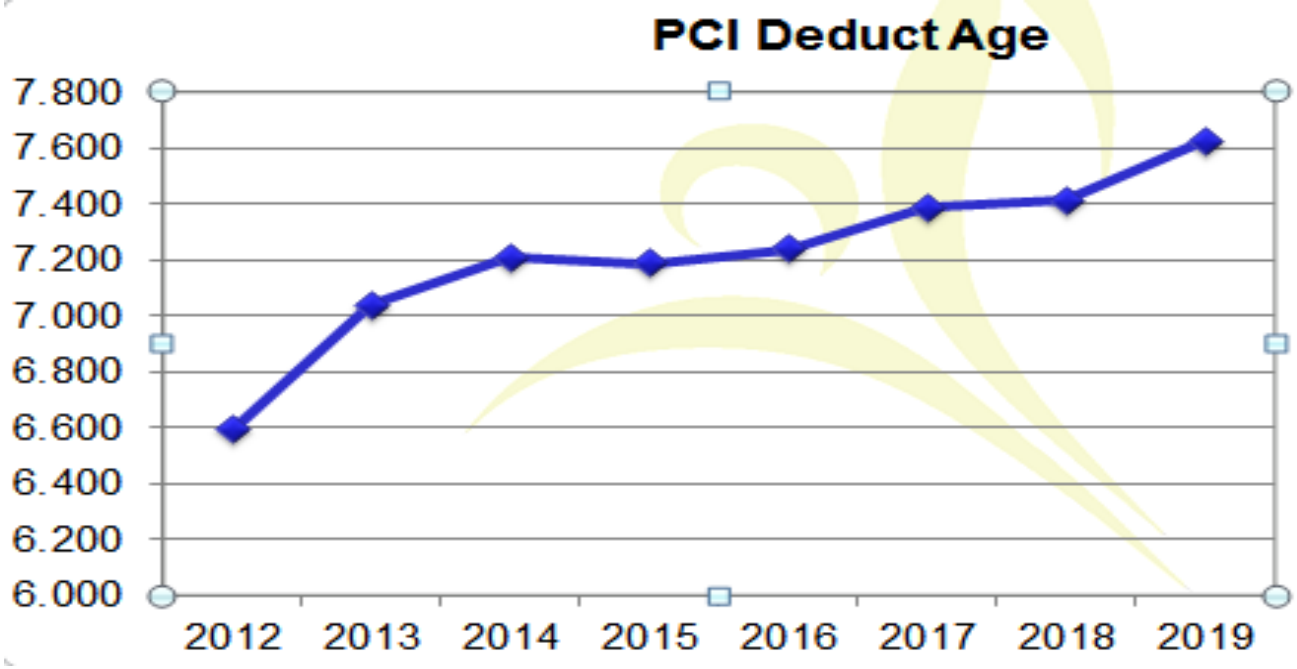
Achievements

Current Network Condition Distribution

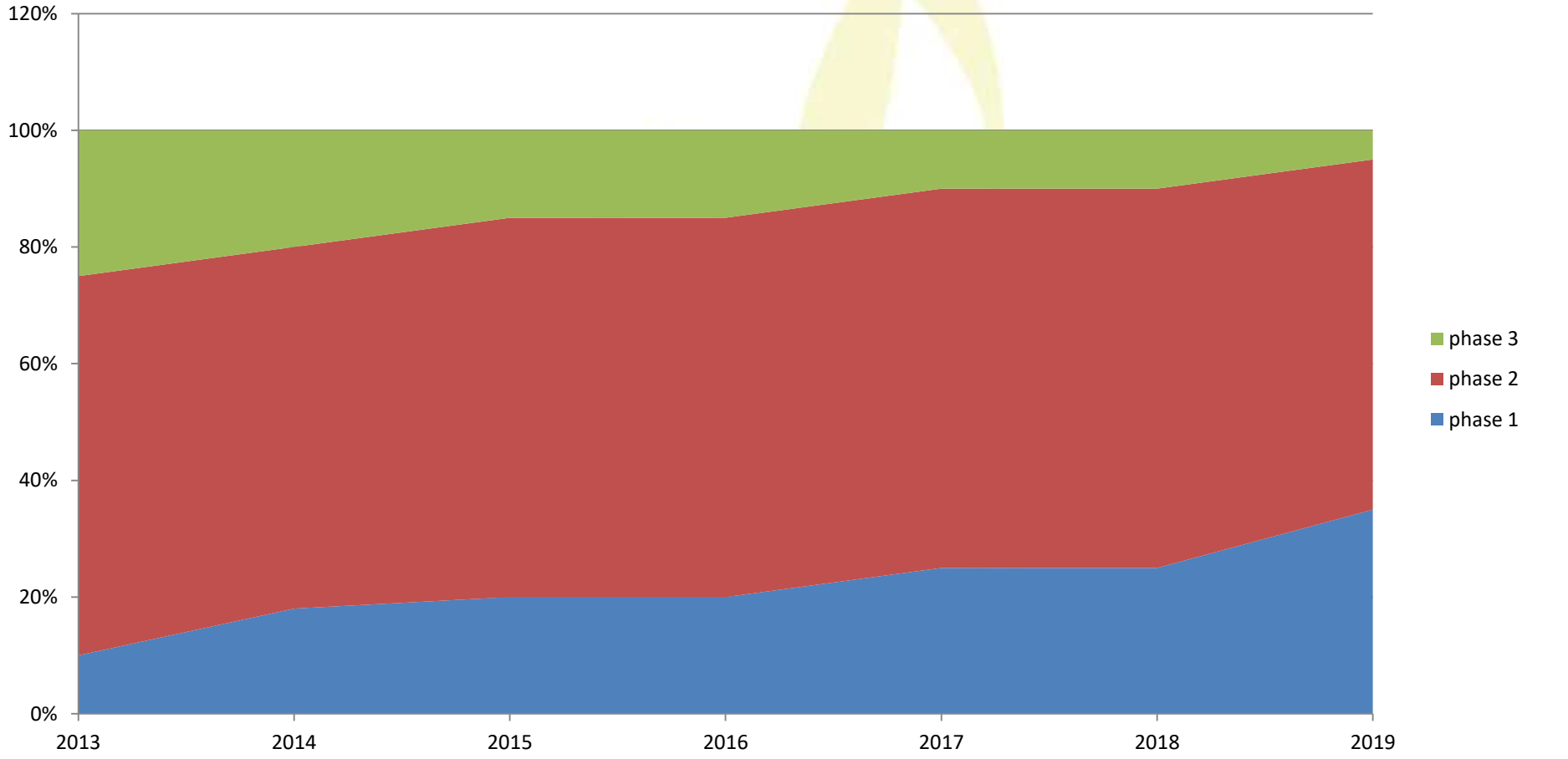


Network Condition Improvement

Results below graph the overall network PCI and the influence increased use of Pavement Preservation strategies have provided over the last decade



New Funding Strategy



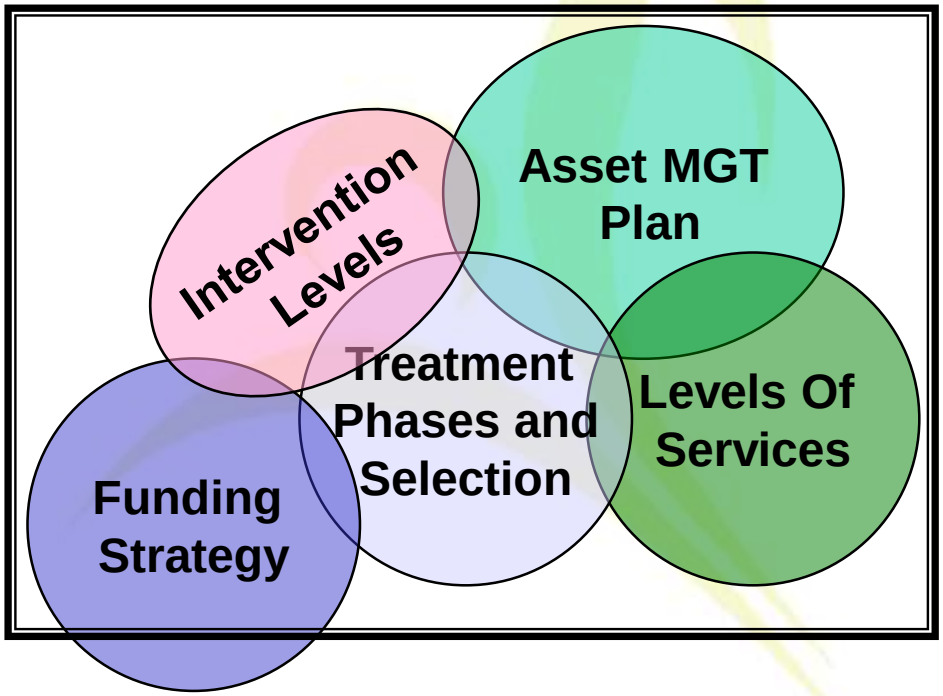
Renewal Backlog Reduction 2000 vs 2018

Finacial modeling comparisons on budget costings between projected backlog in FY 2000 compared to FY 2018 show a trend of decreased backlog cost required to elevate the PCI at network level. This result is a correlation and reflection of increased investment in Pavement Preservation and earlier intervention moving away for a worst first approach.

CCC applied a simple philosophy with considerable success.

1. Delivering an increase in the number of roads treated annually within current budget constraints.
2. Maximising asset useful life at the lowest life cycle cost.
3. Council senior management is now aware of the level of funding required to maintain the safe and resilient road network
4. Over Time the funding strategy has been shifted to a more preventative model
5. Council has managed to upgrade and maintain its whole road network in good condition.

Summary: Pavement Management Strategy

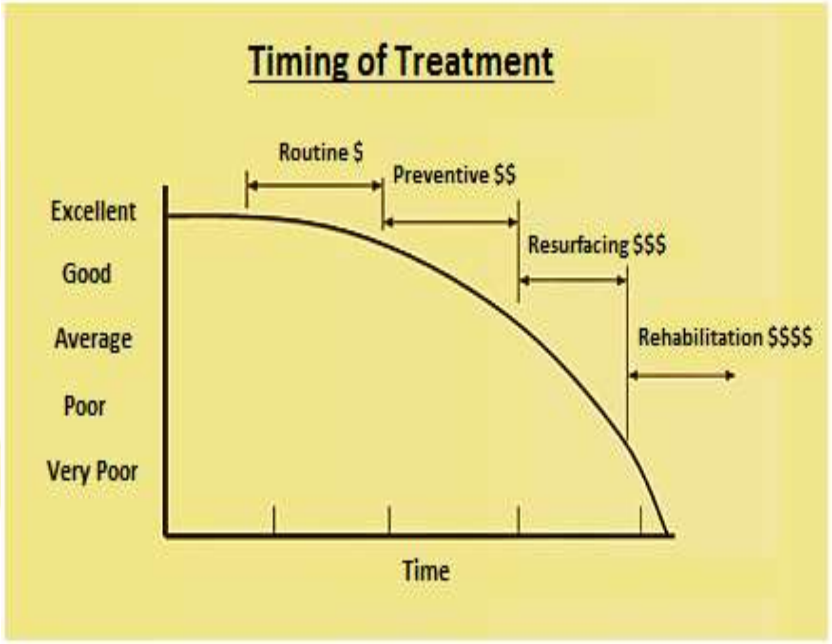


Can the Strategy be transferred to another council or organisation?

- Yes, as this was done for Wollondilly
- The key for success is to collect the right data to make informed decisions for the particular circumstances;
- And then bravely assess where we are and develop strategies to determine where we want to be.

Strategy Recognition

This Strategy was recognised by International Slurry Surfacing Association as outstanding contributions to Pavement Management in January 2016.



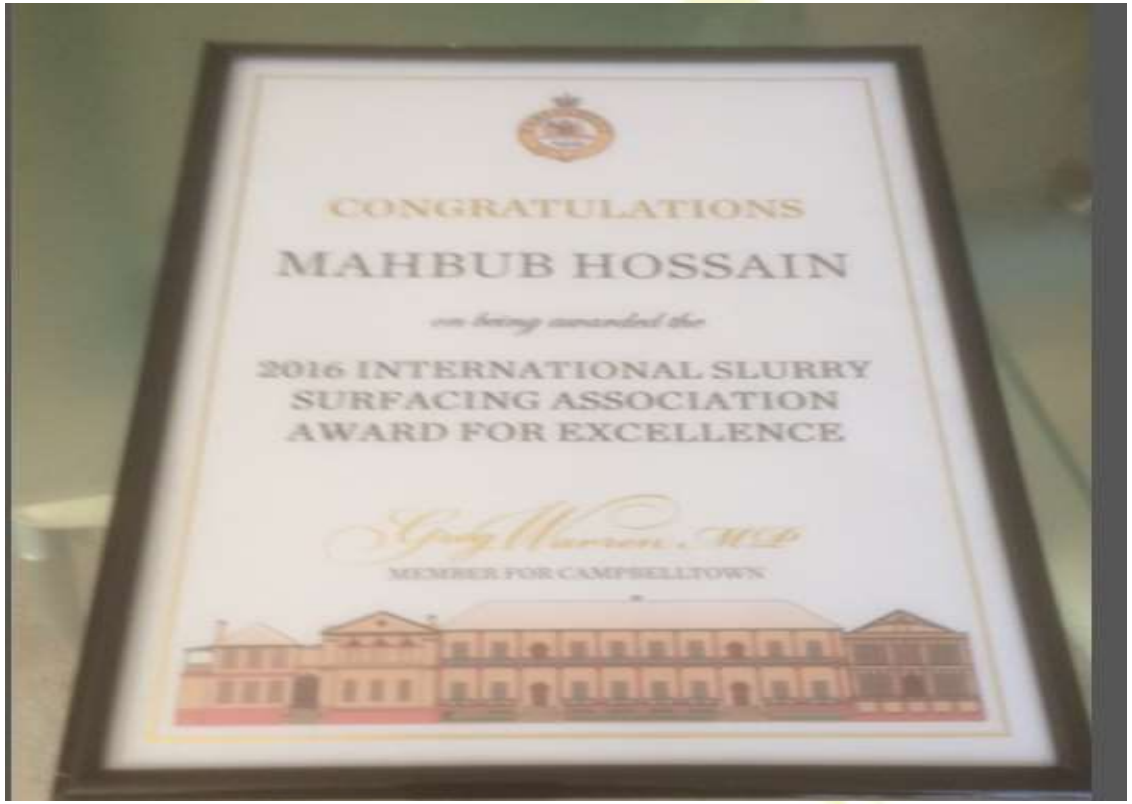
CCC is the winner of ISSA 2016 Award for Excellence in Pavement Preservation - Intl

Further Recognition

- **At the Sustainability in Public Works 2016 Conference, this paper was awarded Editor's choice of the paper on 'Campbelltown City Council - Sustainable Pavement Management Strategy'**
- http://www.ipwea.org/publications/special-technical-reports

IPWEA Special Technical Report

Further Recognition—….



Winner of 2016 IPWEA Engineering Excellence Award

Category 2: New or Improved Techniques including: Innovation and/or Introduction of Techniques or Outstanding Management Initiatives or Outstanding Achievement in Asset Management

Winner of 2017 Local Government Excellence Award

Internationally

- **This paper was presented to the Pavement Preservation & Recycling Summit, PPRS 2018 in Nice, France, March 26 -28.**
- **This will also be presented at the 2018 APWA Public Works Expo (PWX).**

The details are as below:

- **Session Title: International Perspective Presentation/Lightning Round: Asset Management in Australia Part 2.**
- **Session Date: Tuesday, August 28, 2018, 9:45 – 11:00 a.m.**
- **Location: Kansas City Convention Center, Kansas City, Missouri, USA**

city environment lifestyl campbelltown city council