Category 4: Excellence in Pavement Recycling and Stabilisation in Local Government

Pavement Recycling in Campbelltown City Council

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CAMPBELLTOWN CITY COUNCIL

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Background

Campbelltown City Council has 790 km of road infrastructure assets with a replacement cost of approximately $400 million.

The rapid growth of Campbelltown City Council from 25,000 residents in 1966 to more than 170,000 today has required a significant investment in infrastructure including the road network to service the ever growing residential, commercial and industrial estates.

Due to increased financial pressure to maintain the road network in good condition, Campbelltown City Council has developed and adopted a sustainable pavement management strategy that optimizes the budget's capacity and also meets the local community's expectations for good quality and safe roads.

As per Council's internationally recognized pavement management strategy, recycling and reuse of existing pavement materials by insitu stabilisation is the main treatment utilized by Campbelltown Council as a way to upgrade the structural capacity, shape and ride quality of poor to very poor conditioned road sections. It enabled Council to upgrade existing roads without the removal of any existing pavement materials.

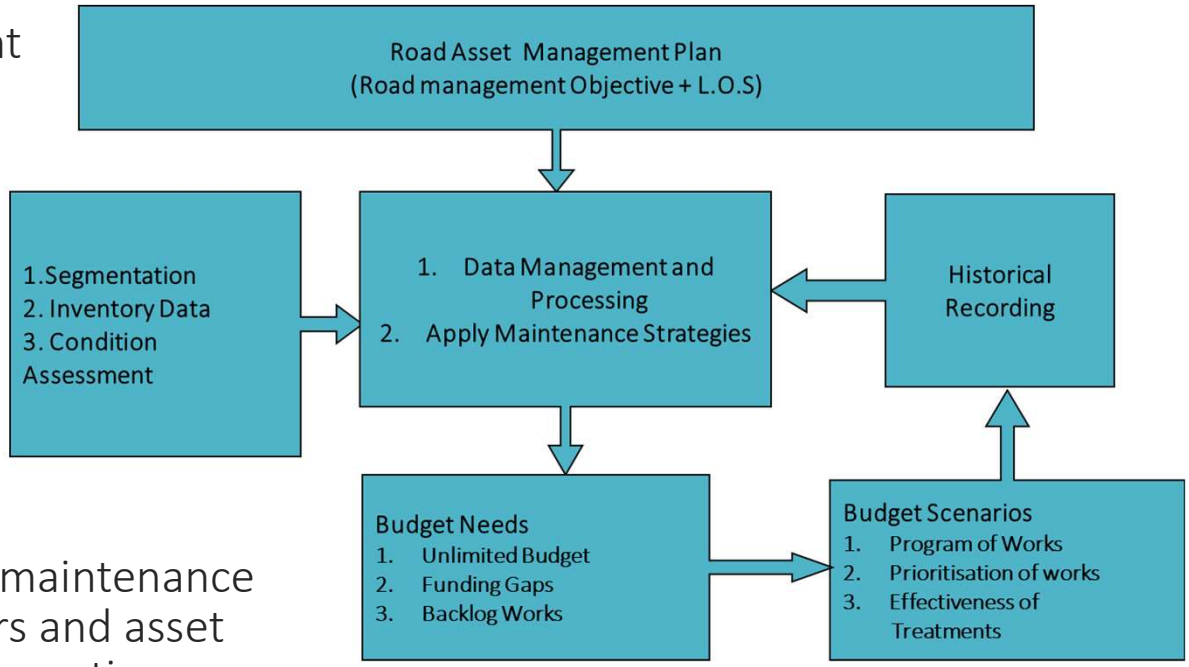
Between 1991 and 2021, Campbelltown City Council has successfully completed 300 insitu stabilisation road projects to provide the community with sustainable outcomes for the management of its road network.

Overview and Objectives

- 790 km of roads (4800 segments) with $400M Replacement Value
- 88% is urban, 12% rural
- Community Expectation: Good conditioned roads
- Budget Constraint: Requires significant investment to maintain the whole network at acceptable standard
- **Overall Challenge: To ensure all roads are fit over long periods of time at a minimum lifecycle cost**
- Stabilised 300 Road Projects in the last 30 years for Poor to Very Poor condition pavements (as an alternative to Full Depth Reconstruction)
- Cost wise: 60% cheaper than Full Depth Reconstruction
- Time wise: Rehabilitation project can be completed within a week
- Innovative approach by Campbelltown City Council: PMS integrates pavement recycling options to achieve longer term financial sustainability in its network management

Campbelltown City Council's Pavement Management Process

- Campbelltown's pavement management process flows through the Council's Pavement Management System (PMS)
- The flowchart shows how the PMS draws upon data such as budget constraints, condition assessments of the network, treatment selections and suitability and historical recording in generating effective and prioritised works programs



- The PMS assists with future modelling, maintenance application choices, intervention triggers and asset budget modelling for whole-of-life-cycle costing
- Innovation by Campbelltown CC has seen the PMS integrate pavement stabilisation options to achieve longer term financial sustainability in its network management

Pavement Management Strategy

A variety of failure modes or intervention triggers are assessed as part of the strategy to link life cycle to whole of life extension. Treatment selection can then be employed based on pavement requirements addressing and improving the PCI (Pavement Condition Index).

Campbelltown selects and uses a broad range of treatments based on PCI and life extensions outcomes.

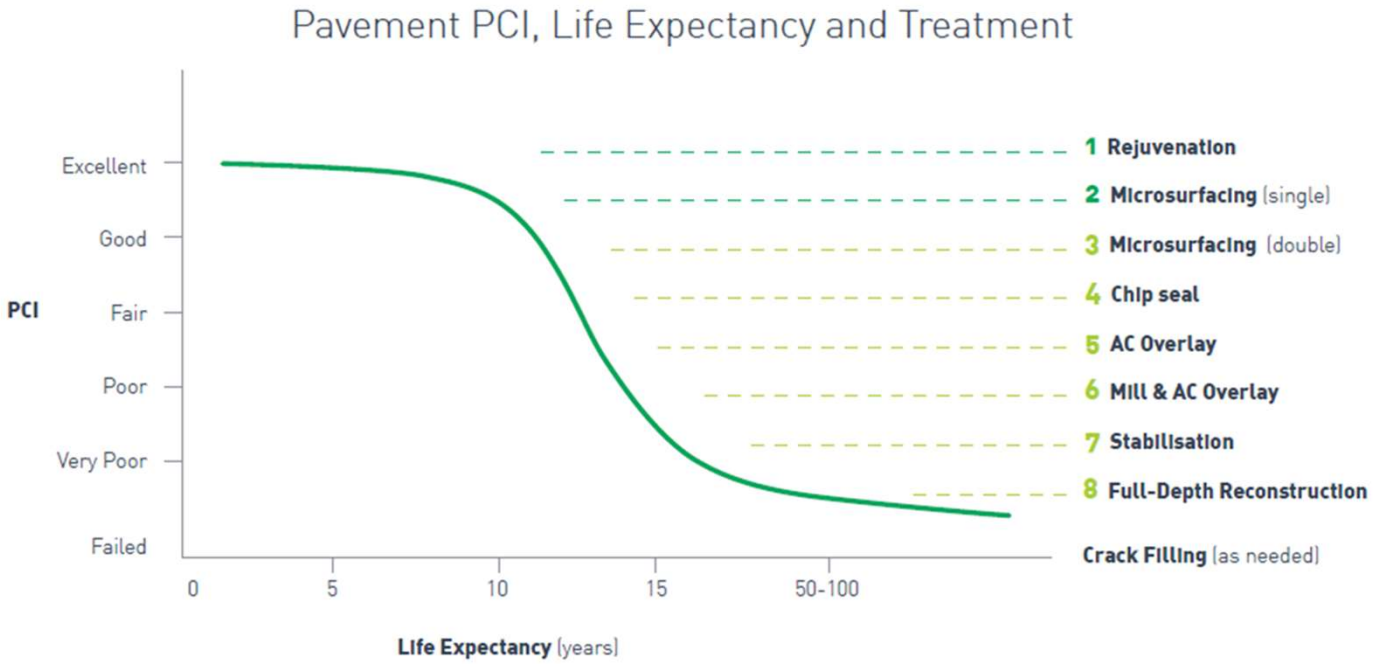
Critical to treatment success is the failure mode being addressed and the life extensions realized.

PCI 0: New, PCI 1: Very Good, PCI 2: Good, PCI 3: Average, PCI 4: Poor, PCI 5: Very Poor, and PCI 6: End of Life

Based on clearly defined and transparent levels of services and considering:

- Engineering suitability,
- Minimum life-cycle cost,
- Budget Capacity, and
- 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.



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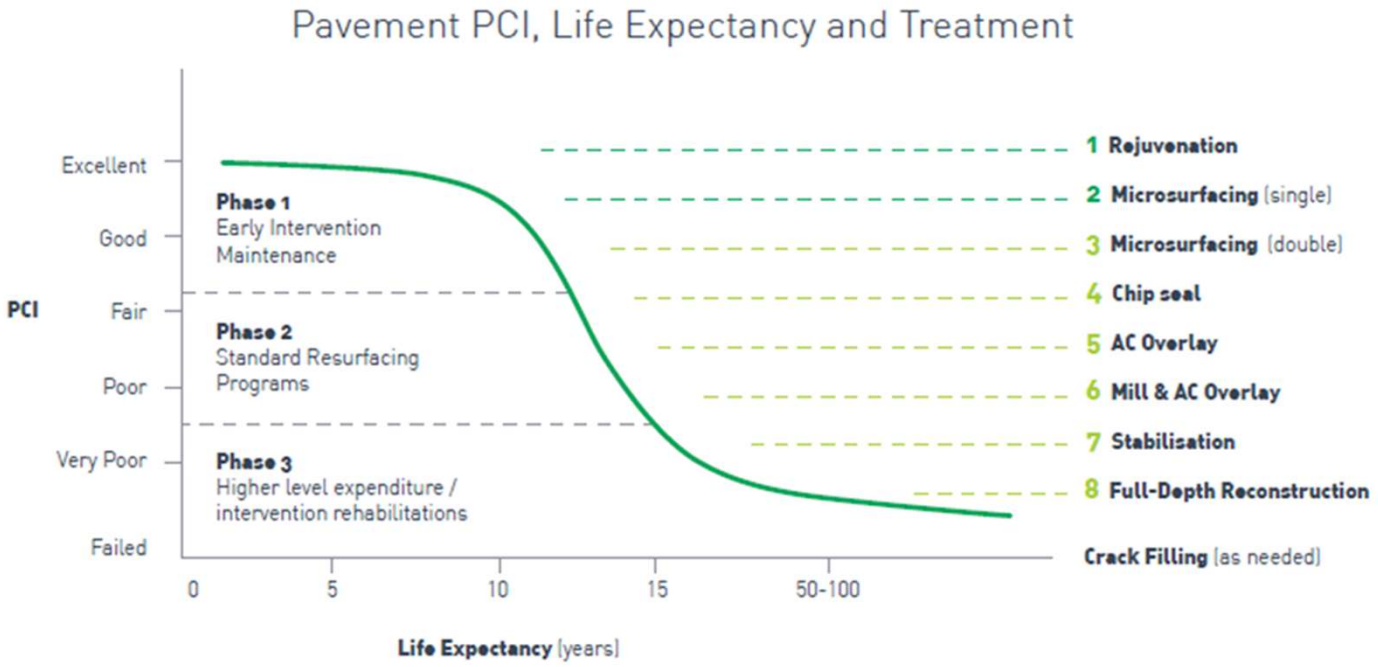
Treatment Selection Divided into 3 Phases

Phase1: Preservation ***(early intervention maintenance)***

Phase2: Standard Resurfacing Program

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

Treatment selections are broken into three distinct phases – Preservation, Resurfacing and Rehabilitation with budget target allocations for each phase.



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Funding Strategy

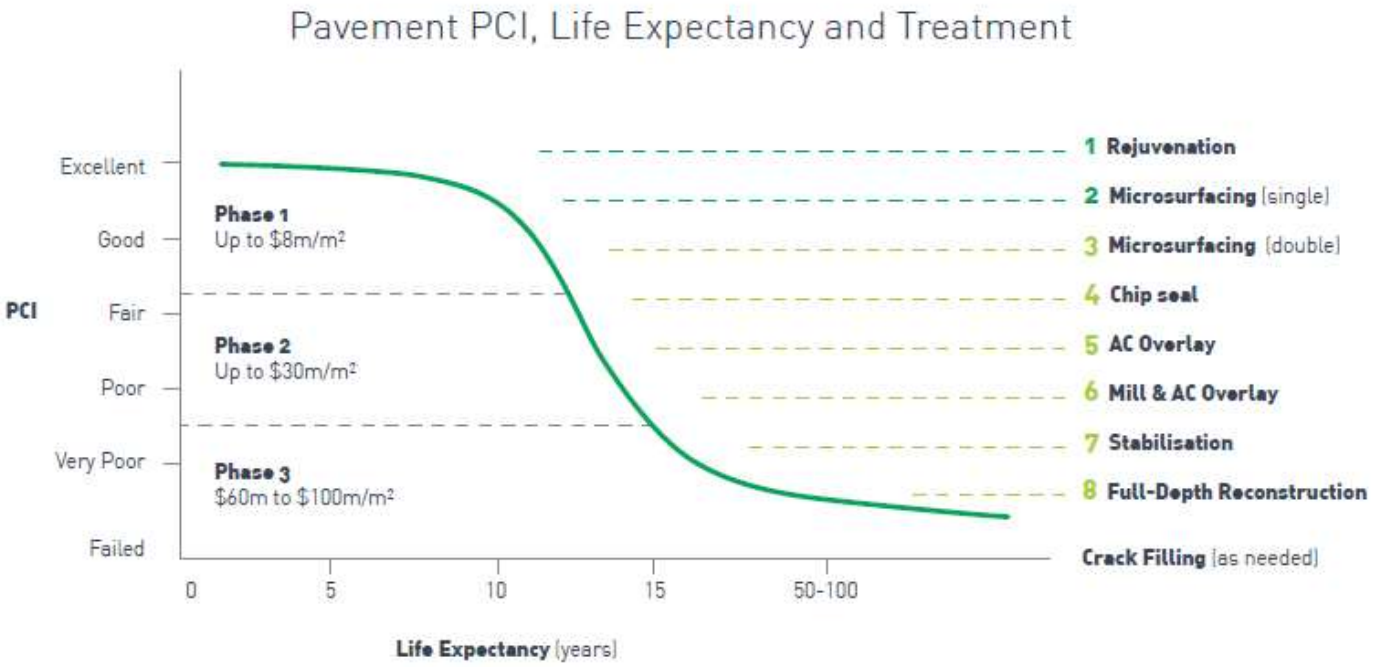
With the help of Finance team, the asset section has also developed a funding strategy of all three phases as follows:

- **Phase 1:** 100% funded since treatments in Phase 1 are cost effective proactive maintenance and aimed to keep the good conditioned road in good condition for a long time (Budget allocation 20%)
- **Phase 2:** Based on PCI, most of the Council's road renewal backlogs are in this phase. Council strategy is to fund the worst projects so that remaining projects do not go to Phase 3 (Budget allocation 65%)
- **Phase 3:** Based on current PCI, a small number of projects are only in this phase. Council decided to eliminate these in 5 to10 years. Project selections are based on asset risk score, cost benefit analysis, minimizing road user and future maintenance costs (Budget allocation 15%)

Phase 1: 100% funded, cheaper and keep the good conditioned road in good condition for a long time (20%)

Phase 2: Maximum projects in this category; Fund the worst projects first so that remaining projects do not go to Phase 3 (65%)

Phase 3: Long term Planning. Eliminate this in 5/10 years. No increase in number. Allow some funding for reactive (15%)



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Pavement Rehabilitation – Phase 3 Treatment

Sites exhibiting the lowest PCI are targeted and rehabilitated where required with full depth bitumen foam / cement or lime insitu stabilisation. This process allows for full pavement rehabilitation and once completed allows a new life cycle to commence. Strategies of pavement maintenance are included in life cycle modelling with an aim that sites requiring full rehabilitation are a decreasing component of annual expenditure.

- Rehabilitation treatments are listed on the left in the next slide – rehabilitation is a 5 step process
- Rehabilitation treatment is selected by PMS based on condition, service levels, etc. as shown in the table on the next slide
- Pavement stabilisation from project initiation to construction is a 5 step process:
  - Step 1: Treatment selection by PMS modelling
  - Step 2: Deflection test to verify if there is any other way to Pavement Rehabilitation
  - Step 3: Geotechnical Investigation for bore-hole details, Subgrade CBR, Sieve Analysis, Plasticity and UCS tests
  - Step 4: Pavement design by CIRCLY model
  - Step 5: Pavement construction / stabilisation

Pavement Rehabilitation – Phase 3 Treatment

Treatments:

Mill & Fill, Stabilisation and Reconstruction

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

Stabilised more than 300 projects in the last 30 years.

5 steps process

Step1: Treatment selection by PMS

CAMPBELLTOWN **Works Program**

Scenario: t3 2017-18 works program **Works program for:** 2018 # 1 **BUDGET** 15,000,000.00
Sub network: SUB_BACKLOG SECTIONS WITH UNACCEPTABLE PCI **Optimisation method:** Maximise Network PCI
Rule Base: TREAT_RECONt7 RULEBASE FOR RECONSTRUCTION

Road No	Block	Road Name	Block Name	Code	Description	Cost
1351.00000	10.0000	WANDA PLACE	CRONULL - END CUL	RC2	LOCAL URBAN REHABILITATION	$52,496.00
1430.00000	10.0000	KEIRA PLACE	JUNCTIO - END CUL	RC2	LOCAL URBAN REHABILITATION	$50,965.00
1864.00000	10.0000	COOLABAH PLACE	EUCALYP - END CUL	RC2	LOCAL URBAN REHABILITATION	$49,421.00
1916.00000	10.0000	HEREFORD PLACE	HANSENS - END CUL	RC2	LOCAL URBAN REHABILITATION	$48,312.00
2026.00000	10.0000	AINSLIE PLACE	KEMBLA - END CUL	RC2	LOCAL URBAN REHABILITATION	$46,042.00
2118.00000	30.0000	GERTRUDE ROAD	RODNEY - FIONA P	RC2	LOCAL URBAN REHABILITATION	$136,382.00
2239.00000	20.0000	MEMPHIS STREET	VICTORI - END [KA	RC2	LOCAL URBAN REHABILITATION	$49,500.00
2473.00000	10.0000	RAVENSWORTH PLACE	RIVERSI - END CUL	RC2	LOCAL URBAN REHABILITATION	$48,510.00
2481.00000	10.0000	BRUDENELL AVENUE	TURIMET - MAVICK	RC2	LOCAL URBAN REHABILITATION	$133,901.00
2492.00000	20.0000	MACQUARIE AVENUE	BANKS S - RUSSELL	RC2	LOCAL URBAN REHABILITATION	$36,353.00
2548.00000	80.0000	KINGSCLARE STREET	TERALBA - O'SULLI	RC2	LOCAL URBAN REHABILITATION	$44,920.00
2572.00000	20.0000	MEGALONG CRESCENT	NEPEAN - VALLEY	RC2	LOCAL URBAN REHABILITATION	$126,720.00
2584.00000	10.0000	BOTTLEBRUSH AVENUE	JACARAN - BLACKBU	RC2	LOCAL URBAN REHABILITATION	$202,910.00
2843.00000	10.0000	GEARY STREET	KELLICA - MENANGL	RC6	IN-SITU CEMENT STABILISATION	$140,140.00
2917.00000	10.0000	DON PLACE	MISSISS - END CUL	RC2	LOCAL URBAN REHABILITATION	$18,533.00
3024.00000	20.0000	ORCHID PLACE	END CUL - END CUL	RC2	LOCAL URBAN REHABILITATION	$10,039.00
3752.00000	50.0000	GLENQUARIE CENTRE SERVICE	GLENQUA - BLOCK 2	RC2	LOCAL URBAN REHABILITATION	$108,900.00
						$1,304,044.00

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Investigation

- Step 2: Left hand side: Falling Weight Deflectometer test is carried out for all selected pavement rehabilitation candidates first to determine if there is any other way to carry out rehabilitation
- Step 3: Right hand side: Geotechnical investigation is carried out to check the borehole log, CBR, Particle Size Distribution, Plasticity Limit and UCS, etc.

Step 2: Deflection Testing

Falling Weight Deflectometer Results

PAVEMENT MANAGEMENT SERVICES ®
ACN 002 245 329

SMEC

RABY ROAD

Survey Date: 20-Aug-02

Road Id	RABY002
From Street	THUNDERBOLT RD
To Street	KEARNS RD

Chainage (m)	Lane	Surface Temp	Load kPa	Measured Deflections (um) at distance (mm) from load 0	200	300	450	600	750	900	1200	1500	E1 MPa	CBR (%)	Beam (mm)	Curv (mm)
0.025	2	26.0	711	1264	907	699	485	378	185	92	63	35	385	9	1.22	0.34
0.050	1	26.0	610	898	487	325	220	148	100	77	48	7	449	6	0.80	0.24
0.075	2	26.0	761	591	364	227	159	121	99	84	56	32	458	21	0.56	0.20
0.100	1	26.0	638	915	641	444	285	174	115	83	55	33	369	4	0.99	0.29
0.125	2	26.0	770	519	376	283	225	167	130	105	70	46	912	12	0.50	0.13
0.150	1	26.0	625	566	408	281	197	138	104	80	56	37	529	10	0.67	0.20
0.175	2	26.0	563	655	539	414	287	201	140	96	61	24	522	4	0.90	0.30
0.200	1	26.0	643	546	349	233	166	120	95	78	58	42	479	15	0.61	0.21
0.225	2	26.0	279	649	607	421	252	144	94	66	46	56	175	2	2.05	0.56
0.250	1	26.0	654	492	325	213	159	111	80	63	36	25	644	11	0.55	0.16
0.275	2	26.0	558	516	340	250	181	136	106	84	52	36	501	12	0.66	0.20
0.300	1	26.0	635	519	330	225	161	113	84	66	43	23	566	11	0.59	0.20
0.325	2	26.0	466	1126	787	555	366	223	144	113	84	45	217	3	1.64	0.49
0.350	1	26.0	614	485	353	261	207	158	126	105	70	54	607	13	0.57	0.15
0.375	2	26.0	506	668	473	312	187	118	84	67	52	36	417	7	0.79	0.22
0.400	1	26.0	626	520	321	212	133	99	66	53	37	24	488	12	0.60	0.22
0.425	2	26.0	480	797	563	387	257	175	131	105	74	51	290	5	1.14	0.33
Overall													477	9	0.87	0.26
Stnd Dev													176	5	0.43	0.12

Step 3: Geotechnical

Unconfined Compressive Strength of Compacted Stabilised Materials

NATA Accredited Laboratory Number 2750

Project: Woodland Road, Bradbury	Project No.: 15314/9723A
Client: Campbelltown City Council	Report No. 04/0706
Address: PO Box 57, Campbelltown	Report Date 02/08/04
	Sheet 2 of 3

Test Method: AS1141.51 Standard Compactive Effort

Sample No.	24A	24B			
Location	BH 24	BH 24			
Depth of Sample	0.0-0.3m	0.0-0.3m			
Type Of Additive	RSA HS1585	RSA HS1585			
Source of Additive	Hyrock	Hyrock			
% Additive added	3.0	3.0			
% Greater than 37.5mm	Nil	Nil			
% Greater than 19.0mm	Nil	Nil			
Initial Curing Time	1 Hr	1 Hr			
Moisture Content as Compacted t/m3	9.0	9.0			
Dry Density as Compacted t/m3	2.08	2.08			
Density Ratio %	NA	NA			
Moisture Ratio %	NA	NA			
Type of Specimen Curing	Accelerated	Accelerated			
Specimen Curing Time	7 Days	7 Days			
Average Unconfined Compressive Strength MPa	3.5	3.5			

Remarks: Additive Composition (85% Slag, 15% Lime)

NA - Not Applicable

Approved Signatory.....

Technician: LC

George Prudnyk - Laboratory Manager

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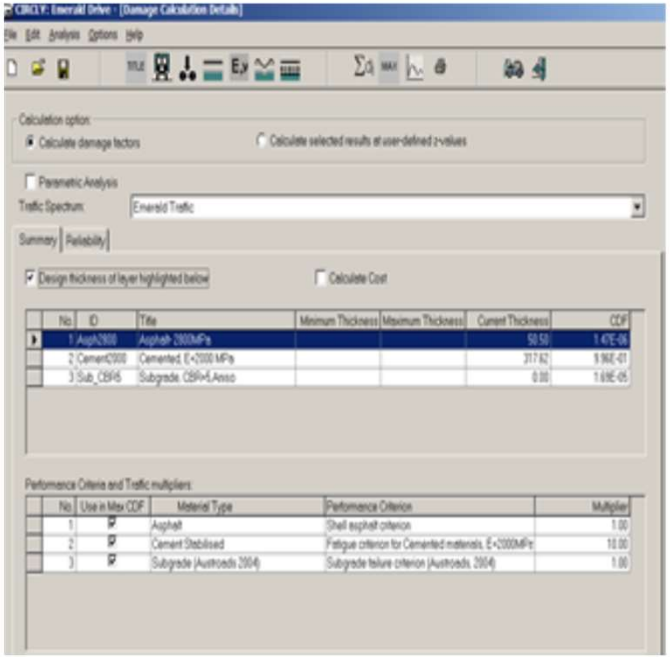
Investigation

- Step 4: Left hand side: Pavement design is done in-house by using CIRCLY model
- Step 5: Right hand side: Pavement construction by selected contractor
  (Downer, Stabilised Pavements of Australia, Fulton Hogan or Roadworx)

Step 4: Pavement Design (in-house)



Step 5: Pavement Construction

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Savings Achieved

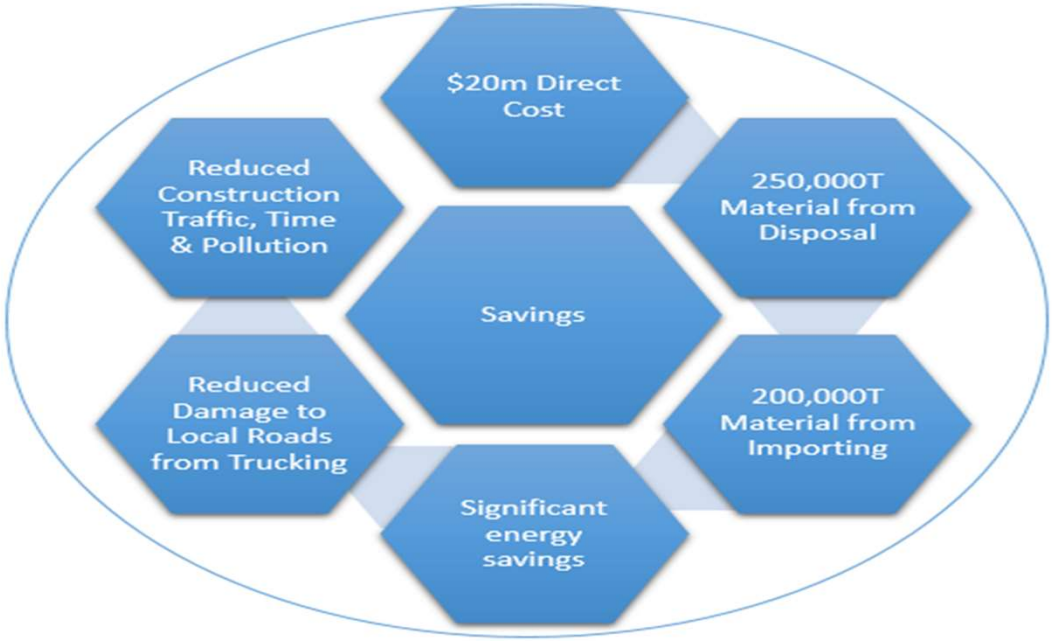
Recycling of existing pavement materials by stabilisation is one of the main applications for Campbelltown Council's road rehabilitation processes. It enabled Council to upgrade existing roads without removal of any existing materials. Between 1991 and 2020, Campbelltown City Council successfully implemented 300 stabilisation road projects to provide sustainable outcomes for the management of its road network.

Council staff, by acting proactively and utilising their comprehensive pavement management skills and sound performance results, have implemented 300 stabilisation projects to minimise the deterioration of its road network assets and to optimise the service levels of the network assets within the constraint of available funding.

Council achieved the following benefits:

- Saved 45% direct treatment costs, at least of the next best alternatives
- Saved 250,000 tonnes of pavement materials from disposal
- Reduced construction traffic
- Reduced truck generated pollution
- Reduced damage to local roads due to trucking operations
- Saved 200,000 tonnes quarried material
- Achieved significant energy savings
- Drastically reduced construction time and lane closure

Savings Achieved from 300 Stabilisation Projects (From 1991 to 2020)



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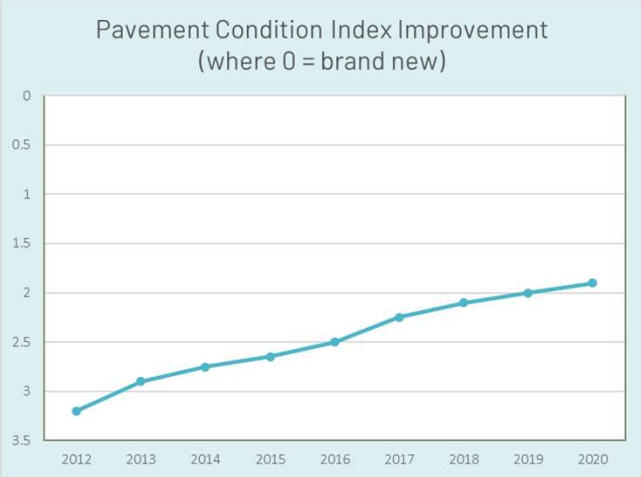
Achievements

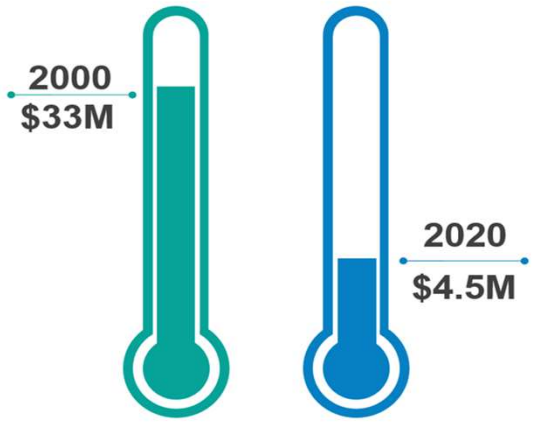
By adopting a systematic innovative approach, acting proactively and implementing a comprehensive pavement management strategy, Campbelltown City Council has managed to optimise the service levels and minimise the risk of the asset stock within budget constraints.

- Left hand side graph: The graph below details the overall improvement in the road-network PCI due to implementation of Council's comprehensive Pavement Management Strategy over the last decade
- Right hand side graph: Financial modelling comparisons on budget costing between the Council's road renewal backlogs in Financial Year 2000 and Financial Year 2020 show a trend of decreased backlog cost required to elevate the PCI of the road-network asset. The results are a direct reflection of Council's adopted innovative approach.

Condition Improvement



Backlog Reduction



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