DESIGNING A FIT FOR PURPOSE ASSET MANAGEMENT TEMPLATE

Latrobe City Council in Victoria has followed a carefully structured program in developing its best practice asset management strategy for roads and footpaths.

By Graeme Fletcher and Ashay Prabhu

Since the release in 1998 of the Victorian Department of Infrastructure report *Facing the Renewal Challenge* the importance of the Infrastructure Renewal Gap has been thrust to the forefront of asset management throughout local municipalities.

The importance of good asset management has been further strengthened by the recent adoption of the *Road Management Act 2004*. In today's growth environment it is of vital importance that a council can demonstrate that it is managing its infrastructure in a way that will ensure that generations to come are not faced with a huge gap between available funds and renewal requirement.

Having a fit-for-purpose condition measurement method and robust performance models are key elements of good asset management practice, and there are three key outcomes that can be achieved through a simple but effective ground-up approach:

- gap analysis as requested by the local government minister and DVC surveys can actually be done in a realistic and defendable manner;
- deterioration models as have been professed by many research bodies like ARRB can be developed by using local test sites and are more suited to the local environment;
- real pavement lives can be determined through a unique technique of using FWD and visual condition parameters.

Four years ago, Latrobe City Council (LCC) in south-eastern Victoria, recognised the need for strategic asset management for its roads assets. The City Infrastructure Division took a strong initiative to develop a robust asset management framework which included scientifically determined data capture and analysis processes to ensure that the city was best managing its funds on a road asset, with a replacement value of $341million.

Over this period, the city committed itself to addressing the issues of predicting long-term pavement performance, developing a fit-for-purpose condition measurement method, developing council-specific road treatment strategies and establishing asset management tools and processes that enabled the development of life-cycle models for pavements and kerb. This process has meant that the city has clearly identified its strategies and tactics in response to the Victorian road management legislation.

LCC has two network-level road performance models that are used to determine its twenty-year funding requirements, fifty-year renewal profile and capital works programs. These models are based on deterioration criteria and condition measurement methods that are totally LCC-specific and therefore are objective and defendable. The models have been applied to determine impacts of reduced or increased funding levels, test the impacts of redistributing funding and to predict future asset condition for a range of strategies. This article describes the steps, findings, practices, processes and the lessons learnt during this journey.

Good practice asset management

LCC is a Victorian regional city municipality with a population of over 71,000 residents and an approximate area of 1,422 square kilometres. It maintains a road network of 1,500 kilometres which was valued at $341 million in 2003. Of this network the sealed roads represent approximately 875km and a value of $285 million.

A demographic shift towards an aged population combined with increasing litigation risk on footpaths places a higher priority on the footpath infrastructure quality and standard. An increasing employment rate in the city over the last five years has provided a vital boost to the local retail and housing trade which has put extra pressure on the provision and maintenance of new infrastructure like roads, footpaths and drainage.

LCC is committed to developing and implementing Good Practice Asset Management Strategies for its infrastructure.

It is recognised that a Good Practice Asset Management Strategy can only be built on solid data, thereby resulting in confident decision-making.

One of the first requirements was to identify the city's position with relation to its major asset category, its sealed road network. It had to attempt to face the tough questions - what is the ideal condition of the network? how does the current condition compare to the ideal condition? how is the network performing? what are the renewal requirements, when are the peaks and where are the troughs? are the current funding levels adequate? There was a solid acknowledgment that the city needed to be in a position to answer these questions confidently.

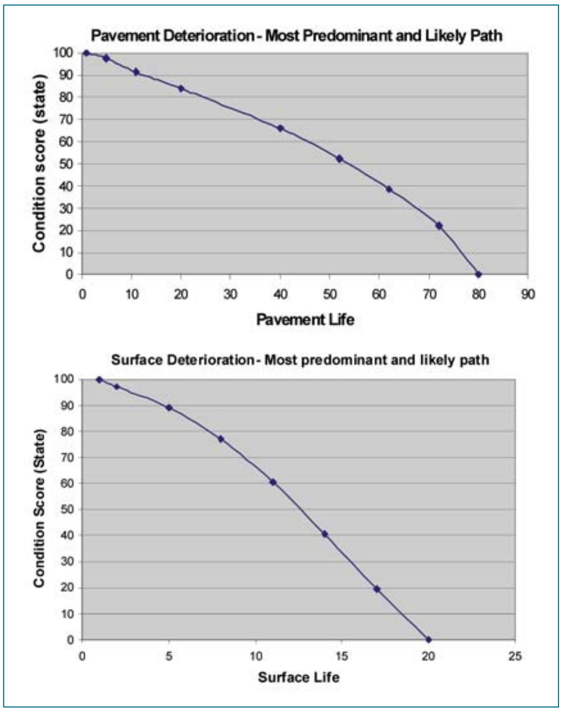

Figure 1

To answer these questions a representative condition assessment method was required to collect meaningful data. After all, confident decision-making can only be based on accurate data.

LCC has long been at the forefront of Pavement Management System (PMS) implementation with regards to pavement inventory, condition assessment and network modelling. This step of reviewing the PMS data, network modelling and maintenance practices was seen as a necessary activity to ensure that the city was optimally maintaining its sealed road network.

The steps taken

New Condition Assessment Methodology

Prior to 2001, LCC had used RTA New South Wales ROCOND 90 method of visual assessment. Whilst this method was sound in its basic principles, a pilot application of the data revealed that it was not as effective as it should be in providing accurate data to support the decision-making process. The two main reasons for this were:

1. ROCOND defect rating levels were not aligned with treatment trigger points.

2. The use of a 50-metre gauge length was regarded as being an unreliable method for determining overall ratings for a segment that in some cases could be over one kilometre long.

It was acknowledged by the Asset Management Unit that condition measurement based on intervention levels for the various major treatments was critical to the process.

With this in mind it was decided to review the existing method and develop a new fit-for-purpose method tailored specifically to LCC's current road network environment, treatment types and maintenance practices.

First, workshops were held with key staff members from areas including asset management, network supervisors and maintenance foremen. The purpose of these workshops was to determine 'best appropriate' current treatment types for sealed road pavements and kerbs, why LCC carried out these treatments, and at what point in the asset life or condition were they most likely to do them. This information then led to determining both objective definitions for defect data collection that were capable of identifying required treatments and the optimal intervention levels that would drive them.

This data was confirmed on-site by inspecting various examples of assets requiring different major treatments. Based on these workshops and previous data it was decided that LCC would need to divide its road network into two sub-networks - urban and rural.

At the end of this process LCC had a new data collection method that identified only those defects that specifically triggered individual treatments as well as the varying levels and combinations of defects that drove separate treatments. This ensures that the data collected will always be meaningful and enable 'choice evaluation based on cost and other benefits'.

Data Collection

Once the methodology had been confirmed and adopted it was time to carry out the assessment on the full sealed road network.

To add to the value of this process it was decided to not only collect surface condition data, but also carry out Falling Weight Deflectometer (FWD) testing on a sample of segments based on their visually inspected condition states. This would enable LCC to undertake a renewal gap analysis based on the combination of surface and structural condition. It also assisted the city in developing realistic life models for pavements.

This sample of roads was determined after the condition assessment had been completed. This ensured that the test sites were a representation of all the varying condition states.

Due to the significant size of the project it was decided to let out a contract for the work and the visual condition assessment was completed in February 2004. During this process a significant amount of time was spent in auditing contractor data that resulted in the re-assessment of some areas.

Following this, the sample testing sites were determined according to sub-network and condition state. This work was then contracted out and completed, including final analysis and report, in April 2004.

Data Analysis & Modelling

LCC's models are established on very rigorous site testing and the deterioration profiles shown in Figure 1 represent the most predominant path of deterioration.

Some key future strategies, based on council's performance models are shown in Figure 2.

Key Findings

The present condition of LCC's road network is very good. The status of very good implies the following which is generally applicable to Australian granular sealed pavement network.

The quantity of pavements in poor

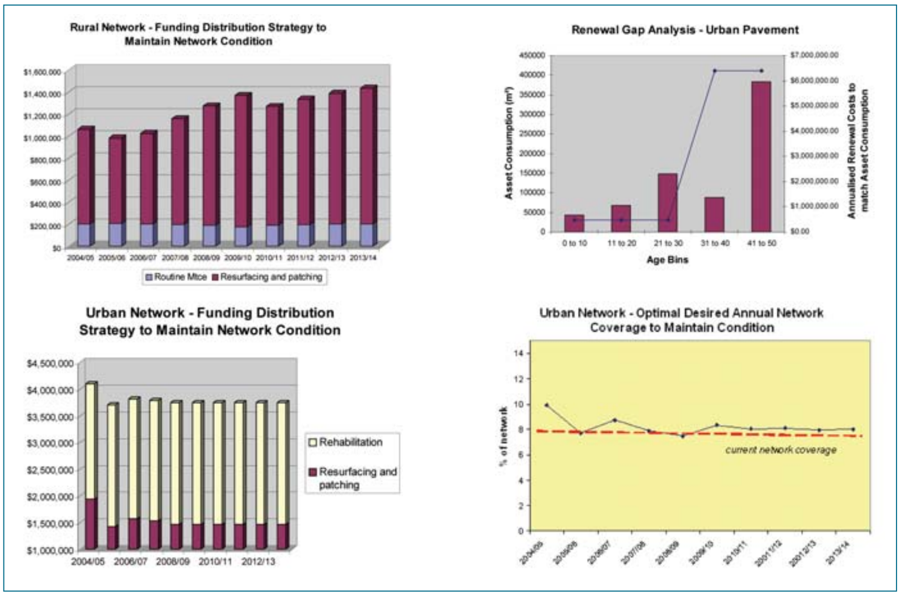

Figure 2

condition is below 6% for the rural network and below 3% for the urban network. Pavements with less than 20 years remaining life under currently assumed traffic loadings (and % commercials) are deemed to be in poor condition. The quantity of surface in poor condition is below 3% for the rural network and below 6% for the urban network.

The amount of cracking in poor condition is very insignificant: less than 0.5% of the total network area has poor cracking. The 2000 condition data, although measured using a different method (ROCOND 90 method), also concluded that there is insignificant cracking in LCC's road network.

The prime driver of resurfacings is oxidisation and/or seal age. The seal age data is incomplete at this stage, hence there is heavy emphasis on using oxidisation condition as a primary driver. The secondary driver of resurfacings is cracking and minor shape-loss. The primary driver of rehabilitation is major shape-loss and kerb (in urban areas).

It was hoped that pavement strength testing would provide a more representative mechanism to trigger LCC's rehabilitation works. It was also anticipated that a relationship between pavement strength and certain visually assessed parameters like shape loss and crocodile cracking could be developed. However, one of the major findings of the pavement testing has been that the remaining life profile of LCC's pavements is very flat with a vast proportion of pavements having a calculated remaining life over 150 years. This makes it impossible to establish a linear relationship between remaining life and measured condition.

It must be acknowledged that the remaining life profile is based on assumed percentages of commercial vehicles and that the actual remaining lives may be much lower if accurate commercial traffic counts were available for all test sites. If such data was available in the future, the relationship between condition and remaining life could be established.

The critical elements of a successful asset management process are as follows:

1. Identification of condition data needs by way of workshops with maintenance/capital works staff and supervisors

2. Development of a fit-for-purpose data collection method that will provide useful data capable of producing realistic maintenance/capital programs. (Only measure and collect data if it is going to support decision making!!)

3. Collect data, ensuring quality assurance at all times.

4. Test the outputs of the models on-site to ensure integrity and representativeness (check results against field conditions).

5. Undertake renewal analysis to identify future peaks

6. Utilse the outputs of this process as key inputs to the asset management plan

In the absence of a commercial vehicle count, it was not possible to develop rehabilitation programs based on current pavement strength data. Therefore rehabilitation programs have been developed using project level visual data. However, it must be acknowledged that the pavement strength data is not incorrect or useless. It should also be noted that pavement strength data should be valid in its entirety for at-least five years and that traffic counts could be gradually updated over time to refine the remaining life analysis.

Seal age data and pavement age data are without doubt a very powerful indicator of future needs i.e. resurfacings and renewals. LCC's current data file has approximately 60% data for segment ages. Whilst available data has been used to develop deterioration profiles, the lack of complete data has meant that project level optimisation is restricted.

The lack of pavement age data also restricts the application of 'renewal analysis' in determining segment level useful lives. The lack of pavement age data also restricts rigorous analysis of pavement strength and structural number data.

Lessons learnt

- Visual assessments can be less costly; however they require a significant amount of quality assurance by way of field audits to ensure the accuracy of the data.
- Need for committed staff that are appropriately trained in the practice of asset management is vital to the successful implementation of the process.
- Reliability of the data is one of the fundamental elements that impacts on council's financial long-term planning.
- The prioritisation can be more effective, and needs based if accurate traffic data including commercial vehicle breakdown is utilised. This is particularly important with increased mass-limits and tyre pressures from the transportation industry.
- Site-testing at project level is the fundamentally critical element of developing robust long-term models.

Recommendations

- For future data captures, cracking may be measured as a surface distress only.
- Cracking may be measured using in-vehicle rating. As there is very little cracking on the network, any cracking that is visible from a moving vehicle

will be deemed as measurable cracking. This applies to both linear and crocodile cracking. Whilst the data may not be used in modelling, it will still be provided to LCC's works depot to drive a crack-sealing program.

- Shape-loss visible from a moving vehicle may be collected as a visual distress.
- Oxidisation condition will be assessed as per VicRoads standards.
- Update seal age and pavement age data to extend to entire network.
- Given the nature of LCC's network condition - i.e. most of the network in good condition - it is critical that LCC concentrates on developing very strong and robust surfacing models. It is obvious from the condition data over two rounds of data collection that LCC's maintenance activities are of good quality. This includes the preparatory works like patching and crack sealing prior to resurfacing.
- Continuing to maintain this level of maintenance quality is the key to keeping a good network in good condition. It is also equally important to maintain the resurfacing levels (annual reseal quantity) at least at the present levels recommended by the models, to ensure that good and fair condition roads do not rapidly deteriorate into poor condition.

- **Graeme Fletcher is the Asset Management Engineer with Cardinia Shire Council in Victoria. He was previously with Latrobe City Council. Ashay Prabhu is the Principal of ACEAM Pty Ltd, asset management consultants. Email ashay.prabhu@aceam.com, web: www.aceam.com**