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Asset Lives: a puzzle worthy of the Strategic Asset Manager

Occasionally we have used the last issue for the year to present a puzzle, something to keep you entertained over the holiday break, or to present stories that have that irresistable touch of Schadenfreude. Here we do both.

But mostly this issue addresses asset lives because it is one of the key issues for asset managers. Asset life is inextricably linked to asset values, asset condition and asset performance. We have, in the past, looked at the danger of assuming that no asset life should exceed the mid-point of the distribution of lives (commonly referred to as 'the' asset life) forgetting that at least half of the portfolio will, as a matter of course, exceed the average, and justifiably so. However, in this issue we look at a range of other issues to do with asset life.

In this issue

This is the last issue for 2013, we resume again after a summer recess, on **January 13th 2014.** However we will continue to post 'Best of SAM Selections' to the website for you to enjoy over the break. Check the website for the announcement of the December prize winner.

Thank you for your interests in *Strategic Asset Management* this year.

All my best wishes for the New Year, Penny

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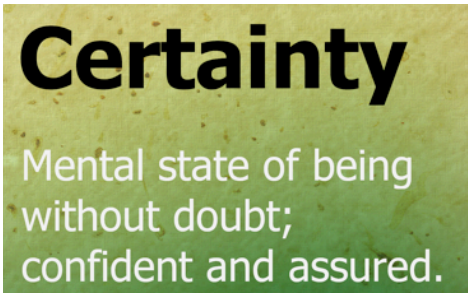
Editorial: On Certainty

The Certainty Paradox



We all wish to be confident and assured, but does this really mean being without doubt, or does it mean understanding and accepting that there must always be doubt - but nevertheless confident enough in our flexibility and in our ability to handle what life will throw up? I think we are better asset managers for taking the second route.

The more doubts that we are able to process and think about before we make a decision, the less likely that we will be really wide of the mark in whatever decision we do make, also the more likely that if we do need to make changes, we will quickly recognise that fact and be flexible enough to do so. **This is the basis of the current issue on Asset Lives.**

A Lust for Certainty

Some 25 years ago the Archbishop of York was being interviewed on the BBC. The Interviewer said, 'Your Grace, people have this urge for certainty but you give only doubt.' The Archbishop thought for a moment and then quietly said: 'Have you ever considered that the lust for certainty might itself be a sin?'

This is an intriquing statement. Many think it a virtue to be certain. Yet it may well be true that, in an essentially unknowable world, we commit the sin of arrogance, even hubris, to claim certainty. Yet, politicians, in particular, believe that they must be certain to be seen as leaders. Indeed, I recall one fellow saying that although he did not believe in the policies of Margaret Thatcher, he would still vote for her, since she seemed to be the only politician who knew where she was going. Politicians want to know 'will this work or won't it?' and do not take kindly to an answer of 'It depends'. So how do we, as asset managers, take a more nuanced position?

I had the advantage of working for a very bright politician when I was a Ministerial Advisor. Like others, he wanted an answer that enabled him to make a decision. But he was bright enough not to expect certainty. I would say, "Minister, i think, on balance, the best course of action is X. However, there is a possibility that if you do this, you will experience problems with Y and if this happens, the best response is Z." By anticipating problems and providing solutions to them, I was able to retain my integrity and provide action-worthy advice. It also meant I needed to monitor the outcomes, with the result that my advice became better over time. I don't know how well this would work with some of the less bright politicians, but it might well be worth considering.

Penny

When does Asset Life begin?

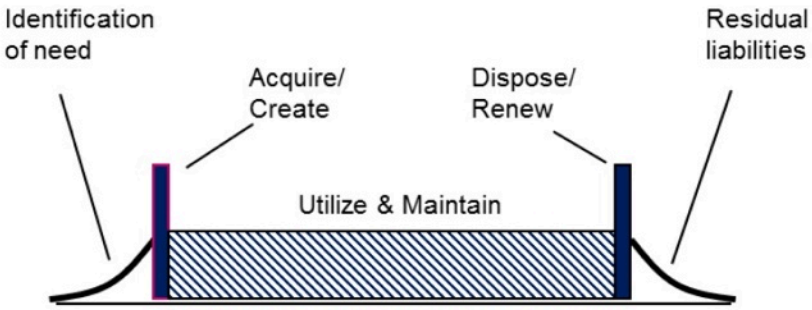
Asset life is the period from asset creation till end-of-life. ISO 55000.

In earlier discussions, asset life was defined as from the period of 'conception' rather than creation. Where on the following diagram you would place the beginning of life? I suspect that when talking philosophically about the 'life cycle' we would seriously consider the 'identification of need' stage when all options are still open, yet when we come to put a figure on the asset life for all practical purposes, we would opt for the 'Acquire/Create' stage. It just seems more concrete, even though (as indicated by the thick vertical bars) the acquisition/ creation may take many years.

Should we date our asset from the time the first sod is turned for the foundations, (the beginning of creation) or from the time that it begins operations, or some time in between? Indeed what is the difference, if any, between 'asset life' and 'asset responsibility period'? Does the assumption of debt to finance the project have any bearing on your decision?

The following two diagrams were produced by John Woodhouse and Peter Kohler during Melbourne ISO 5000 discussions and I am grateful to them both for so clearly illustrating some of the problems we face when trying to determine, even after the event, when life began - and when it ended.

Asset Responsibility Period

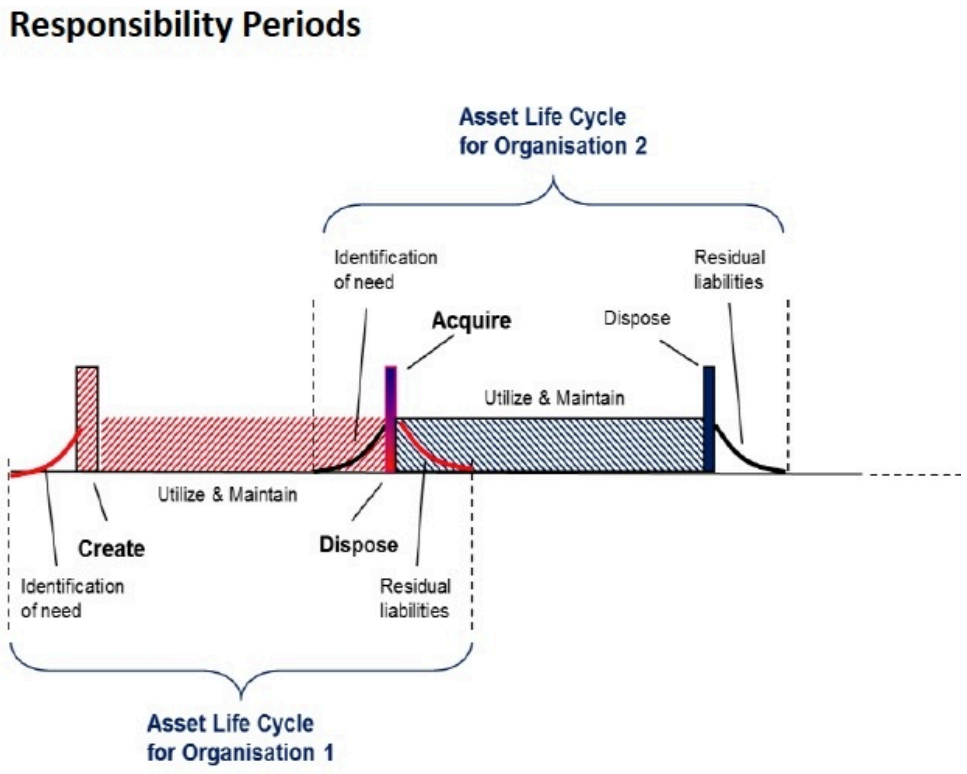


Responsibility Period

- The "responsibility period" is the period of time over which an organization has accountability for an asset and can be within one or many of the assets life stages
- The role of asset management is to maximize value from assets across each of the asset life stages that fall within or in some instances beyond the "responsibility period" of the organization

When does Asset Life End?

This second diagram illustrates the possibility of any given physical asset having several distinct functional lives. These may be in different organisations (as shown in the diagram), or they may be within the same organisation. I first ran across this problem in 1986 when trying to model asset renewal for ETSA (the Electricity Trust of South Australia). There, a generator may go through three distinct life functions - in the early years when it is new and at its most efficient it operates in 'base load' mode and runs most of the time. After a certain time (dependent on many factors), it is downgraded to be 'mid-load' and operated at peak times during the day but otherwise held in reserve. Then it moves to 'seasonal peak' use only. Even after this stage it might not be decommissioned but held in storage (called 'mothballing') against a later emergency use. At which stage in this multi-faceted life, does the asset come to the end of its life? This was the problem that I faced trying to model renewal. As it happens, when the plant moves from 'base load' to 'mid-load' it is necessary to renewal its base load function. Similarly when the existing 'base load' plant moves to mid-load, the plant that was previously mid-load shifts down a notch. The asset is thus being renewed/replaced at the end of each of its partial lives! It may exist in its base load function perhaps 20 years, but even though the generator remains in exactly the same physical position and with the same ownership, its functional life has changed, the 'base load' function has ended. The 'residual liabilities' still apply even if the asset doesn't change hands, only functions. It was this early realisation that led me to define renewal as 'renewal of function' rather than 'renewal of asset' per se.



Why do we want to know?

A life is a life is a life - right? Well, not really. We may well come up with different rationales for asset life and, as a result, different lives, when we focus on why we want to know. We may wish to know asset lives to calculate depreciation for prudential balance sheet purposes. Or we may wish to know the lives in order to plan for long term renewal. Or we may wish to know the lives to determine when to intervene to maintain or extend life. The latter two require also knowing the age of the asset for it is a comparison of age and life that will determine the answer. However, it is perfectly possible to calculate depreciation just knowing replacement values and asset lives and without any reference to age.

Does depreciation life = planning life = intervention life? For depreciation purposes we may wish to deal with whole classes of assets (and, indeed, audit requirements often stipulate that we do). For financial planning we can also deal in broad classes and it is a matter of choice how much detail (i.e. sub-classes) we wish to deal with. Intervention, arguably, requires to most attention to sub-classes.

What does 'Asset Life' mean for a Complex Asset?

Simple assets are replaced as a whole. For these we can determine a finite life.

Complex assets are renewed piecemeal by replacing worn out components as they occur. Infrastructure, including buildings, are complex assets. Often referred to as 'grandfather's axe' where the blade and the handle may have each been replaced numerous times yet is still regarded as the 'same axe'. Because we can keep the axe going as long as we care to, renewing the blade and the handle each time they wear out, they is no finite predictable life for the axe as a whole. This is true for all complex assets such as infrastructure. So how do we define 'life' for a complex asset?

Definition **"The 'life' of a complex asset is the period over which the cost of renewing component parts amounts to the replacement cost of the entire asset. "**

So a hospital with a 'life' of 45 years is not expected to be demolished then. Many elements in the hospital at that time may still have 10, 20 or even 30 years of life left in them. *What is more, the same may also be true in 30 years' time!* That is what continual renewal means. *The life of a complex asset is undefinable.*

"What is the life of a building where components are being continuously replaced?" This question was asked recently in a paper I was reading and the author gave the answer "Who cares?" Indeed, if we think of asset life as the time between acquisition and complete renewal, it makes no sense to ask this question at all, and impossible to answer.

The answer is clearly that the asset can last as long as we want it to, as long as we consider it worthwhile to keep renewing the components that wear out. One day it will happen that we can think of a better way of providing the service than with this existing asset or that we do not need to provide this service at all and we will then stop renewing components. But that decision will be a 'political' one (political with a small 'p' in the sense that it will be a community decision and is not predictable with life cycle tools.)

Economic Life of an Infrastructure Asset.

There is a sense in which it is worth calculating the 'life' of a building, or any infrastructure asset that is renewed piecemeal - and that is for **understanding the cost of infrastructure provision.**

How to calculate the Life of a Complex Asset

Example of calculation

Imagine an infrastructure asset with just three components, A, B and C.

A's total cost is $100. It has a life of 5 years, thus an annual renewal cost of $20
B's total cost is $200. It has a life of 20 years, thus an annual renewal cost of $10
C's total cost is $1000. It has a a life of 100 years, thus an annual renewal cost of $10

The total replaceable cost of the asset is 100 + 200 + 1000 = $1300.
The annual renewal cost of the asset is 20 + 10 + 10 = $40.

How many years will it take for the annual renewal costs to mount to the total replaceable cost? Clearly that is simply 1300 / 40 or 32.5 years.

You may have been expecting that since component C is so dominant, representing 75% of the total, that the weighted average life would be closer to 100 years. But it is not. The shorter lived components carry greater weight because they are renewed many times.

A common mistake is to weight each component by its share of the capital cost, rather than by its share of the renewal cost. If we were to do that, we would end up with a life for this asset of 70 years *which may look right, but is actually wrong.* You can see that this is wrong because if you divide 70 into the capital cost you get an annual renewal cost of only $18.80 - far short of that needed to renew each of the components.

So weight by the average annual component renewal cost and not by the construction value of the components.

Functional Lives

One of the danger of calculating the weighted average life for a complex asset by measuring the lives of the components is to know where to stop! Do you, for example, calculate the lives of every element and weight them?

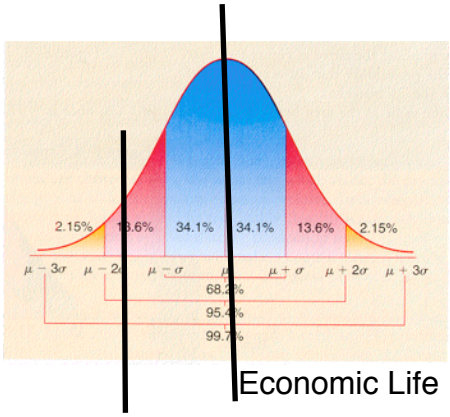
A recent study I examined required the valuer to estimate functional or 'service' lives. The valuer went about the work in a very professional and dedicated manner and estimated the lives of every element and sub-element then aggregated them into the major functional components.

Despite such diligent work, the valuers were clearly concerned at the end of the exercise with the life estimates that resulted from their work. Intuitively they felt they were far too short and said so. But they did not understand why.

The reasons were 3:

1. The life assumptions for the individual elements themselves erred on the short side

   To get them the valuers had relied on 'service life' estimates provided by specialists in each element who seek to preserve the 'excellence' of their elements by early renewal. In at least one case, not having these service lives to hand for a particular element, they had relied on warranty lives. I have heard of other people using warranty lives. To see why you should never do this, consider what risk the warrantor would wish to take. If he had to pay out on even 5% of his sales, this would not only be a great financial impost, the damage to his reputation would be even greater. So he is going to set a low figure for warranty purposes to be on the safe side. See the figure.



2. The lives of the individual elements were treated as if they were independent and this is never the case with complex assets.

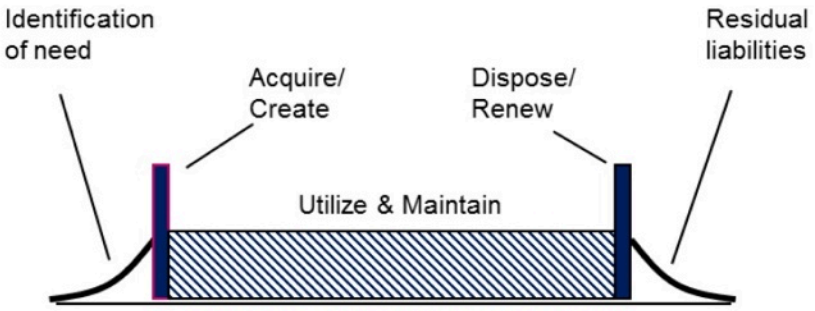
   No matter what the theoretical service life of an element, e.g. a door, a piece of wall panelling or whatever, if we were to replace everything according to those lives we would be always interfering with service itself. So typically we bundle them all up and do them in a block.

3. Service lives are meaningless when applied to individual elements since elements themselves (e.g. windows, doors, roof beams) do not provide a service.

   To get a service you need to consider many elements working together in a structured whole, ie a functional component, e.g. Fit-Out.

Asset Life and Responsibility Period

Let us revisit our life diagram and ask what is the difference, if any, between asset life and responsibility period. In particular let us look at 'residual liabilities', and consider the case of the Costs of disposal can come as a nasty surprise.



Residual Liabilities

My favourite story was told to me by Peter Niven, then General Manager, City Rail in NSW. Back about twenty years ago, City Rail decided to update its stock. The “Red Rattlers” that had provided good service from about 1927 lacked the features that modern travellers required, maintenance costs were high and their reliability was only about 50% of the newer models.

It was time for them to go - but go where? Too old to be sold to another line, the best option seemed to be scrap metal. However just as this plan was about to be carried out it was discovered that about 10% of the carriages were lined with asbestos. The problem was the records did not show which ones! For safety, all had to be stabilised and then sold for low value purposes such as chook houses. City Rail were unprepared for the very large costs involved with disposal - and the newspapers had a field day!

Do residual liabilities affect asset lives?

In this case it is unlikely that knowledge of the exit costs would have changed the management’s decision to upgrade, but they would have been more prepared for the cost, and the publicity consequences. However, there are times when the decision is marginal and (correct) inclusion of the exit costs would affect the decision.

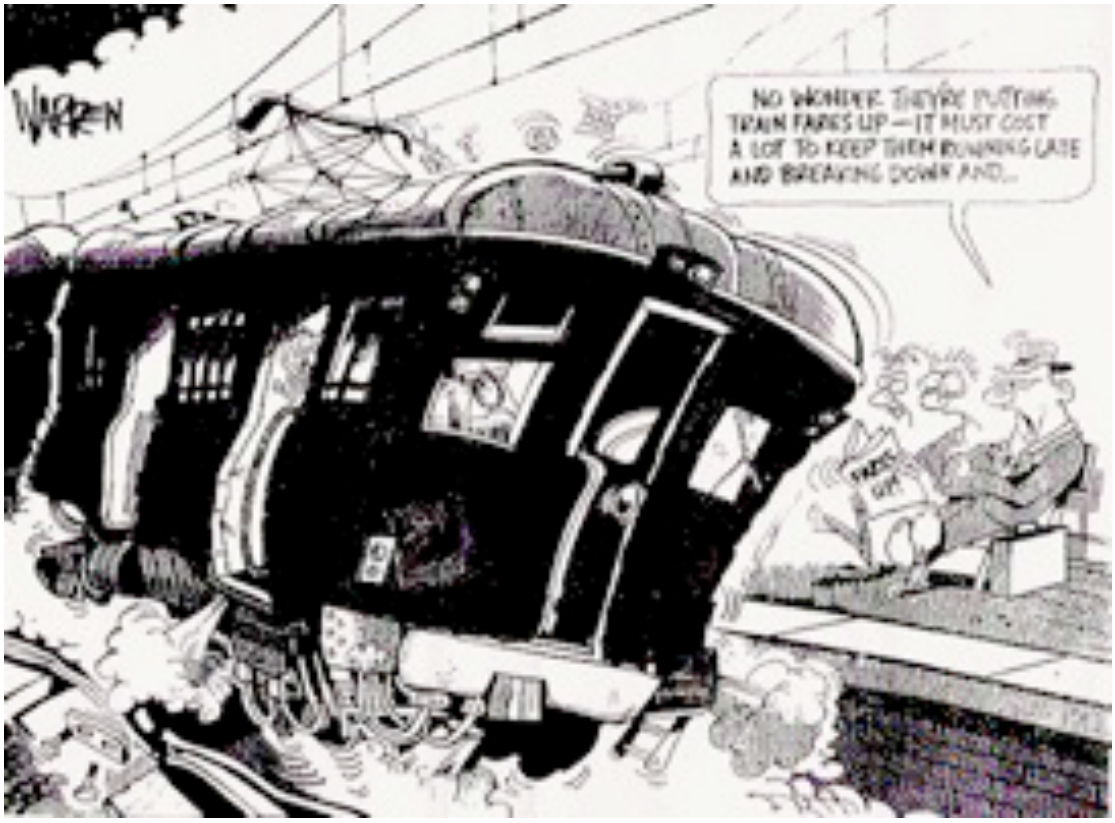
It is also possible that knowledge of the exit costs could cause management to delay renewal so as to delay coping with the residual liabilities. in this case awareness of the residual liabilities - a responsibility period issue - could end up impacting the actual life of the asset - an asset life issue.

There are also health and safety issues to be taken into account with asset disposals. Private companies also need to consider whether the purchase of their old stock may allow another company to compete and under-cut their price. Bridgestone Tyre Company, for example, told me that they would never sell their outdated and obsolete equipment for this reason. Instead it piled up in their yard until the space was needed and then it was sold for scrap.

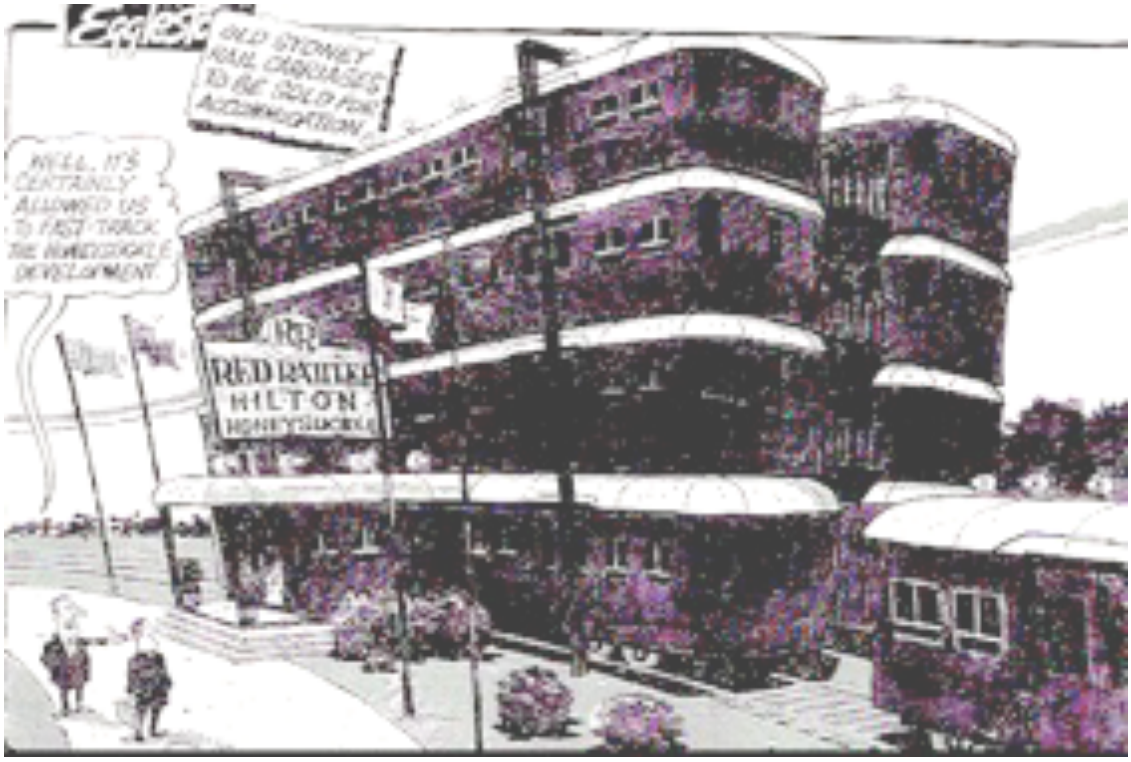
One of the residual liabilities is the impact on public opinion and the opportunities presented for media fun and mayhem.

Just for our fun, here are a couple of cartoons about NSW Rail and its Red Rattlers.

“No wonder they’re putting train fares up - it must cost a lot to keep them running late and breaking down and...”



Old Sydney Rail Carriages to be sold for accommodation.
“Well, it’ s certainly allowed us to fast-track the Honeysuckle Development”



Other articles on Asset Lives available in the Archives.

Talking Points in SAM 119 (July 25 2003) which covers many issues that were the subject of debate amongst asset managers at the time (now, too?) including reconciling design life and asset life, structural versus hydraulic condition as an indicator of end life, and using a mix of approaches depending on the asset and the need.

Selecting the Right Tool for the Job: Asset Lives Part 2, in SAM 62E (May 18 2001) in which we look at 'as is' versus 'as desired'.

Functional Components in SAM 62E (May 18 2001) in which it is argued that rather than replacing individual physical components as they wear out, changing demands on the system may well indicate replacing entire functional units.

Asset Lives and how to calculate them. SAM 61 (May 4 2001) Where to start and what to watch out for. Plus a case study.

Advanced Asset Management - Distributed Lives. SAM 32 (March 24 2000)How to get more reality into your renewal forecasts without it costing you an arm and a leg in resources.

and, highly recommended

A template for assessing and reporting asset condition and economic life for sealed road assets by John Howard in SAM 161 (March 4 2005)

While not in SAM, the following is very useful and worth a look.

The Infrastructure Asset Useful Lives Report is a report written by Tonkin Consulting in March 2009 for the Local Government Association of South Australia. The full title of the report is "Infrastructure Asset Useful Lives - SA Councils' Current Practices".

The report collates asset useful life data contributed by 14 South Australian Councils.

You will find it on the web at ....

http://lgam.wikidot.com/infrastructure-asset-useful-lives-report