



New South Wales  
TREASURY

**TOTAL ASSET MANAGEMENT GUIDELINE**

# **Asset Maintenance Strategic Planning**

TAM06-3 June 2006

# Asset Maintenance Strategic Planning

## Contents

<b>1. Asset Maintenance Strategic Plan within TAM</b>	<b>1</b>
<b>2. Application of Asset Maintenance Strategic Plan</b>	<b>2</b>
2.1 The strategic planning approach	2
2.2 Benefits of maintenance planing	2
2.3 The role of maintenance planning	3
2.4 Minimum and optimum maintenance costs	3
2.5 Asset deterioration	4
2.6 Capitalisation of maintenance	5
<b>3. Agency roles and responsibilities</b>	<b>6</b>
3.1 Service agencies	6
3.2 NSW Treasury requirements	7
<b>4. Maintenance planning process</b>	<b>8</b>
4.1 Maintenance planning process	8
4.2 Overview	15
4.3 Sources of planning information	16
<b>Appendix A Maintenance planning checklist</b>	<b>17</b>
<b>Appendix B Measuring performance</b>	<b>19</b>

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# **1 Asset Maintenance Strategic Plan within TAM**

General Government agencies are responsible for delivery of particular services in line with Government's overarching service delivery agenda and priorities.

Agencies determine the best way to achieve Government requirements. Accordingly, their plans recognise current and future risks including changes in service demands, changes in delivery methods, and changes in the level of resources available.

Prior to commencing the Asset Maintenance Strategic Plan, the agency needs to develop an Asset Strategy that reviews the way assets are required to support service delivery.

Having determined that part of the asset base which continues to support service delivery and the risks that these assets pose to the ongoing service delivery, the agency is equipped to develop the Asset Strategy Maintenance Plan. The plan should cover all asset types including information and communication technology (ICT).

The Plan will determine the work required to efficiently and effectively address the risks of asset ownership and their impact on service delivery.

## **2 Application of Asset Maintenance Strategic Plan**

### **2.1 The strategic planning approach**

The NSW Government's Strategic approach to asset planning is based on Total Asset Management (TAM), which links assets to providing services. As part of this policy, Budget dependent agencies are required to develop Asset Maintenance Strategic Plans in support of submissions to the Budget Committee of Cabinet for funding.

These plans should cover all assets including land, buildings, information technology, infrastructure, collections, equipment and fleet, owned or controlled by an agency. They must be focused on ensuring assets continue to support the planned delivery of services, identify any deferred maintenance requirements and establish a funding plan.

The change in focus by Government from capital works asset creation to strategic asset management places an increasing importance on maintaining the service capacity of existing assets.

In order to successfully implement maintenance planning, agency managers need to pursue initiatives that:

- Enhance the link between service outcomes delivered to the community and the maintenance of the assets involved in the delivery;
- Establish clear links between maintenance objectives and asset performance;
- Resolve uncertainty regarding the disposal of assets; and
- Gain the commitment of operational maintenance managers and staff to Maintenance Planning.

### **2.2 Benefits of maintenance planning**

The adoption of maintenance planning offers a number of benefits to both agencies and Government as a whole:

#### **Benefits to agencies**

- Assets perform at optimum levels, reducing service disruptions and losses due to asset failure;
- Risks to the agency posed by its assets can be identified and ameliorated;
- The costs of asset maintenance can be quantified and budgeted with confidence;
- The performance of the asset can be reviewed to suit service delivery needs;
- The plan provides a foundation for continuous process improvement;
- The plan provides feedback to improve future application of the maintenance process; and
- Reduced environmental impact by controlling resource usage.

#### **Benefits to government**

- Asset costs associated with service delivery can be identified and minimised in the long term;
- Risks to the Government can be identified and ameliorated;
- Alternative asset and non-asset solutions can be compared to best suit service delivery needs;
- Maintenance costs can be benchmarked across agencies and industries;
- The value of public sector assets can be protected, where appropriate; and
- Environmental responsibilities such as energy management, water usage, and pollution control can be addressed.

## 2.3 The role of maintenance planning

Maintenance planning plays a key role in the strategic management of an asset over its planned life span. It is initially undertaken during the development of the Asset Strategy and may indicate one of three options for the future of the asset:

- **Maintenance** to meet the ongoing service role of the asset
- **Renewal and adaptation** to suit changed service needs, operating environments or emerging technologies by capital expenditure, or
- **Disposal** of the asset when it is no longer required for service delivery and has no other value to the agency.

Asset Maintenance planning is a detailed assessment of those assets or asset segments, which the Asset Strategy indicates, require only strategic maintenance in order to continue to satisfy the delivery of service. It is aimed at ensuring these assets remain productive at the lowest possible long-term cost and involves:

- A detailed functional analysis of maintenance needs that meet the required service delivery outcomes;
- The development of maintenance strategies; and
- The institution of procedures to ensure adequate control of the implementation of the maintenance plan.

## 2.4 Minimum and optimum maintenance costs

Maintenance is a technique to address risks emanating from the ownership of assets. Risk Management processes should be used to identify the risks associated with the failure or non-performance of an asset. These risks-of-failure costs could include:

### Service delivery risk

- Delivery interruption (failure)
- Delivery level not achieved (eg. water pressure, water quality, voltage stability, asset image etc)
- Emerging technologies rendering current systems obsolete and incompatible over time

### Cost risk

- Higher maintenance costs, from greater asset deterioration or reduced availability of spares
- Litigation payout, from failure to deliver services or failure of the asset

### Social risk

- Occupational health and safety
- Litigation, and
- Community disruption.

Maintenance can therefore be regarded as an insurance premium against the underlying risks associated with the operation of the asset. The aim is to select the type and level of maintenance, which results in minimum overall cost.

The minimum overall cost is the position where the sum of the maintenance cost and the risk of failure cost cross.

## 2.5 Asset deterioration

Some part or components of the asset will fail before others. Timely attention to these repairs can allow the remainder of the system to continue in service. Maintenance slows the overall deterioration of the asset by restoring the condition of its short life components and allows its overall full service life to be achieved.

An asset's service life may be determined not by its condition but by the pace of emerging technology which may render it ineffective or incompatible with developing systems and service delivery techniques. In such situations, maintenance must be integrated with the planning of upgrades and replacements.

The Budget process requires agencies to focus on maintaining their current effort and levels of service delivery. A limited number of agencies will be invited to submit proposals for delivery of enhanced services, where this reflects Government service priorities.

For agency plans based on maintenance of current effort and service levels, asset maintenance levels should ensure the asset base continues to support delivery of existing service levels. Sometimes this will unavoidably require upgrading the standard of the asset to comply with changes to codes and statutes or to address changes in service delivery risk.

Where such factors are the drivers for maintenance funding requests, a clear explanation of the basis for the funding sought and an evaluation of the risks if funding is not available should be provided.

Where an agency plans to maintain assets to support higher levels of service delivery, it should firstly discuss the proposal with its Treasury analyst, as funding for any proposal which increases service levels is subject to prior invitation from Treasury.

This has been implemented to ensure increased service delivery remains consistent with Government priorities and provides maximum benefit overall.

The diagram below shows the deterioration in asset condition over time, the deterioration being regularly addressed with maintenance expenditure. The restored condition is usually below that of a new asset. At less frequent intervals, more extensive refurbishment and upgrading commonly occurs to replace components and to change the asset's functionality to accommodate changed service requirements. Particular aspects of the asset or its overall standard may then exceed those of the original asset.

Regardless of the funds source for such works, both maintenance and upgrades should be identified in the Asset Maintenance Plan.

If the amount to be spent on maintenance or upgrading assets exceeds available funding, then value management and economic appraisal techniques can be used to test alternative courses of maintenance action and disposal/replacement options.

The value of alternative maintenance options that may require significantly different expenditure patterns over the life of the asset can be compared by use of Life Cycle Costing Methods. The technique allows the selection of optimised maintenance strategies by adjusting the cost of each proposal to allow for the changing value of money over time.

While the term *backlog* or *deferred* may be used for maintenance identified but not addressed within a timeframe, this distinction is not made within this guideline. Maintenance is driven by the need to ensure assets continue to support service delivery. Maintenance proposals that do not proceed in one year should be reassessed along with other proposals in future years and be set priorities according to their impacts. Some proposals will remain valid. Others may change or be combined. All maintenance proposals should be reviewed and tested to determine whether it remains valid.

## 2.6 Capitalisation of Maintenance

The initial assessment of an asset's useful service life must assume that certain maintenance will be necessary for the asset to achieve its anticipated useful life. That is, maintenance expenditure is generally incurred to ensure that the asset continues to provide its pre-determined service capacity and quality and achieve its useful life.

Works to an existing asset will fall into one of the following categories:

- Minor works to allow the asset or its separately identifiable components to achieve their full life expectancy
- Works to replace separately identifiable components at the end of their life to protect the asset overall
- Works to enable the asset to fulfil a changed functional role (eg. changed level of lighting need)

Work that addresses minor failures and deterioration should be expensed from recurrent funding.

Those works resulting in greater capacity or quality than the original asset had should be capitalised. If the work extends the useful service life of the component then it also should be capitalised.

If the value of the replacement component is below the level determined by the agency for identifying and separately depreciating components, or if components cannot be easily identified, it should be treated as maintenance expenditure. Periodic overhaul of aircraft engines involves replacing some components, overhauling others and leaving others unchanged. It would be impractical to identify or account for these components separately thus the overhaul would be expensed.

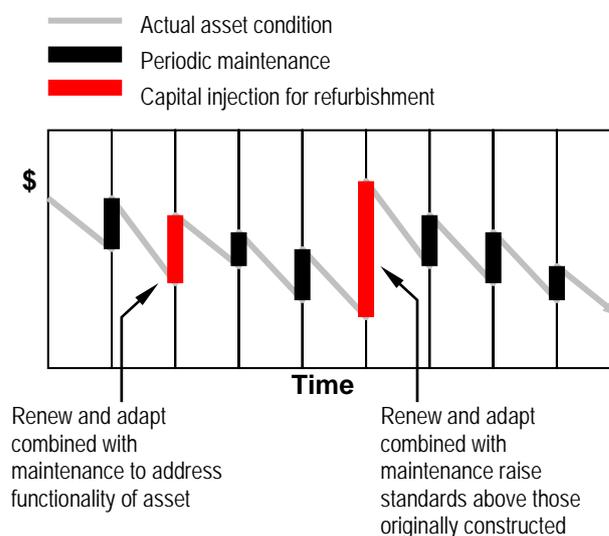
Separate identification of asset components depends on:

- The useful life of the segment being significantly different from the asset
- The segment being capable of separate valuation or being apportioned a separate value, and
- The segment being significant enough to justify the accounting effort required.

Treasury Policy and Guidelines Paper "Guidelines for the Capitalisation of Expenditure on Property Plant and Equipment" should be consulted.

Larger capitally funded maintenance, refurbishment and enhancement projects may require business cases and gateway reviews and the involvement of accredited planners and project managers. NSW Procurement Policy and details of the Agency Accreditation Scheme should be consulted on the Treasury web site.

**Figure 3 Effect of Maintenance over the life of an asset**



## **3 Agency roles and responsibilities**

### **3.1 Service agencies**

Each agency is responsible for the on-going maintenance of assets to a standard appropriate for effective achievement of its corporate goals and service delivery objectives.

Agencies are required, in support of the budget process, to develop an Asset Maintenance Strategic Plan as part of their annual Asset Management Strategy.

The preparation and updating of the plan and the achievement of nominated maintenance targets should be referenced in managers' and senior executives' individual performance agreements with performance monitoring systems maintained by each agency.

To achieve real benefits from maintenance planning the agency will need to be committed to its successful implementation.

It is expected that a committed agency will:

- Provide adequate resources and training of personnel;
- Put in place an information and planning system that is tailored to the agency's culture and methods of operation; and
- Be prepared to persist with use of the system to achieve long-term gains.

Each agency is expected to prepare a Maintenance Plan in accordance with the process outlined in Section 4. Treasury reviews these plans prior to making submissions to the Budget Committee, as part of the Budget development process for the forthcoming financial year.

Agencies should report on their maintenance strategies and achievements in their Annual Report. In preparing the Asset Maintenance Strategic Plan each agency needs to:

- Demonstrate the linkage of the proposed maintenance plan to its Results and Services Plan and its service delivery strategy;
- Ensure assets efficiently and effectively support service delivery and comply with statutory requirements;
- Manage asset ownership risks and service delivery risks within the overall resources envelope set in the Budget process.
- Indicate the basis for the maintenance budget;
- Link the Plan to the asset register;
- List the maintenance tasks to be undertaken and the approaches to be adopted;
- List the resources required;
- Provide a framework for performance monitoring and control;
- Include targets & indicators to evaluate performance achieved;
- Comply with current Treasury reporting needs;

## 3.2 NSW Treasury requirements

NSW Treasury “*Guidelines for the Capitalisation of Expenditure on Property Plant and Equipment*” provides guidance on the appropriate accounting and budgeting treatment of capital and maintenance expenditure in both Budget and Non-budget Sector agencies.

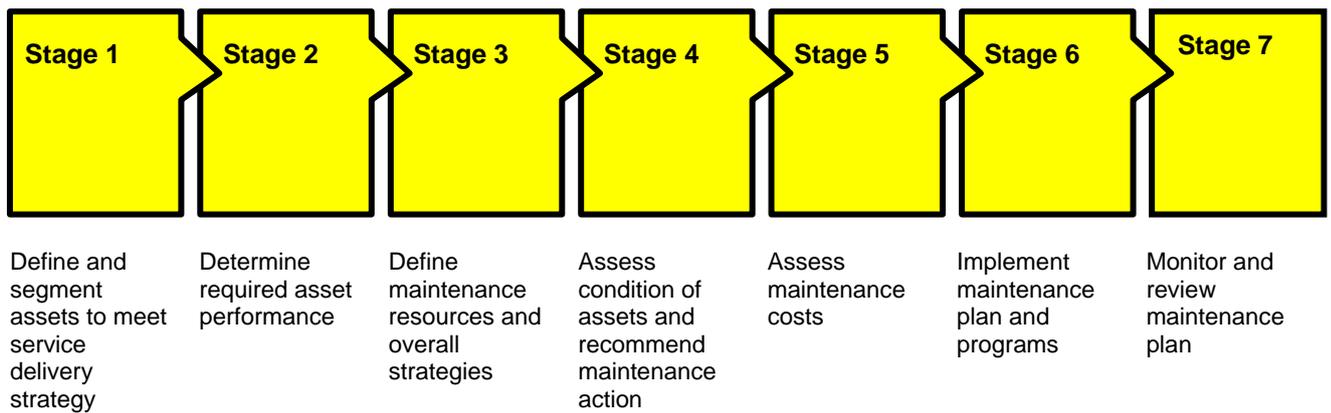
The Guidelines require that all agencies develop Maintenance Plans, which set out their approach to optimising the economic life and operating performance of all existing assets. As there is limited capacity to increase overall funding within the State budget, maintenance of existing assets should take precedence over the acquisition of new assets.

Agencies with asset bases having replacement value in excess of \$5 million must submit Strategic Asset Maintenance Plans to Treasury. Economic appraisal and value management studies must be offered in support of proposed major periodic maintenance.

In reviewing the Plan, some issues that Treasury will consider include:

- Is the plan linked to the agency’s Results and Services Plan, Service Delivery Strategy, and Capital Investment Strategic Plan?
- Does the maintenance strategy and methodology appear effective in achieving service objectives?
- Do cost estimates/maintenance standards appear comparable with industry standards?
- Does an independent assessment appear warranted?
- Is proposed work priorities/justified by detailed analysis?
- Are annual cash flows separately shown for routine maintenance, major periodic maintenance and asset enhancement?
- Is proposed major periodic maintenance supported by economic appraisal?
- Does the proposed level of funding exceed present maintenance allocation?
- What sources of funding or strategies will the agency use to address funding shortfalls?
- Does the Plan raise any policy issues?
- Is the information in the Plan ready to be submitted to the Budget Committee in support of agency funding decisions?

## 4 Maintenance planning process



### 4.1 Maintenance planning process

Maintenance planning is a structured and systematic process, which ensures an agency's portfolio of assets supports agency service delivery at the lowest possible long-term cost.

Maintenance planning is part of an agency's overall asset planning and wider corporate planning, all of which reflect its corporate governance structures. The application of the planning process requires a detailed knowledge of the agency's asset portfolio and good understanding of the service delivery strategy.

A well-defined and comprehensive service delivery strategy aligned with an agency's Results and Services Plan is essential to the development of a meaningful and effective Asset Strategy and Asset Maintenance Strategy. It must specify the services to be provided in sufficient detail to assess asset options against each service delivery component.

Criteria should be developed for assessing existing asset maintenance for its suitability to support service delivery objectives. This suitability will be expressed as a performance gap between existing asset maintenance levels and what is required. It should be measured at each step in the Asset Strategy framework (eg. location, capacity, functionality etc.).

This gap analysis should also highlight areas of waste, (such as under-utilisation of an asset or operating cost above market standard), and clarify opportunities for improving performance.

An agency's future direction is influenced by a number of factors including Government priorities, budgetary constraints, advances in technology, and changes in legislation. These factors impact on the way an agency delivers its services and need to be taken into account when determining future asset maintenance requirements.

Maintenance planning involves:

- An analysis of maintenance needs against agency corporate objectives and service outcomes;
- The development of maintenance strategies; and
- The instigation of procedures to ensure adequate control of the implementation of the maintenance program.

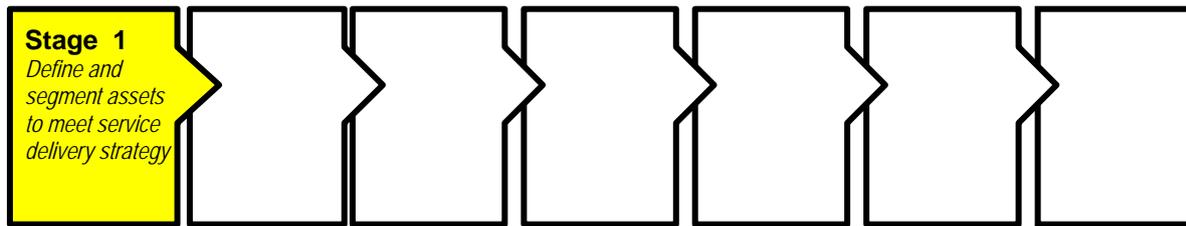
The 7-step planning process has been developed to link service strategies with asset maintenance. It is described in the following sections and summarised in a checklist format in Appendix A.

The descriptions of each stage are not intended to be prescriptive but rather present a range of issues, which should be considered. The significance of each issue and the degree of detail evaluated in the Plan will vary from agency to agency and with the types of asset they control.

The asset Maintenance Strategy should align with the Capital Investment Strategy and Asset Disposal Strategy, which collectively reflect the agency's overall Asset Strategy.

Preparation of the Maintenance budget is part of the process of preparing the Maintenance Plan.

## Stage 1 Define and segment assets to meet Service Delivery Strategy

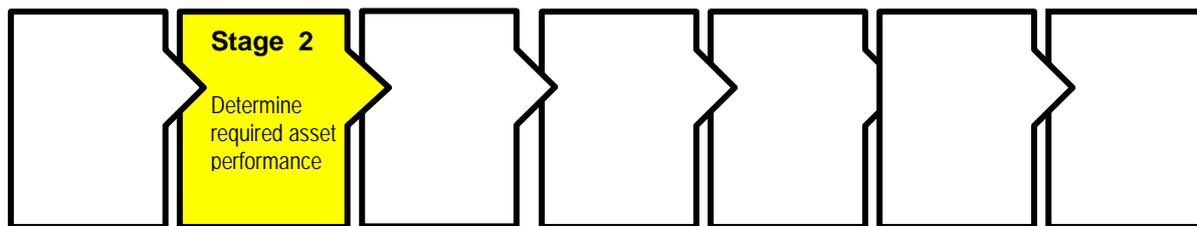


An agency's Asset Strategy should clearly define the assets which are to be kept and maintained over their estimated service life.

Assets of significant value or significant strategic importance, owned or controlled by an agency should be grouped into segments according to the service outputs they support. It may be necessary to link an asset to several services where it supports the delivery of more than one service.

It is necessary to establish why assets are needed and what purpose they serve. Assets should be maintained to the level that best contributes to achieving service strategy objectives over their planned service life.

## Stage 2 Determine required asset performance



The required asset performance level is determined by its role in delivering service. The performance level allows the asset maintenance needs to be established and these needs are communicated to the maintenance planners.

There are many aspects or attributes of an asset, which are vital to their service delivery support role, while other aspects are less important or of no significance. Image, availability, mass, air quality, physical security, abrasion resistance, gradient and seismic stability are examples.

Some attributes are more necessary than others for the asset to perform a particular service role. Therefore, maintaining all attributes to their original standard might well be an unnecessary burden. For example, a building can be structurally sound, quiet, secure, and aesthetically pleasing. Some buildings require lighting maintained to very critical standards while security or aesthetics in the same area might not pose a risk to delivery of the service.

It is necessary to define broad performance requirements that establish which attributes must be maintained for each asset or asset segment and to what level. The performance standard specified for a particular asset should allow it to satisfy its role in an agency's service delivery. Any gaps between present and required asset performance level should be identified here.

Once the significant aspects of particular assets or classes of assets have been defined, a range of possible performance levels is set for each attribute. The minimum value of this range for each attribute, which achieves the desired performance level for each asset segment, is then adopted as the asset standard.

The standard of each attribute required for an asset to support the delivery of service can vary significantly throughout a facility, within a network or across a portfolio.

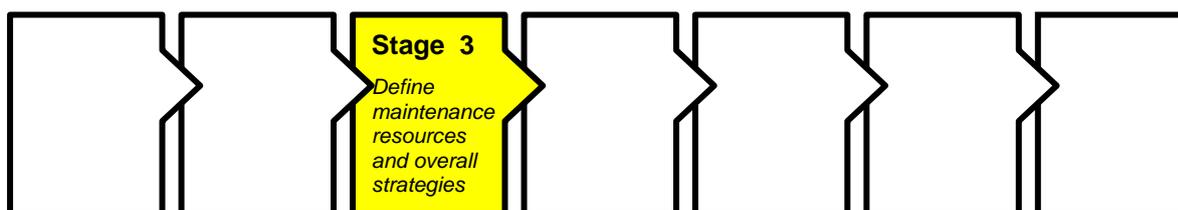
For example, image may vary between a courtroom and a court waiting area. Higher air quality control is required in an operating theatre than in a hospital ward, and lighting levels are more critical in a classroom than in corridors.

Asset performance is also determined by codes and legislation which can vary during the service life of an asset. Where compliance is mandatory, this should be addressed in the asset performance requirements.

Even the way in which assets are required to withstand weathering and general wear and tear varies with an asset's service delivery role and is affected by factors including the risk of such events disrupting service delivery and the remaining service life of the asset.

Where the emergence of new technologies affects the way in which services are delivered and the compatibility of existing assets with these technologies, maintenance decisions will be affected by the rate of planned obsolescence.

### **Stage 3 Define maintenance resources and overall strategies**



Agencies vary greatly in the resources they have available to them to plan and implement maintenance. Maintenance resources include planning, technical procurement and trade skills. These skills may be available in house or on contract or a mix of two.

Knowledge of the asset base and systems to manage this data should also be seen as maintenance resources.

A maintenance strategy that sought to prevent all failures from occurring would be costly and disruptive. Similarly a strategy that attended to all maintenance only after failure would also be costly and even more disruptive (see Section 2.4).

An optimal balance between preventive and corrective maintenance is needed and will vary with each agency's requirements, resources, and circumstances.

The most appropriate strategy will depend on the type of asset, its condition, planned service life and the specific circumstances of the agency. These may include the:

- Type of asset to be maintained and its failure modes;
- Consequences of breakdown or non-performance of the asset; and/or
- Availability of resources to execute the maintenance.

An agency's structure and its assessment of risk will affect its decision on the maintenance resources required. The nature of the service delivery, the location and complexity of the assets and the criticality of maintenance response times impact on what maintenance resources it has in house, whether they be located centrally or regionally, and how effective resources can be obtained when required.

Different strategies may be adopted for various assets or components thereof. These generally fall under three categories:

- Fix when fail, or breakdown maintenance
- Scheduled or routine maintenance
- Condition based or major periodic maintenance

For example, within a building:

- Fix when Fail maintenance is usually adopted for minor mechanical, hydraulic and electrical plant or when attending to vandalism
- Scheduled maintenance generally applies to machinery that requires regular servicing or where a statutory requirement for maintenance at prescribed intervals exists (as with lifts or fire control equipment)
- Condition based maintenance may be applied to building fabric elements (roofs, carpets, etc) and services and reflects the maintenance applied to achieve desired service levels

Advances in technology may allow replacement of asset elements with improved materials and techniques leading to increased performance and service life. This should be taken into account when planning future maintenance or replacement.

Having defined the maintenance resources available to the agency and overall strategies, an agency is then able to decide in broad terms how the maintenance work is to be delivered; eg. using in-house staff or external contractors, using specified works or performance based maintenance contracts. Agencies may need accredited staff or contractors to plan and project manage larger maintenance and refurbishment projects.

#### **Stage 4 Assess condition of assets and recommend maintenance**



It is necessary to identify the asset deficiencies that could pose a risk to an agency's service delivery. This may be achieved by conducting condition surveys, to compare actual asset condition and performance with required performance, or by sampling and statistical analysis of a large numbers of similar assets.

In addition to the asset segmentation according to service output requirements undertaken in Stage 1, a thorough understanding of the performance of a complex network or portfolio may require segmentation of the asset base by characteristics such as:

- Type
- Age
- Service life
- Maintenance approaches
- Demographics
- Cost structures, etc.

Each asset segment is further broken into those components requiring different maintenance approaches, skills or resources. Any important inter-relationships between these components should be identified. For example:

- A water supply scheme will consist of a dam or reservoir, pumping stations, treatment works, distribution system and a monitoring/control system;
- A freeway will consist of bridges, culverts, pavement types and traffic control systems; and
- A hospital could be segmented into 10 departments each consisting of parts of the building, the relevant electro-medical equipment, computers, fitouts and vehicles, etc attached to that department.

Continuous assets such as a road or pipeline can be segmented on an operational or regional basis if they are too large to consider otherwise.

The condition of the components should be assessed in the light of their service delivery role to:

- Identify any defects, deterioration and deficiencies either currently effecting asset performance or likely to occur over the life of the Maintenance Plan;
- Identify the impacts on their service delivery capability;
- Determine the maintenance or renovation required to bring the asset to the state where it provides the specified level of service delivery support, and
- Estimate the cost to maintain.

Consider the risk and cost entailed in not rectifying the deficiencies. In some situations it may be cheaper to live with the defect or substandard asset.

### **Create asset maintenance task list**

An appropriate register of assets and maintenance work is vital to the success of the Maintenance Plan.

Asset registers should be secure and allow easy retrieval of the information in a useable and flexible format. Regular feedback about asset performance in achieving desired service outcomes needs to be provided to service planners.

### **Rank the maintenance tasks**

The maintenance tasks are then ranked in order of priority based on supporting service objectives. It is unlikely that funds will be available to carry out all the desired maintenance tasks and therefore the tasks that are most important to supporting service outputs should be identified and given priority.

In response to difficult funding situations, agencies can experience pressure to defer maintenance liabilities in favour of other resources to ensure continuing service delivery.

Some assets deteriorate slowly and threaten service delivery only incrementally. There is however a risk that this strategy will accrue major cost liabilities for future funding if the asset related risk to service delivery becomes critical. An agency's asset performance measurement, risk management and asset maintenance planning should aim to ensure such liabilities do not arise.

The criteria that determine the importance and urgency of maintenance may include:

- Statutory requirements;
- Occupational health and safety legislation;
- Service delivery risk; and
- Commercial risk.

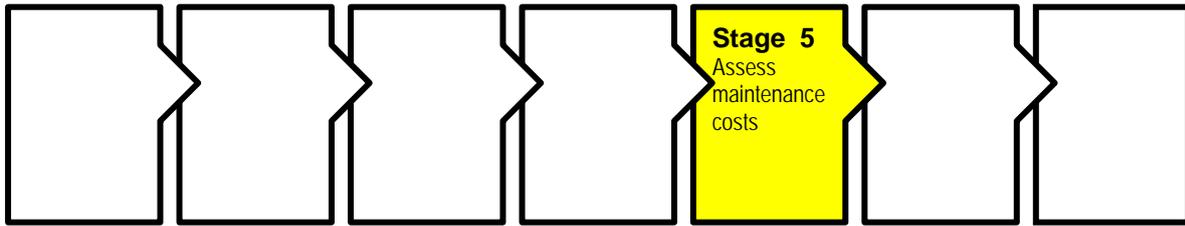
Larger capitally funded maintenance and refurbishment projects may need to be the subject of business cases and require accredited project planners and managers to be involved.

The maintenance tasks are then evaluated and ranked against these criteria with an agency-wide perspective to remove the bias of regional or operational units. This is particularly important with an integrated maintenance plan covering constructed assets, ICT, fleet, office accommodation, plant and equipment.

It is recognised that the assessment of asset condition may reveal differing maintenance strategies, resources and/or contractual approaches to those established in Stage 3 and hence Stages 3 and 4 must be treated as iterative.

Plans should also take into account the iterative nature of sound asset and service planning. Neither assets nor service are absolute. Both must be balanced and must be delivered within the overall resources envelope set by the Budget process.

## Stage 5 Assess Maintenance Costs



In assessing the maintenance costs it is important to carefully evaluate priorities and to focus on appropriate standards along with the most cost effective solutions. Rarely will funds be available to allow all identified tasks to be carried out. This will require the development of a proposed funding strategy that may revisit the recommended maintenance established in Stage 4, and to this extent Stages 4 and 5 are iterative.

Planning should be done at three levels of detail:

- Long-term planning;
- Medium-term planning; and
- Short-term (annual) planning.

Maintenance plans should be integrated with the agency's capital investment and disposal strategy.

### Long-term planning

Long-term planning should show the timetable for replacement, disposal or modification of major assets as well as any long-term maintenance cycles and their funding.

Planning should be as long as clear decision-making allows. For example, if a cycle is adopted for external painting, or pavement seal coat replacement then the plan should exceed those cycle times in order to encompass at least one full maintenance cycle. For example, if a major asset is scheduled for total refurbishment in 20 years time, say, then the appropriate planning period should exceed 20 years.

If service delivery methods or the demand for service is likely to change greatly over 5 years, then this will have a major effect on longer term asset maintenance planning.

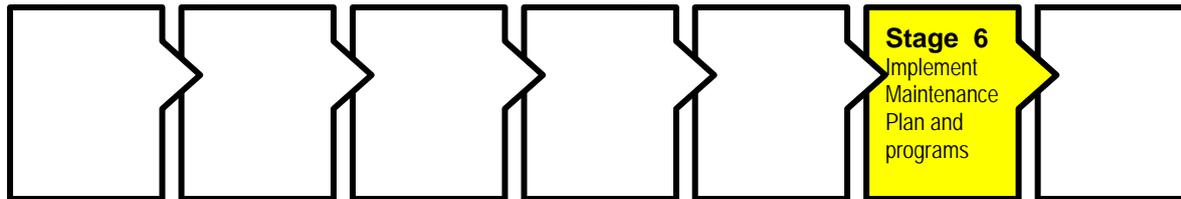
### Medium-term planning

Medium-term planning schedules impending major tasks, and asset downtime, programs resources, and is the basis for budget planning. Its shorter time scale allows it to be a more focused and accurate prediction than the long-term perspective.

### Short-term (annual) planning

Planning is a dynamic process. Priorities sometimes change at short notice. The annual plan is the final assessment of priority and is the working maintenance plan. Annual planning is also needed to confirm funding required for the following year.

## Stage 6 Implement Maintenance Plan and programs



This stage involves securing funding and scheduling the maintenance tasks to the limit of the available funds.

Maintenance plans should distinguish between recurrently funded (expensed) routine maintenance and major periodic maintenance and asset enhancement expenditure, both capitally funded. Routine maintenance expenses should include total employee related expenses, including the cost of day-labour and staff involved in asset maintenance planning, management and operation.

Maintenance plans should include the impact on services if funding is not received for particular items or programs and the cost impact of delaying works. This enables Budget and agency deliberations to be made with the full knowledge of the implications and risks if tradeoffs are made.

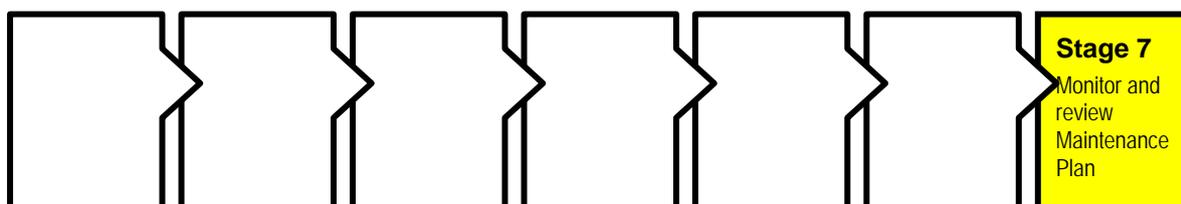
If the first year of the Maintenance Plan has not been fully funded, then it will be necessary to review the plan to establish where funding cuts can be accommodated. In broad terms this can be achieved by:

- Holding over works from the first year, thus reducing the standard of which the asset operates, and the risks to service delivery;
- Reducing asset availability along with corresponding adjustments to the Service Delivery Strategy for the first year; and
- Reallocating recurrent funding from other agency priorities to asset maintenance.

The use of risk management techniques allows analysis of the risks posed by delaying maintenance peaks on the future viability of the asset and the risks to the service it supports. The Maintenance Plan is then amended accordingly and divided into programs according to implementation responsibilities or reporting needs.

The maintenance programs detail the execution of maintenance and are used to schedule asset downtime and to control the progress of works throughout the year.

## Stage 7 Monitor and Review Maintenance Plan



As with all management processes, it is necessary to monitor and review the relevance, effectiveness and efficiency of the Maintenance Plan in relation to achieving required service delivery levels. This continuous feedback is a most important aspect of the maintenance planning cycle.

Monitoring is most effectively achieved through the use of performance indicators. Guidelines on the development of performance indicators specifically for maintenance planning are given in Appendix B. Such measures should utilise best practice benchmarks to provide a basis of assessing relative performance.

With the benefit of hindsight and the use of collected data, it is possible to improve the previous decisions concerning management of assets and their maintenance so that subsequent maintenance expenditures will be more effective.

Actual performance should be compared against the nominated performance indicators. This involves reviewing asset and service objectives and achieved results.

**Questioning the maintenance strategy:**

- Did it really need to be done?
- Was the timing and standard appropriate?
- Would another method have been more effective?
- Would adaptation of the asset have enabled better performance?
- Was the maintenance strategy appropriate to the asset?
- Does the asset continue to effectively and efficiently support service delivery?
- Simply, could it have been done better?

## **4.2 Overview**

### **Stage 1**

- Consider agency Service Delivery Strategies and service levels to be achieved
- Decide period of time that asset is to be retained in service
- Establish the purpose served by assets
- Segment assets according to which service outputs they support

### **Stage 2**

- Decide what asset attributes are necessary to support delivery of required service
- Establish asset performance levels
- Set performance indicators of desired performance level

### **Stage 3**

- Identify agency operational strategic and cultural influences on resourcing maintenance
- Set a balance between preventative and corrective maintenance responses to address current and future risks to service delivery.

### **Stage 4**

- Identify asset service defects
- Establish works to ameliorate service defects
- Rank tasks by priority

### **Stage 5**

- Establish long-term maintenance
- Establish medium-term maintenance
- Establish annual maintenance

### **Stage 6**

- Secure finance
- Re establish priorities within available funding
- Establish programs by responsibilities or reporting needs
- Execute works programs

### **Stage 7**

- Devise indicators of asset operation and maintenance effectiveness
- Consider effectiveness of maintenance on agency service delivery
- Undertake continuous improvement review of maintenance process
- Provide feedback to asset managers and service planners

### **4.3 Sources of planning information**

Planning requires information, some of which may have to be purpose generated but some may already be available from the:

- Agency Service Delivery Strategy aligned with its Results and Services Plan
- Agency Asset Strategy
- Agency Capital Investment Strategic Plan
- Agency Asset Disposal Plan
- Past maintenance expenditure and budgets
- Inspection reports
- Operation and maintenance manuals
- OH&S fire security survey reports
- Facility master plans
- Post occupancy review reports
- Consultancies

## Appendix A Maintenance planning checklist

### Stage 1 Define and segment assets to meet Service Delivery Strategy

- Identify (from the agency Asset Strategy) assets required for service delivery and segment assets according to their role
- Identify assets not required for service delivery for inclusion in Asset Disposal Strategic Plan
- Identify assets requiring alteration, upgrade, extension, etc. for inclusion in the Capital Investment Strategic Plan

### Stage 2 Determine required asset performance

- Determine the range of services supported by each asset
- Establish how long assets are required to continue delivering service
- Determine performance parameters for each asset segment
- Set performance levels for each performance parameter

### Stage 3 Define maintenance resources and overall strategies

- Identify agency cultural influences and risk assessments that affect the manner in which maintenance is organised
- Identify strengths of agency planning, agency or trade staff resources
- Identify strengths of external maintenance planning, technical or trade staff resources
- Decide the level of risk the agency is prepared to accept in their service delivery
- Determine overall maintenance strategies (ie. Fix when Fail, Scheduled or Condition Based maintenance)
- Decide how the maintenance work will be carried out (eg. in-house maintenance, individual maintenance contracts and/or broad based maintenance contracts)

### Stage 4 Assess condition of assets and recommend maintenance

- Assess groups of assets with similar characteristics (for example, type, age, service, life etc) as required
- Identify assets whose condition is known and therefore not requiring condition assessment
- Identify assets whose condition can be assessed by sampling; ie. assets having predictable operating and/or maintenance environments **and** highly homogeneous in terms of manufacture, age, use, failure mode etc
- Identify assets requiring individual condition assessments
- Carry out individual and sample condition assessments
- Prepare a costed Asset Maintenance Task List for the period of the Maintenance Plan
- Estimate the repeat period for maintenance tasks requiring attention more than once during the life of the Plan
- Rank the priority of the maintenance tasks
- Determine strategic drivers for assessment of maintenance priorities

## **Stage 5 Prepare Maintenance Plan**

- Distribute maintenance works into the years they are required to be done
- Conduct economic appraisal of major periodic maintenance proposals to review benefits
- Commit any capital works planned to maintain the asset's service delivery capacity, to the Capital Investment Plan and cross-reference
- Examine agency service and asset strategies and adjust maintenance priorities as required
- Develop short, medium and long term maintenance planning components
- Identify proposed funding strategy and adjust maintenance priorities as required

## **Stage 6 Implement Maintenance Plan and programs**

- Submit Maintenance Plan to Treasury or agency funding authority

If Maintenance Plan for Year 1 has not been fully funded:

- Establish if sufficient works from Year 1 can be deferred to accommodate funding reductions, and/or
- Identify reduced asset availability due to funding reductions and adjust service strategies for Year 1 accordingly
- Amend Maintenance Plan to incorporate changes

If Maintenance Plan for Year 1 has been fully funded:

- Divide Year 1 Maintenance Plan into programs according to implementation responsibilities or reporting needs
- Develop reporting and feedback process to provide information for agency annual strategic planning cycle

## **Stage 7 Monitor and review Maintenance Plan and programs**

- Develop performance indicators to monitor the Maintenance Plan and programs
- Measure and evaluate the indicators
- Strategically Review Maintenance Plan and asset strategies where asset performance is not meeting service delivery needs
- Review Maintenance Plan to identify more efficient and effective ways of achieving the required asset availability and standards
- Modify the Maintenance Plan for future years

## **Appendix B Measuring performance**

### **B1 Developing performance indicators**

Performance indicators are used to report the quality of service, efficiency, productivity or cost effectiveness of an agency, program or activity.

Performance indicators compare existing performance to a standard, target or norm for management purposes.

Developing performance indicators

- Define the key performance levels, outputs or outcomes to be monitored for effective planning and control. For each of these key performance levels, outputs or outcomes, define successful achievement; ie the “success factor” - that which happens when things are going well.
- Determine how to measure the “success factor”, eg dollars expended/square metre, units completed per period, etc.
- Establish targets or benchmarks to compare with the achievements; eg last period’s performance, an industry average, etc.

When used successfully, performance indicators enable managers to see how their programs or activities are performing and show where action is needed to correct a deviation from the program or activity plan.

However, indicators should cover the broad range of results to be achieved. They should be balanced where appropriate with qualitative information and be based on data that can be collected without consuming disproportionate human and/or financial resources.

Key factors for performance indicators

- Indicators should focus on outcomes achieved rather than action taken
- Consistency in definitions and methods of measurement is essential to ensure results can be analysed and compared over time
- Simplicity should be as highly valued as reliability. Complex approaches are expensive and often need a high level of expertise
- Rarely do numbers alone tell the story. Qualitative information on performance is equally useful
- Indicators should be explicit in their format and expressed as a percentage, a ratio or some other numerical format
- The number of indicators used at any management level should be limited to a maximum of, say, seven. Larger numbers of indicators tend to lose relevance and their impact is diluted
- Indicators should be underpinned by an information system that enables the information required by the indicator to be readily available
- In defining success, past experience has shown that input at the development stage from those involved in using the indicators will help engender ownership and support for the application of the indicators

## **B2 Application of the indicators**

The indicators proposed should be examined with the intention of:

- Culling the indicators to a workable number that will provide the information needed by managers to see that their maintenance activities are effective and efficient
- Assigning the resulting indicators to appropriate management levels

It is important to remember the indicators are what they say they are - indicators. They are not intended to be highly accurate measures of performance. Instead they should be considered quick and simple assessments to guide future actions. Therefore, focus on materiality rather than precision.

As far as possible, managers should use performance indicators to monitor the outcomes they are achieving. Indicators are intended, first and foremost, as a tool to help managers manage.

Using them for control purposes, risks misuse of data to make particular managers look more successful. When this occurs, the usefulness of the tool is lost.

At this stage there are few valid industry benchmarks against which the indicators can be compared. Therefore, in the short term, it may be necessary to use the performance of the previous period as an interim benchmark.

The indicators need to be underpinned with appropriate procedures including:

- Standardised definitions
- Standardised methods of measurement
- Coordination with information systems

## **B3 Defining the planned service outcomes**

Many different outcomes arise from the maintenance of physical assets. For the purpose of developing an effective set of performance indicators, the key outcomes can be grouped into five categories.

- Physical assets are available as required to deliver service at their intended standard
- Maintenance is conducted both cost- and time-efficiently
- Stakeholders (including corporate management, property managers, funding providers, customers and community) are satisfied with the maintenance program
- Investment in physical assets is protected (economic lives are extended where appropriate and asset values are optimised)
- Exposure to risks is appropriately managed
- Typical performance indicators for each of the above outcome categories are given in the following section

## B4 Typical performance indicators

### Planned service outcome 1

Physical assets are available and serviceable as required

Performance Standard (Defined Success)	Performance Indicators & Measures	Basis of Measurement
Assets are available within appropriate levels of downtime and/or service disruption	Downtime as a proportion of total operating time (%)	Target
	No. of breakdown call-outs on critical services (lifts, aircon etc) per month	Target / trend (To review planned to reactive maintenance balance)
	Cost of major defects / area.	Trend over time (To consider asset replacement, changed usage or cost of service delivery)
	Total defect costs / annual expenditure	Trend over time (An indicator of adequacy of maintenance expenditure)
Assets perform at their specified standard	No of client complaints of service interruption per month	Trend over time (To revise level of maintenance)
Assets meet performance requirements from Asset Strategy gates. <ul style="list-style-type: none"> <li>○ <b>Utilisation</b> Eg. Laboratory standards supports all agency plant biology research</li> <li>○ <b>Capacity</b> Eg. Storage levels in each water reservoir meet demand</li> <li>○ <b>Functionality</b> Eg. Relative humidity maintained to preserve long term condition of collection</li> </ul>	<p>No. of departmental research programs conducted in laboratory / no. conducted elsewhere No of research staff using facility Units of research output delivered</p> <p>Av and min daily pumping rate Min. water level per day.</p> <p>Av. RH readings per month.</p> <p>Target ( To indicate adequacy of asset maintenance and usage of asset facility)</p> <p>Target / trend (To assess adequacy of pumps and their maintenance)</p> <p>Target / trend (To assess adequacy of AC plant maintenance and waterproof-ness of structure)</p>	
Asset life cycle managed for long term service delivery	Age profile of assets for example:	
	Age / floor area	Target / trend (To monitor portfolio age profile and life cycle maintenance profile)
	Age / value per category	Target / Trend (To monitor portfolio age profile and life cycle maintenance profile)
Assets comply with appropriate health and safety requirements	OH&S defects reported / period	Target (To manage liabilities and maintenance response and comply with OH&S legislation)
Reduction of accidents over time	No. of accidents/injuries attributable to asset defects per period % workforce injured	Trend over time (To manage liabilities and maintenance response)

## Planned service outcome 2

Maintenance is conducted both cost- and time- efficiently

Performance Standard (Defined Success)	Performance Indicators & Measures	Basis of Measurement
Cost of maintenance is reasonable	Maintenance cost to no. of occupants (\$/occupant)	Target / trend
	Maintenance costs compared between facilities or assets	Trend (To identify / manage highest cost assets)
	Maintenance cost per unit of service delivery (\$ per user)	Target (to measure service cost, to manage service strategy and maintenance strategy)
	Maintenance cost to facility replacement cost (%)	Target (Indicates adequacy of maintenance expenditure)
	Maintenance cost to useable physical measures (\$/m <sup>2</sup> , \$/km travelled)	Target (Indicates benefit / cost return)
	Maintenance cost to total operational cost (%)	Target (Indicates significance of assets to service delivery. To manage service strategy and maintenance strategy)
	Maintenance cost to 5 year moving average maintenance cost (%)	Target / trend (To manage life cycle maintenance)
Majority of maintenance is programmed rather than emergency	Cost of responsive maintenance / cost of planned maintenance	Target / trend (To manage maintenance strategy)
	Cost of responding to defects in key categories eg: statutory, structural, waterproofing, key plant items	Trend (To identify and manage risks)
	Ratio of emergency maintenance cost to total maintenance cost (emergency maintenance index)	Target / trend (to manage risks and maintenance strategy)
	Ratio of breakdown call-outs per period to average call-out rate (%).	Trend over time (To manage maintenance strategy and contracts)
Response time is appropriate	Average time taken to respond to work requests	Target / trend (To manage maintenance strategy)
	Number of outstanding work orders to number of work orders received during period (%).	Trend over time (To manage maintenance strategy and allocation)

### Planned service outcome 3

Stakeholders are satisfied with the maintenance program

Performance Standard (Defined Success)	Performance Indicators & Measures	Basis of Measurement
Corporate, property managers, clients and community perceive maintenance to be: Cost efficient Timely Of an appropriate standard	% clients surveyed annually (for key stakeholder categories) who express satisfaction regarding: Economy Timeliness Condition of assets (stakeholder sentiment index)	Target / trend (To manage maintenance strategy)
Maintenance programs are completed within budget allocations	No. Of complaints of unacceptable standards per period per \$1000K spent	Trend over time (To manage maintenance strategy and procurement)
	Ratio of actual maintenance expenditure to budgeted maintenance expenditure (%)	Target / trend (To manage expenditure priorities and maintenance expenditure)

### Planned service outcome 4

Investment in physical assets is protected.

Performance Standard (Defined Success)	Performance Indicators & Measures	Basis of Measurement
Asset maintenance completed in the period planned.	Cost of maintenance due / average annual maintenance expenditure	Target (To manage maintenance strategy and allocation)
Asset continues to support service delivery	Cost of refurbishment awaiting funding / average annual refurbishment expenditure	Target / trend (To manage asset strategy, maintenance strategy and allocation)
Asset values maintained	Asset valuations completed / total assets in portfolio Change in portfolio values / time	Target (To identify outstanding valuations) Trend (To meet reporting responsibilities. To indicate investment level)
Asset management strategies implemented	TAM Plans endorsed by CEO TAM Plans submitted to Treasury.	Target Target

## Planned service outcome 5

Exposure to risks is appropriately managed

Performance Standard (Defined Success)	Performance Indicators & Measures	Basis of Measurement
<p>Risks are identified and contingency plans are in place</p> <p>TAM Plans address service and asset risks.</p>	<p>Risk management plans being implemented</p> <p>Risk management plans updated per year.</p> <p>Divisions providing input to TAM Plans</p> <p>Divisions signing off on TAM Plans</p>	<p>Target (To ensure identified risks are managed)</p> <p>Target (To ensure current risks are identified)</p> <p>Target (To manage corporate governance risks )</p>
	<p>% of identified management issues being implemented</p>	<p>Target (To monitor continuous improvement)</p>