STRATEGIC ASSET MANAGEMENT AT THE PORT OF MELBOURNE

by

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ABSTRACT

The objective of this paper is to discuss the Port of Melbourne's journey and experiences in implementing a strategic asset management program with the principle outcomes being the ability to reliably understand, predict and influence the total life-cycle cost of its infrastructure assets.

The Port of Melbourne Corporation (PoMC) owns and manages a diverse range of infrastructure assets with a current total replacement value of approximately AU$1.8 billion. PoMC has been actively building on its asset management processes by implementing an asset management Policy and Strategy that were approved by its Board of Directors in 2008. The key deliverables of the Strategy are to:

- Develop asset renewal forecasts based on age, condition, level of service and risk.
- Develop life cycle planning processes so as to understand and predict total cost of ownership.
- Understand asset risk exposure and its influence on maintenance and renewal forecasting.
- Develop optimised renewals decision-making processes so as to reliably determine optimal treatments and associated timings.
- Embed asset management as a core business discipline within the business.

This paper provides an overview of PoMC's operations as well as the activities it has developed and is continuing to develop to ensure the long term sustainability of its ageing infrastructure. The paper addresses the following:

- How asset management systems have been employed to provide a framework for asset maintenance and renewals modelling.
- Improvements in asset data structures and work management processes to support strategic analysis.
- The principles and data used in modelling renewal forecasts of infrastructure assets.
- The results of renewal and maintenance modelling and how the outcomes are incorporated into business planning processes.
- Examples of life-cycle planning including the financial indicators used in decision-making for capital and major recurrent asset investment.
- Assessment of asset related risk exposure based on condition and/or remaining life and how the outcomes are incorporated into maintenance and renewal forecasting.

1 PORT OF MELBOURNE'S OPERATIONS AND ASSET PROFILE

The port of Melbourne is situated at the northern end of Port Phillip Bay which is on the southern coastline of Victoria, Australia. Figure 1 shows the location the port of Melbourne relative to Victoria and Australia.

While Victoria is Australia's smallest mainland State, it is ranked second in terms of population and economy with a population of over 5.3 million and a Gross State Product of US$180 billion. This represents approximately 25% of Australia's GDP. Victoria's main industries include automotive production, manufacturing, food processing and agriculture.

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Figure 1: Location of the port of Melbourne in Victoria, Australia

The Victorian State Government created PoMC through a legislative reform process in 2003 to strategically manage the port of Melbourne on its behalf. PoMC is a Government Business Enterprise with one shareholder - the Victorian State Government.

PoMC's legislated functions include:

- Management and development of the port of Melbourne in an economically, socially and environmentally sustainable manner.
- Ensuring essential services are available and cost effective.
- Ensuring effective integration of the port with other infrastructure systems.
- Facilitation of trade growth.
- Management of shipping channels in the port for use on a fair and equitable basis.

The port of Melbourne is Australia's premier container port and handles about 2.3 million TEU annually which represents approximately 36% of the nation's container trade. The port of Melbourne is in the top 50 ports globally.

Approximately 3,600 ships visit the port of Melbourne every year including about 50 cruise ships that berth at the heritage listed Station Pier. All of this activity represents an approximate value of trade through the port of US$60 billion.

In order to strategically manage the port of Melbourne, PoMC relies heavily on the development and operation of a diverse range of highly critical assets. As an infrastructure rich organisation, it is incumbent on PoMC to continually manage its infrastructure assets over their life cycle so as to ensure an appropriate level of service is maintained to its customers and stakeholders at the lowest possible cost and within an acceptable risk regime.

PoMC's Corporate Plan requires the development of fit-for-purpose services and facilities which are secure, reliable, technologically efficient, innovative, safe and meet customers' needs. To ensure this is achieved, PoMC's Corporate Plan incorporates the following business objectives:

- Application of prudent life cycle management.
- Development of long term plans for port development, access and support services.
- Facilitation of appropriate capacity of services, facilities and infrastructure within the port.

The inclusion of these objectives in PoMC's Corporate Plan indicates that there is a clear recognition and commitment at the highest level that PoMC will retain best practice asset management capability and continually recognises the importance of its physical infrastructure in supporting service delivery.

As a result of a commitment to undertake several major port infrastructure developments over the past two and the next five years, and an increase in community expectations on PoMC operating a major city port, PoMC has implemented several initiatives to proactively manage balance sheet pressure on the business.

One of these initiatives is the implementation of a strategic asset management program that will ensure that step improvements are made in the commercial rigor applied to PoMC's infrastructure renewal programs into the future. PoMC's high level infrastructure portfolio is shown below in Table 1:

Asset Class	Quantity	Replacement Cost (AU$ m)
Wharves/Jetties	64	$863.7
Buildings	136	$142.1
Road, rail and stacking areas	73	$135.9
Utility services	274	$33.3
Plant & equipment (inc. 3 survey vessels)	194	$26.7
Navigation aids	275	$16.1
Navigation equipment	717	$2.6
Land improvements	434	$590.3
Total	**2,232**	**$1,810.7**

Table 1: High level asset portfolio

More specifically, PoMC's infrastructure portfolio includes the following major components:

- 34 commercial container, liquid bulk, break bulk and motor vehicle berths
- 7 kilometre's of wharf length
- 35 major tenants
- 125 buildings
- 13.7 kilometres of roads
- 9.5 kilometres of rail
- Over 510 hectares of land
- Over 21 kilometres of waterfront and 100,000 Hectares of port waters in Port Phillip Bay

PoMC invests substantially in the maintenance of its dredged waterways through an annualised AU$4-5million dredging program and also invests approximately AU$20-40 million in the renewal and rehabilitation of its infrastructure assets.

2 STRATEGIC ASSET MANAGEMENT POLICY FRAMEWORK

2.1 General

In early 2008 the PoMC Board adopted a policy position in relation to strategic asset management within the business and consequently adopted a new Asset Management Strategy (Strategy).

2.2 Asset Management Policy

The Board adopted Asset Management Policy (Policy) places several obligations on PoMC to implement best practice asset management protocols within the business. While several of these obligations are legislated requirements, the Board also recognises that PoMC must manage its

infrastructure in a sustainable manner and achieve a commercially sustainable return on its investment so that it can deliver its obligations to stakeholders and customers into the future.

The Policy articulates the following activities as fundamentals to maintaining basic asset management:

- Maintain a computerised asset management system that incorporates a comprehensive register of all of PoMC's infrastructure assets.
- Maintain appropriate interfaces between the asset management system and all other relevant corporate systems that support asset management, eg. property, financial, document management systems and the Geographical Information System (GIS).
- Maintain a robust asset condition rating methodology framework and apply this to all relevant PoMC assets.
- Maintain a structured asset inspection regime to facilitate the timely reporting of defects and the development of maintenance plans.
- Maintain a costing and valuation history for assets and develop an appropriate unit cost structure.
- Ensure infrastructure assets are maintained in a fit-for-purpose state.
- Establish and manage scheduled and unplanned maintenance and associated budgets so that assets are maintained in a condition suitable for their intended use.
- Establish appropriate performance or prescriptive based inspection and maintenance contracts with suitably qualified providers.
- Ensure all relevant assets comply with appropriate Acts, Regulations, Standards and Guidelines.
- Develop and maintain standard operational policies and procedures for PoMC assets where relevant.
- Maintain appropriate backup systems for mission-critical assets

The Policy also articulates the following strategic asset management objectives:

- Where possible, employ demand-management principles to minimise the need to create new or renew existing assets.
- Understand PoMC's risk exposure from its entire infrastructure asset portfolio, particularly from underperforming assets.
- Define responsibility, accountability and reporting requirements in relation to the performance of assets.
- Use whole-of-life costing and discounted cash flow techniques when considering new or replacement asset options.
- Use optimised decision-making techniques when considering asset renewal options to ensure that renewal strategies are based on return-on-investment and whole-of-life cycle capital, operations and maintenance costs.
- Develop and maintain long-term asset renewal strategies based on risk exposure, condition/level of service requirements and commercial utilisation arrangements.

2.3 Asset Management Strategy

The Strategy adopted by the Board in early 2008 articulated the 'road map' for PoMC to progress from its previously successful, albeit basic, approach to asset management to a more strategic and pro-active methodology under a structured improvement program.

PoMC's asset management improvement program is based on the achievement of the following key principles aimed at consolidating PoMC as a cohesive and high performing world class asset management organisation:

- Build a unified organisational focus with consistent policies, procedures, and clarity over responsibilities for asset performance.
- Embed asset management as a core business discipline within corporate processes.
- Remove silo-based asset management processes and improve corporate consistency.
- Move from project-centric to whole-of-life philosophy.
- Improve clarity over measurement of asset performance.
- Standardise approach to life cycle planning and costing methodologies.

- Develop Asset Management Plans for key infrastructure assets that align and support service outcomes and corporate goals.
- Make sustainable decisions based on whole-of-life cycle costs, risk, level of service considerations and return on investment.
- Develop and implement a suite of technology systems and tools to support the strategic asset management decision-making processes.
- Implement an appropriate best practice asset management training program for PoMC staff likely to influence asset management decision-making.
- Build competency and intelligence in strategic asset management across PoMC.
- Develop tools to assist with long term renewals planning and optimised renewals decision making.

3 IMPLEMENTATION PROGRAM

3.1 Previous Basic Approach

PoMC's previous approach to asset management was based on a structured asset condition inspection program for major assets using specialist engineering consultancies to develop capital works and maintenance programs. To facilitate the realisation of the inspection program PoMC retained the services of a panel of consultancies with expertise in a range of disciplines relevant to marine engineering operations.

The inspection reports procured for all commercial wharves, large cargo sheds and roads were used to scope and determine cost estimates for capital rehabilitation and ongoing maintenance works. Capital rehabilitation projects identified through the asset condition inspection program were considered for inclusion in the five year capital works program.

While the reports include an analysis of repair, rehabilitation and renewal options for particular assets and associated net present value cost estimates for each option, the intellectual property of these decisions was retained by the consultants and as such PoMC's technical engineering staff were somewhat divorced from the accountability obligations of being the 'asset owner'.

All maintenance works were carried out by appropriately qualified and competent contractors under either fixed term or project specific contractual arrangements. To support these activities, a computerised asset management system was purchased and standardised works management processes adopted.

3.2 Strategic Approach and Context

One of the key drivers for progressing to a new strategic asset management regime was that PoMC recognised that an increasing portfolio of ageing and expensive assets over time leads to an increase in business risk exposure. The need to identify and strategically manage future asset renewals by providing a robust methodology for directing funds to assets that deliver the greatest return on investment was considered paramount.

It was further recognised that improved customer satisfaction levels and company profits are a direct result of sound asset management practices, and that the implementation of strategic asset management facilitates the identification of potential cost saving opportunities and improved control over maintenance budgets.

The main area of attention to achieve the step improvement was the development of technical information systems. However it was recognised that of equal importance was the implementation of appropriate business processes and the provision of appropriate skills training for people who will ultimately be called upon to interpret system outputs and make judgement decisions based on best practice standards, commercial imperatives and sound asset management experience.

The focus of the delivery program was broader than a simple implementation of new business process, new data management techniques and improvements in technical systems and software; it also commanded close management of the cultural shift required across the business.

Figure 2 below shows a maturity model pyramid developed internally within PoMC that articulates how the step improvement process was measured and benchmarked. It can be see that PoMC progressed substantially since 2006 during which time it was operating at a basic level of asset management. It is anticipated that PoMC will progress to the strategic level by mid to late 2010.

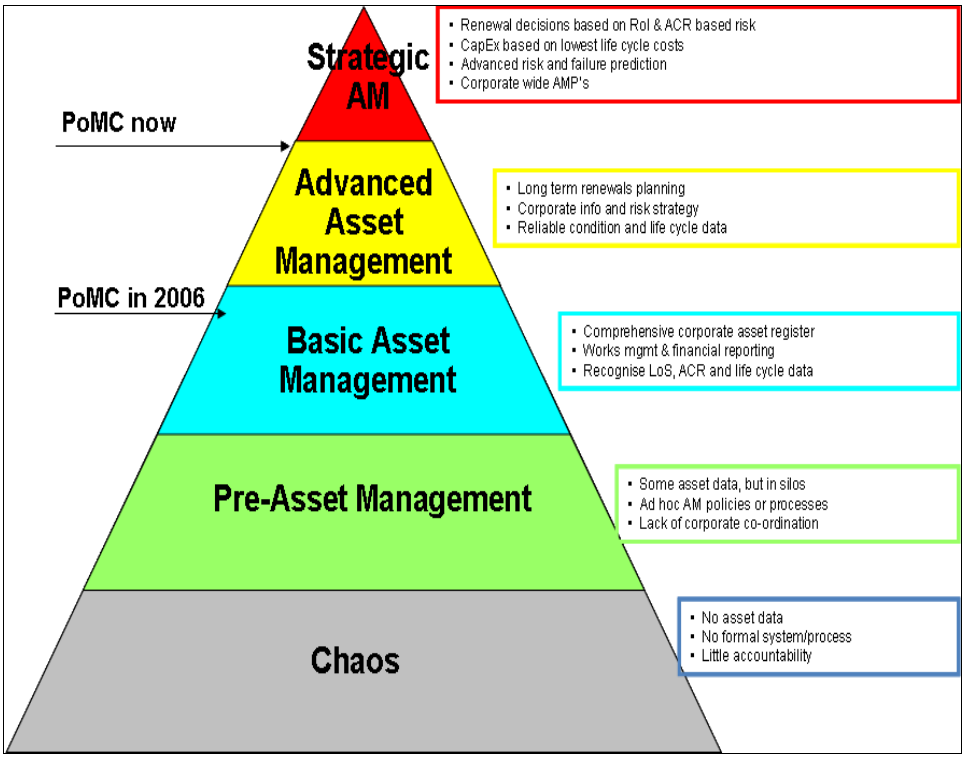

Figure 2: Asset Management Maturity Model

3.3 Strategic Asset Management Principles

One of the fundamental differences between basic and strategic asset management is that strategic asset management is an output driven process whereas basic asset management is predominately about inputs.

The key benchmarks for measuring success in terms of having achieved strategic asset management operations may be summarised be asking the following questions:

- Is long range renewal planning undertaken within a level of service context?
- Is historical data used for strategic renewals decision making and predictive modelling?
- Is possible to begin to predict likely asset failures and pro-actively manage accordingly?
- Is asset risk management integrated into decision making?
- Are renewals options decision making based on present value return on investment?
- Are infrastructure planning processes based on 'whole of life' costs?

These benchmarks may be further distilled down to the following four main processes and elements of system functionality:

- Renewals Modelling.
- Risk Management
- Optimised Renewals Decision Making, and
- Life Cycle Planning.

The status of the implementation of each of these processes and systems at PoMC is discussed in greater detail below.

3.4 Renewals Modelling

PoMC has worked co-operatively with a leading global engineering firm to implement a renewals planning module that interfaces with its primary asset management system to produce infrastructure renewals profiles into the future.

The renewals planning module takes asset data such as physical attributes, unit or override costs, condition data and failure data from the asset register and, based on particular management strategies and typical degradation curves configured in the renewals planning module, generates renewal profiles over a user defined time scale.

Figure 3 shows an early 30 year asset renewal profile output from the system for PoMC's four major asset classes; wharves, rail, navigation systems and buildings. It is also possible to impose the current level of renewals expenditure and new capital initiatives proposed on this image. This level of analysis provides a first level view at the likely asset renewal obligations imposed on the business going forward.

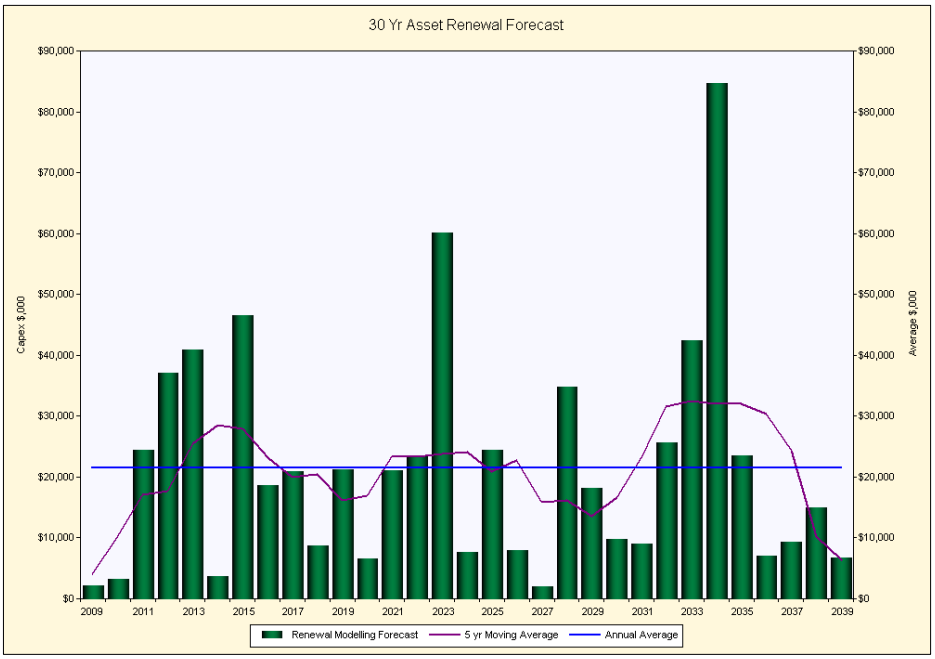

Figure 3: 30 Year Infrastructure Renewal Program

Further analysis of this profile is possible by understanding the main assets that are 'driving' the spikes in the profile. Once determined additional analysis is able to be performed to determine the feasibility of delayed the renewal of those particular assets until a later time, preferably during a period of time when planned expenditure is lower. The aim of this iterative process is to 'flatten' the histogram and enhance renewals affordability on an on-going basis.

The Optimised Renewal Decision Making tool, which is planned for release in a production environment by mid 2010, provides the key functionality to conduct this second level analysis.

3.4 Risk Management

It is important to understand the risk profiles related to assets, particularly underperforming assets. Asset risk exposure is an important input into the renewals modelling process as it provides vital support into the decision making process of deferring 'scheduled' renewals. As risk is an annual representation of the cost of uncertainty, considerations to delay vital asset renewals cannot be made without first understanding the consequences of such delays and evaluating these costs against other cost and revenue considerations.

Annual risk exposure is the product of the probability (or likelihood) of failure occurring (taking into consideration the application of potential redundancy systems) and the consequences of that failure.

Risk / failure mode ($) = Probability (o.n) x Consequence ($) x Redundancy factor

It was a relatively straight forward process to establish an asset risk management framework for PoMC as PoMC already has in place a structured business risk management framework that was replicated with appropriate modifications. It was found that PoMC's asset risk profile is several orders of magnitude lower that its Business risk profile.

Figure four shows the relationship between asset risk exposures and the asset renewals profile.

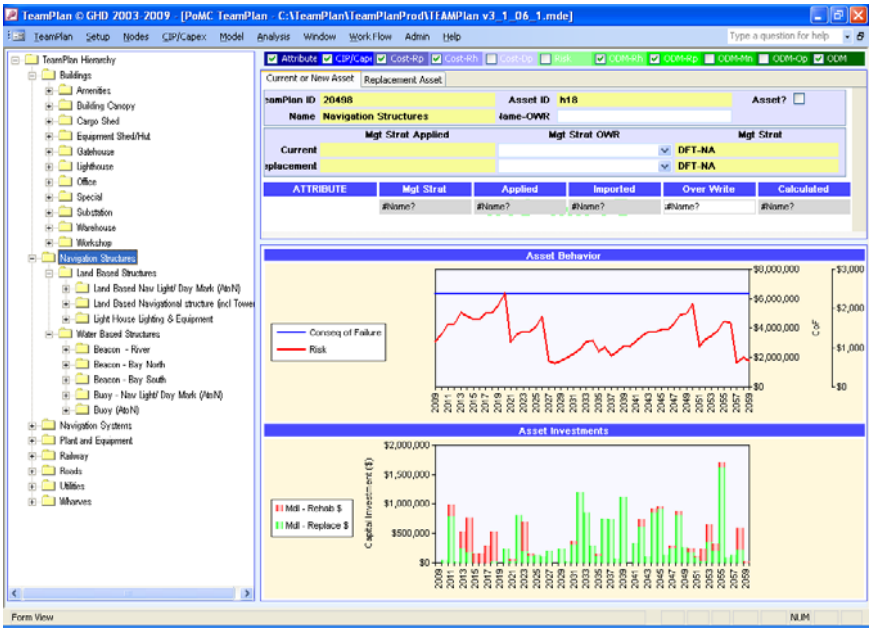

Figure 4: Asset Risk Profile Related to Asset Renewals

It should be noted that the risk profile fluctuates despite the consequences of failure remaining static. This is because of the inverse relationship that exists between the asset renewal profile and probability of failure, which is the other variable used to calculate risk exposure. Fundamentally, when an asset is renewed its condition is improved so its likelihood of failure is reduced accordingly.

3.6 Optimised Renewals Decision-Making

Development of this functionality is well advanced such that it is scheduled for release about mid 2010. This functionality is essentially a financial modelling process whereby the costs and benefits associated with a particular treatment option are evaluated to give a net benefit, i.e. benefits derived by applying the particular treatment less any associated costs.

By considering a 'deferral' of a particular treatment by one year, a similar outcome is obtained, however the 'accumulated' benefits and costs over that year are also considered. Accumulated benefits and costs may be an accumulation of risk exposure, maintenance cost and opportunity costs etc.

The model will run the same analysis over several 'deferral' years to produce a series of plots that indicate the present value of the net benefits and the time at which the optimisation occurs. Typical treatment options include; do nothing, rehabilitate, renew and replace. With all of these treatment options, a 'standard' repeat cycle is assumed, for example, a rehabilitation may have to be repeated every, say 10 years whereas the replacement options provides a new design life.

This functionality may be used on either an individual asset or a generic asset to determine generic optimal treatment options for similar assets in similar physical and financial circumstances. This functionality provides valuable intelligence input into the process of 'flattening' spikes in a renewal profile as it considers every cost element that may have a bearing on whether an asset's planned renewal may be delayed.

Figure 5 shows the present value net benefit curves for three treatment options under consideration for a particular asset. From the graph it can be seen that the optimal renewal strategy for this asset is to do nothing until 2010 and then undertake a major renovation of the facility.

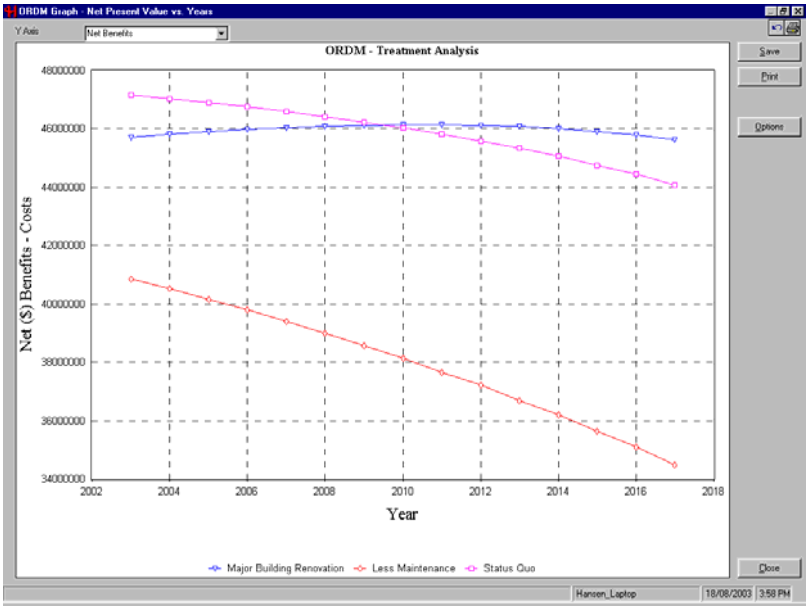

Figure 5: Optimised Renewals Decision Making Output

3.7 Life Cycle Planning

The Life Cycle Planning module has been incorporated into PoMC's core asset management system and as such takes feeds directly from the asset database to populate whole of life costs of built assets.

The main strength of this module is its foreword planning capability which assesses the discounted whole of life costs of assets during the planning phase. By undertaking this analysis an informed decision is able to be made in relation to selecting a particular development configuration that will deliver the lowest life cycle cost while the asset proposal is still 'of the drawing board'.

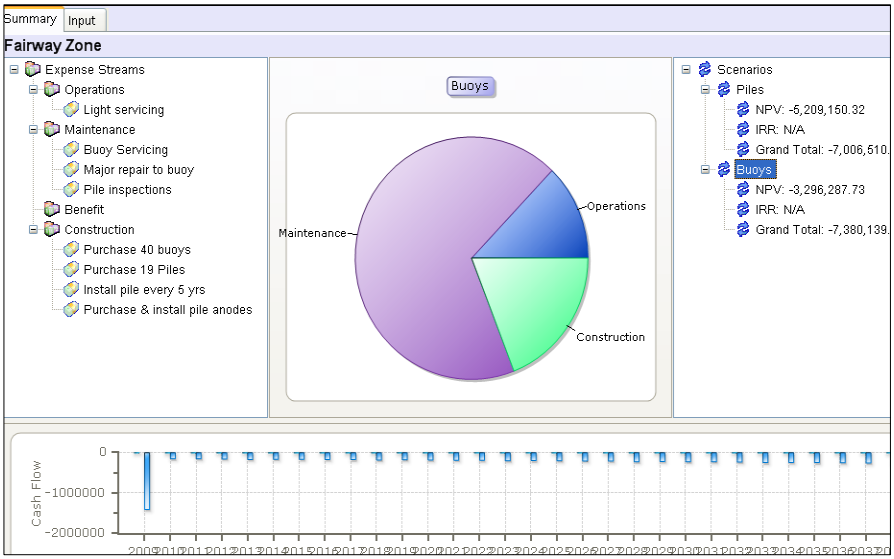

Figure 6: Life Cycle Planning – Case Study

Figure 6 shows the three main cost elements of a particular asset development scenario and indicates that a low capital cost proposal to install a series of navigation buoys in Port Phillip Bay to delineate a shipping Fairway is in fact a more expensive option than constructing navigation piles with a higher capital cost. This can often be the case if a cheaper capital cost scenario has a higher annual operations and maintenance costs.

3.8 Data structures and supporting technologies

To support the above strategic asset management processes and systems, a substantial amount of effort has been invested into the development of robust interfaces to PoMC's GIS to provide a spatial awareness around decision making.

PoMC has also invested heavily in the development of mobile computing technology within its asset management system to streamline operational activities such as condition assessments, asset inspections and remote access by contractors to close work orders directly in the asset management system. In this way a full works and failure history is stored against the asset record by the contractor, subject to PoMC validation. Works and failure history data is vital to the refinement of the management strategies incorporated in the renewals profile module and its use in advanced decision making is a key benchmark for measuring success in strategic asset management.

3.9 Business Processes Reviews

A significant component of the Strategy was the delivery of an asset management awareness program for members of staff and senior managers who have an interest in asset management. The relaxed lecture style process used to deliver this program worked well as it raised the awareness and interest of all participants, including those with only a cursory involvement in asset management.

Substantial benefits to the organisation have already been realised through the refinement of its pre-existing long term asset investment program by the adoption of the 30 year renewals modelling outputs. These outputs are now included in PoMC's corporate financial modelling and in an infrastructure planning sense.

PoMC's infrastructure development protocols have also been reviewed and amended to accommodate whole of life cost outcomes for the evaluation of major infrastructure initiatives.

Maintenance and inspection procedures by operational staff and contractors have been reviewed and refined to make full use of the advantages provided by mobile computing and secure remote access by contractors.

CONCLUSION

As a Government Business Enterprise 100% owned by the Victorian State Government, PoMC has taken a policy position towards impmementing a strategic asset management framework for the long term sustainable of its infrastructure assets.

This approach has seen the implementation of a substantial amount of new technologies and amended business proceses across the business over the past three years. With the work completed to date, the achievement of PoMC's objectives in relation to strategic asset management, are well advanced.

While an enormous amount of work has been completed by a dedicated team of committed professionals to move PoMC from a basic to an advanced level of asset management, there still remains a substantial amount of work to be done to progress PoMC to a best practice organisation, however a program is in place to achieve that goal in 2010.

ACKNOWLEDGEMENTS

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