# Bridge Asset Management Plan


Adopted – Draft

# EXECUTIVE SUMMARY

## INTRODUCTION

The outputs provided by the management of Council's bridge assets contributes fundamentally to Council's objective to plan, develop and maintain a network of sustainable infrastructure.

This plan is intended to demonstrate how Council will support this objective by applying the principles of responsible asset management planning which is to meet a required level of service in the most cost-effective way through the creation, acquisition, operation, maintenance, renewal and disposal of assets to provide for present and future customers.

The contribution of roading services to Council's vision and AM objectives will be achieved by:

- Demonstrating responsible asset stewardship,
- Providing a basis for community consultation to determine appropriate levels of service,
- Implementing a program of inspections and monitoring activities to assess asset condition and performance,
- Undertaking a risk based approach to identify operational, maintenance, renewal and capital development needs, and applying economic analysis techniques to select the most cost effective works program,
- Ensuring services are delivered at the right price and quality,
- Supporting long term financial planning, and
- Continuously reviewing and improving the quality of AM practice.

### Scope of the Plan

The bridges asset type includes all vehicle bridges, major drainage structures and pedestrian bridges located within the road reserve or on a designated pedestrian route.

The scope and value of Council's bridge assets is summarised in the table below.

| Asset Class | Inventory | Current Replacement Cost as at June 2007 ($) | Written Down Value of Entire Asset Class ($) | Total Economic Life (Years) | Average Remaining Economic Life (Years) | |
|---|---|---|---|---|---|---|
| **Bridges Group** | | | | | | |
| Concrete | 85 | $11,328,944 | $8,567,400 | 70 | 53 | 76% |
| Composite | 49 | $4,190,113 | $2,996,804 | 50 | 36 | 72% |
| | **Totals** | $15,519,058 | $11,564,204 | | | |

### Relevant Stakeholders

A stakeholder represents any group(s) or individuals having an interest, in this case, in the service provided by Council's bridge infrastructure.

The stakeholders in the management of Council's these assets are many and often their needs are wide-ranging. The relevant key stakeholders are:

- Local residents including private car drivers, cyclists, pedestrians, etc,
- Industrial and commercial operators and other transport services,
- Emergency Services,
- Other Government Departments, and
- Visitors to the Colac Otway Shire.

The community's needs and expectations are subject to change frequently and are becoming more demanding manifested by demands for services that provide better quality, value for money, environmental awareness and relevant value adding.

**Relationship with Other Plans**

Asset Management plans are a key component of the Council planning process, linking with the following plans, documents and statutory processes.

**Corporate Plan**

The BrAMP is a key document in Council's overall strategic planning objectives.

The Colac Otway Shire's BrAMP is consistent with Council's commitment and goals to plan, develop and maintain a sustainable road network, whilst providing Best Value to the community.

The specific strategies and outcomes identified in the Council Plan 2005 – 2009 include:

- Continue increased funding of infrastructure asset renewal, particularly on rural road resheeting, drainage, timber bridges and footpaths.

- Advocate for improved infrastructure services:

    - Upgrade Turtons Track as a major sealed 2WD Touring route,
    - Upgrade of the main access roads between Princes Hwy and the Great Ocean Road including the Colac – Forrest Road, Birregurra - Forrest Road, Forrest – Skenes Creek Road and the Colac – Lavers Hill Road consistent with actions contained in the Great Ocean Road Regional Strategy.
    - Location of the Geelong By-Pass connection with the Princes Highway to enable a continuous 100kmh speed zone.
    - Construction of a dual carriageway Princes Highway from Geelong to Colac and then beyond to the South Australian border.
    - Development of an alternative heavy vehicle route for the city of Colac.
    - Identification of a designated route for the future location of a Colac By - Pass along the Princes Hwy.

- Implementation of Road Safety Plan and Council approved road safety initiatives in partnership with Vic Roads and other agencies.

- Develop and implement the Asset Management Plans and Asset Management Systems for all infrastructure categories.

- Manage our roads consistent with Council's Road Management Plan

- Strategically manage the impacts on Council's local road network giving consideration to emerging industries and changes in transport demands.

**Asset Management Plan Structure**

The following illustrates the structure and intention of the asset management planning process as it relates to the development of an asset management plan. It also highlights the relevant section references as contained in Council's BrAMP.

| | |
|---|---|
| **Section 1 Introduction** | Outline the purpose and scope of the plan. Justify asset ownership and identify corporate objectives. |
| **Section 2 Level of Service** | Define factors relevant to determining the level of service. Identify current and target level of service. |
| **Section 3 Future Demand** | Identifies the factors influencing future demand. Predicts future changes in demand. State the demand management plan. |
| **Section 4 Strategic AM Policies** | States the strategic risk and investment policies implemented for developing asset plans. |
| **Section 5 Life Cycle Management Plans** | Provides asset information. Identifies maintenance and capital development needs. Identifies management strategies and work programs. |
| **Section 6 Financial Forecast** | Identifies long term financial forecasts. Notes key assumptions and financial policies. |
| **Section 7 AM Improvement** | Describes current AM practice underpinning the plan. Identifies enhancements planned to improve AM planning. |

## LEVELS OF SERVICE

Level of service is the defined service quality for a particular activity or service area against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.

An important objective of the BrAMP is to match the level of service provided by Council's bridge infrastructure assets with the expectations of the community given financial, technical and legislative constraints.

### Defining Level of Service

The adopted levels of service for Council's bridge assets reflect current industry standards and are based on:

- Legislative requirements – Statutory Acts, Regulations and standards that impact on the way these particular assets are managed
- Community research and expectations – Information gained from the community on expected quality and price of service.
- Council's strategic goals – Provide guidelines for the scope of current and future services offered, the manner of service delivery and define the specific levels that Council desires to achieve.

## FUTURE DEMAND

The Colac Otway Shire is characterised by its significant agricultural and timber industries, growing tourism and widely dispersed population centres connected by an expansive network of sealed and unsealed roads.

Factors effecting demand including population growth, traffic growth, social and technology change. The impact of these trends is examined and some demand management strategies are recommended as a technique to modify demand without compromising customer expectations.

### Factors Effecting Demand

The significant changing demands the Colac Otway Shire needs to consider are:

1. The change in the vehicle types travelling on local roads, especially increased volumes of heavy vehicles. As such, there is an ever growing demand on many of Council's bridges to cater for transport vehicles operating at Higher Mass Limits

2. Continual demand for improvements in the levels of service. This can result from:

   - Advances in available technology,
   - Standards of living improving,
   - A greater understanding of the community's perceptions and expectations,
   - A higher level of road safety conscientiousness,
   - Changing legislative requirements, and
   - Change in the strategic management of assets by Council

## LIFECYCLE MANAGEMENT PLAN

Lifecycle management focuses on management options and strategies considering all relevant economic and physical consequences as part of an assets life cycle, from initial planning to disposal.

The life cycle management plan for Council's bridges and major drainage assets presents an analysis of all available asset information and the management plans covering the three key work activities necessary to manage the portfolio, these being:

**Operations & Maintenance Plan:** Activities undertaken to ensure efficient operation and serviceability of the assets, and therefore that assets retain their service potential over their useful life.
**Renewal Plan:** To provide for the progressive replacement of individual assets which have reached the end of their useful life. Deteriorating asset condition primarily drives renewal needs.
**Development Plan:** To improve parts of the system currently performing below target service standards and to allow development to meet future demand requirements. Sub-standard asset performance primarily drives asset development needs.

## FINANCIAL SUMMARY

This section outlines the long-term operations, maintenance and capital financial requirements for the operation, maintenance, renewal and development of roading assets based on long-term strategies outlined earlier in the plan. Funding issues are discussed and key assumptions made in preparing the financial forecasts are noted.

**Historical Expenditure**

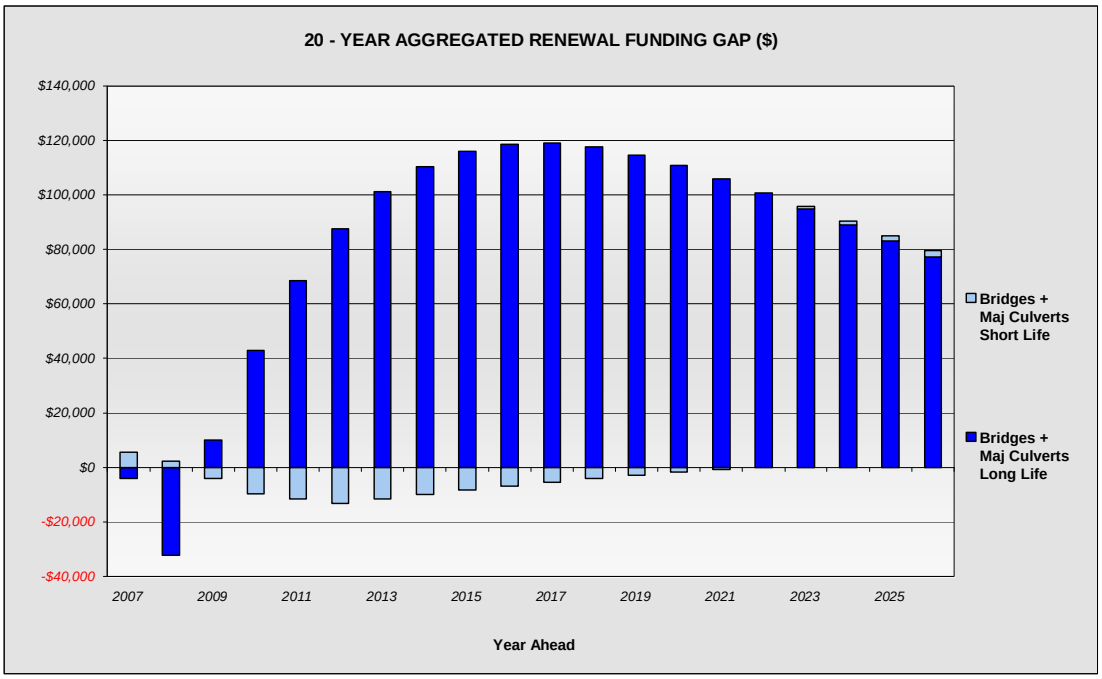
| ***Maintenance*** | **Actual 2005/06** | **Actual 2006/07** | **Budget 2007/08** |
|---|---|---|---|
| **Bridges Group** | $78,300 | $148,700 | $160,000 |
| **Total** | **$78,300** | **$148,700** | **$160,000** |
| ***Capital Renewal*** | **Actual 2005/06** | **Actual 2006/07** | **Budget 2007/08** |
| **Bridges Group** | $142,460 | $235,542 | $83,000 |
| **Total** | **$142,460** | **$235,542** | **$83,000** |
| ***Capital Upgrade*** | **Actual 2005/06** | **Actual 2006/07** | **Budget 2007/08** |
| **Bridges Group** | $0 | $0 | $32,000 |
| **Total** | **$0** | **$0** | **$32,000** |
| ***Capital Expansion*** | **Actual 2005/06** | **Actual 2006/07** | **Budget 2007/08** |
| **Bridges Group** | $323,345 | $15,325 | $20,000 |
| **Total** | **$323,345** | **$15,325** | **$20,000** |

**Expenditure on Assets History**

## Predicted Funding Requirements

Overall, Council has developed a strategy for portraying life-cycle requirements and predictions of road infrastructure condition and performance over the next 20 years. In general, the model used to assist in predicting future asset renewal demands and requirements was developed through Council's involvement in the MAV Step Asset Management Program.

The following Figure indicates the Renewal Funding Gap profile for Council's bridge and major drainage infrastructure over the next twenty (20) years.




**Road Asset Renewal Funding Gap Profile**

The renewal gap profile has been modelled on the expected funding levels adopted by Council's Strategic Resource Plan 2007/08 – 2010/11. The levels of funding for bridge replacement are sufficient to undertake necessary projects until the need increases moderately in about 6 to 7 years.

## Funding Strategy

The aim of Council's Strategic Resource Plan is to assist it in understanding the medium to long term implications of its policies and strategies which are proposed each year and subsequently adopted in the annual budget process. It is intended that the principles of the BrAMP are incorporated into the planning of future budgets.

The Strategic Resource Plan is closely aligned to the Council Plan and provides Council with a broader understanding of the financial implications of its strategic decisions. It guides Council and management in the preparation of future corporate strategies and associated allocation of budgets.

Council's Annual Budget Process is based on the following principles:

1. Deliver the results sought by Council as specified in the outcome statements in each program area.
2. Deliver outcomes as identified in Council's Annual Plan.

3. Reflect Council's capital expenditure priorities as identified in the Five (5)-Year Capital Investment Program, including no new major capital projects.
4. Emphasise the implementation of adopted strategies and priorities identified in Business Plans.
5. Increase funding levels for infrastructure asset renewal and maintenance.
6. Increase working capital and cash reserves.
7. Minimise rates and charges increases.
8. Not exceed existing staff levels.
9. Undertake no new loan borrowing's

**Summary**

All three classifications of Capital Investment, Renewal, Upgrade and Expansion are warranted in differing circumstances:

- Renewal works maintain assets,
- Upgrade works satisfy changes in demand or rectify assets that are perceived as insufficient in meeting community needs, and
- Expansion projects accommodate growth

Council has a current budget strategy that responds to community demand and asset renewal requirements. Council's current emphasis is on asset renewal expenditure rather than asset development.

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# 1.0 INTRODUCTION

This section sets out the scope and objectives of this asset management plan, describes its relationship with other Colac Otway Shire documents, plans and strategies. This section also demonstrates the Bridge Asset Management Plan (BrAMP) framework.

## 1.1 Objectives of this Plan

In order to facilitate the provision of its services to the community, the Colac Otway Shire manages an extensive range of community assets. One of the most significant groups of these assets, with regard to the difficulty and expense of managing, are Council's road infrastructure assets.

Bridges are key elements of the road network and represent a major investment of community resources. Because of their location over natural and other obstacles, any bridge failure may severely restrict road traffic with consequent inconvenience and economic loss to the community.

The outputs provided by the management of Council's bridge assets contributes fundamentally to Council's objective to plan, develop and maintain a network of sustainable infrastructure.

This plan is intended to demonstrate how Council will support this objective by applying the principles of responsible asset management planning which is to meet a required level of service in the most cost-effective way through the creation, acquisition, operation, maintenance, renewal and disposal of assets to provide for present and future customers.

The contribution of roading services to Council's vision and AM objectives will be achieved by:

- Demonstrating responsible asset stewardship,
- Providing a basis for community consultation to determine appropriate levels of service,
- Implementing a program of inspections and monitoring activities to assess asset condition and performance,
- Undertaking a risk based approach to identify operational, maintenance, renewal and capital development needs, and applying economic analysis techniques to select the most cost effective works program,
- Ensuring services are delivered at the right price and quality,
- Supporting long term financial planning, and
- Continuously reviewing and improving the quality of AM practice.

The specific purpose of this plan is to:

- Improve the understanding of service level standards and options,
- Identify minimum long term life cycle costs to provide an agreed level of service,
- Better understand and forecast asset related management options and costs, and the ability to balance out peak funding demands,
- Clearly justify forward works programs and expenditure,
- Manage risk associated with asset failure, and
- Improve decision making based on costs and benefits of alternatives.

## 1.2 Scope of the Plan

The bridges asset type includes all vehicle bridges, major drainage structures and pedestrian bridges located within the road reserve or on a designated pedestrian route.

The scope and value of Council's bridge assets is summarised in Table 1.0.

| Asset Class | Inventory | Current Replacement Cost as at June 2007 ($) | Written Down Value of Entire Asset Class ($) | Total Economic Life (Years) | Average Remaining Economic Life (Years) | |
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**Table 1.0 –** Scope of Bridge Assets

There are a number of pedestrian bridges, viewing platforms and boardwalks provided under recreational services/programs. These assets are not considered in this plan but will be maintained and replaced in accordance with the principles of this plan.

### 1.3 Relevant Stakeholders

A stakeholder represents any group(s) or individuals having an interest, in this case, in the service provided by Council's bridge infrastructure.

The stakeholders in the management of Council's these assets are many and often their needs are wide-ranging. The relevant key stakeholders are:

- Local residents including private car drivers, cyclists, pedestrians, etc,
- Industrial and commercial operators and other transport services,
- Emergency Services,
- Other Government Departments, and
- Visitors to the Colac Otway Shire.

The community's needs and expectations are subject to change frequently and are becoming more demanding manifested by demands for services that provide better quality, value for money, environmental awareness and relevant value adding.

### 1.4 Relationship with Other Plans

Asset Management plans are a key component of the Council planning process, linking with the following plans, documents and statutory processes.

#### 1.4.1 Corporate Plan

The BrAMP is a key document in Council's overall strategic planning objectives.

The Colac Otway Shire's BrAMP is consistent with Council's commitment and goals to plan, develop and maintain a sustainable road network, whilst providing Best Value to the community.

The specific strategies and outcomes identified in the Council Plan 2005 – 2009 include:

- Continue increased funding of infrastructure asset renewal, particularly on rural road resheeting, drainage, timber bridges and footpaths.

- Advocate for improved infrastructure services:

    - Upgrade Turtons Track as a major sealed 2WD Touring route,

- Upgrade of the main access roads between Princes Hwy and the Great Ocean Road including the Colac – Forrest Road, Birregurra - Forrest Road, Forrest – Skenes Creek Road and the Colac – Lavers Hill Road consistent with actions contained in the Great Ocean Road Regional Strategy.
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- Implementation of Road Safety Plan and Council approved road safety initiatives in partnership with Vic Roads and other agencies.

- Develop and implement the Asset Management Plans and Asset Management Systems for all infrastructure categories.

- Manage our roads consistent with Council's Road Management Plan

- Strategically manage the impacts on Council's local road network giving consideration to emerging industries and changes in transport demands.

### 1.4.2 Council Policies & Strategies

The Colac Otway Shire applies a 'whole of life' approach to the management of its Infrastructure Assets. This provides for an encompassing view of asset management through the application of an Asset Management Policy and a Strategic Asset Management Plan.

In its simplest terms, asset management is about the way in which we look after the assets around us, both on a day-to-day basis (maintenance and operations) and in the medium to long term (strategic and forward planning).

### 1.4.3 Asset Management Policy

The Asset Management Policy states Council's commitment to working towards implementing Advanced Asset Management principles to ensure that assets are planned, created, operated, maintained, replaced or disposed in accordance with Council's priorities for the services it delivers.

The purpose of Council's Asset Management Policy is to:

- Set the framework that supports the management of Council's *asset*s,
- Set Council's broad corporate goals and objectives for the management of its *asset*s incorporating a life-cycle approach to *asset management,*
- Ensure service delivery needs form the basis of *asset management,*
- Provide for present needs while sustaining resources for future generations, and
- Define the role of Council and to guide decision makers in providing quality management of its *assets.*

The benefits of a strategic approach to establishing this policy include:

- Better allocation of limited council resources,
- Improved alignment of assets with services and community expectations,
- Reduced demand for new council assets through better integration of service planning and asset planning,
- More effective use and maintenance of existing council assets,
- Improved processes and accountability for capital and recurrent works, and
- Increased use of sustainable development solutions.

### 1.4.4 Strategic Asset Management Plan

The Strategic Asset Management Plan outlines and guides Council's asset response to its service requirements, through the development of an asset portfolio, risk management strategies and asset performance measures.

The principal objective of strategic asset management is to ensure that Council meets its service delivery objectives efficiently and effectively.

This objective will be achieved by:

- Maximising the service potential of existing assets by ensuring they are appropriately used and maintained;
- Reducing the demand for new assets through demand management techniques and consideration of alternative service delivery options;
- Achieving greater value for money through a rigorous project initiation and evaluation process which takes into account life cycle costing, value management techniques and private sector involvement;
- Eliminating unnecessary acquisition and holding of assets by ensuring agencies are aware of, and required to pay for, the full costs of holding and using assets; and
- Focusing attention on results by clearly assigning responsibility, accountability and reporting requirements in relation to asset management.

This outcome is supported by a comprehensive Strategic Asset Management Plan that addresses capital investment, the operation and maintenance of existing assets, and the rationalisation and disposal of assets.

### 1.4.5 Road Management Plan

The Road Management Plan (RMP) sets the relevant standards and policy decisions in relation to the discharge of Council's duties in the performance of its road management functions.

The RMP details the management systems that Council has implemented in order to maintain, upgrade and operate its physical road assets cost-effectively. This document also provides the vision for how Council plans to manage its road network. This vision ensures that the community is provided with a road system that returns optimum economic benefit for the life of the asset while recognising social, safety, environmental, and user needs.

### 1.4.6 Best Value

In association with Best Value, Council is required to comply with the Best Value Principles as defined by the *Local Government Act 1989, Section 208B*. Council has considered these fundamental principles in developing the relevant standards, policy and operational objectives as they relate to this RAMP.

The principles that Council must observe are as follows:

- There must be quality and cost standards set for all services that a council provides to the community,
- All services provided by a council must be responsive to the needs of the community,
- Each service provided by a council must be accessible to those members of the community for whom the service is intended,
- A council must achieve continuous improvement when providing services to the community,
- A council must develop a program of regular consultation with its community in relation to the services it provides, and
- A council must report regularly to its community on its achievements in relation to the Best Value Principles.

## 1.5 Purpose of Asset Ownership

Local Government Authorities exist principally to supply core services that meet the needs of their communities.

What services are provided, and how they are provided, depends on the level of service required by the community. Council has the option of owning road infrastructure assets or supporting their development by the private sector.

The movement of goods and people is generally regarded as the most essential activity associated with enhancing the municipality's economy and accessibility. As such, it is identified that roads and related infrastructure are an essential service that should be delivered by Council.

Council has not considered non-ownership options for delivering services relating to road infrastructure assets. Arguments to justify public ownership of such assets include:

- The road network is a key asset for the sustainable development of the Colac Otway Shire's community,
- The provision of road related services is a core function of Council,
- The provision of these services is assessed as having primarily public benefits,
- Rural residents have a strong affinity with the road network,
- The public generally do not favour private ownership of key infrastructure assets, and
- The balance between the needs of the community and road users is best dealt with through consultation at a local level.

One issue that continues to be a point of debate is the ownership of limited use roads and bridge assets. The Colac Otway Shire has a number of timber bridges, which in some situations serve only a limited number of properties. The continued ownership and maintenance of these bridges may be difficult to justify from a financial perspective, however, continued ownership can be debated from a community and social benefit.

## 1.6 Asset Management Plan Structure

Table 1.1 illustrates the structure and intention of the asset management planning process as it relates to the development of an asset management plan. It also highlights the relevant section references as contained in Council's BrAMP.

| | |
|---|---|
| **Section 1**<br>**Introduction** | Outline the purpose and scope of the plan. Justify asset ownership and identify corporate objectives. |
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| **Section 7**<br>**AM Improvement** | Describes current AM practice underpinning the plan. Identifies enhancements planned to improve AM planning. |

**Table 1.1 –** Asset Management Plan Structure

## 1.7 Asset Management Philosophy

Asset management is a core function of Council. The role of asset management under the strategic direction of Council is shown in Figure 1.1.

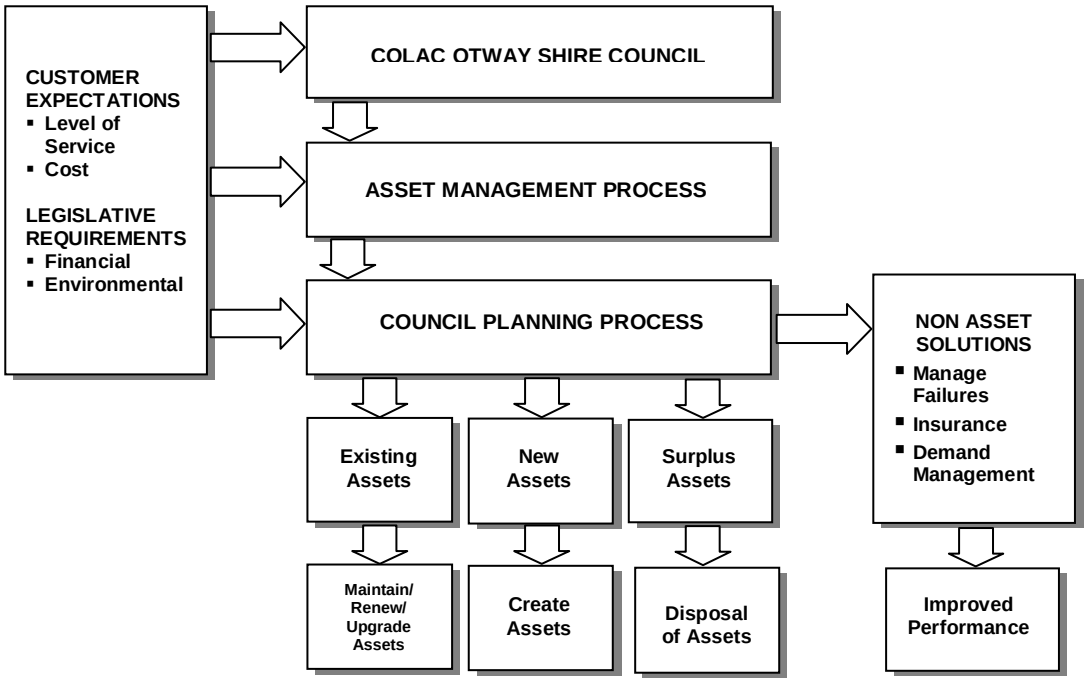



**Figure 1.1 –** Corporate Link to Asset Management

Asset management planning must be linked to the service planning that supports Council's vision and corporate objectives. At a basic level, assets exist to support the services provided by Council. The Bridge Asset Management Plan is a strategic level document for achieving road management strategies resulting from the service planning process.

## 1.8 Asset Management Drivers

### 1.8.1 Community Consultation

The community requires that agreed levels of service be delivered reliably, efficiently and economically. Asset Management techniques focus on the need to seek stakeholder involvement in establishing the appropriate balance between levels of service, risk and expenditure in a manner that promotes intergenerational equity.

The process of community consultation enhances the community's confidence that funding is being allocated in an equitable and cost effective manner and within any constraints identified by the Asset Management Plan.

### 1.8.2 Advocacy

Council's role in advocating on behalf of the municipalities road users, ratepayers and residents is a key driver of the asset management process as it enables objective justification of submissions for and equitable access to external funding for its road infrastructure assets.

External funding for creating, renewing or maintenance of road assets is obtained from a number of sources including State and Federal Governments.

### 1.8.3 Financial Responsibility

Council's Strategic Resource Plan is closely aligned to the Council Plan and provides Council with a broader understanding of the financial implications of its strategic decisions. It guides Council and management in the preparation of future corporate strategies and associated allocation of budgets.

The aim of the Strategic Plan is to assist Council in understanding the medium to long term implications of its policies and strategies which are proposed each year and subsequently adopted in the annual budget process.

The implementation of works programs and associated long term financial projections in Council's BrAMP are the means of satisfying the above corporate objectives in relation to management of road infrastructure assets.

### 1.8.4 Economic Efficiency

Council manages its road infrastructure assets on behalf of its stakeholders

The techniques of asset management support economic efficiency by:

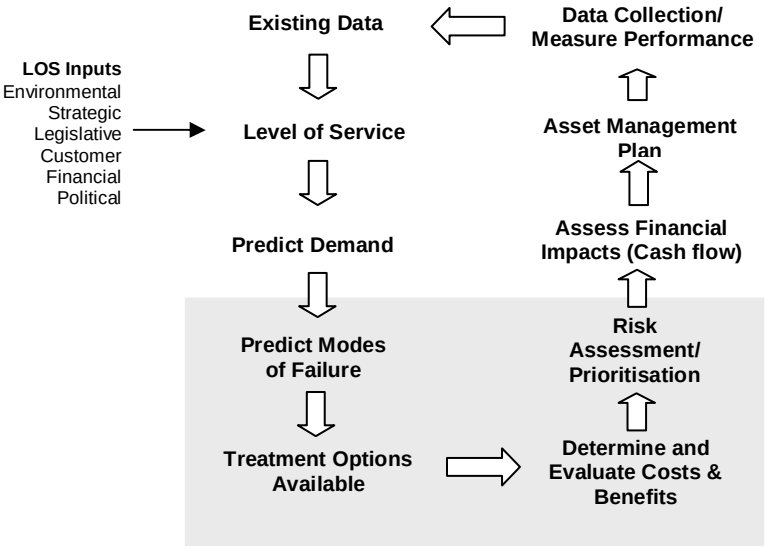
- Enabling Council to plan and prioritise asset maintenance and renewal expenditure,
- Identifying under-funding of asset maintenance and renewal,
- Quantifying risk, allowing the minimisation of high impact failures,
- Providing a basis for monitoring asset performance and utilisation, and
- Extending the life of an asset by optimising maintenance and demand management.

### 1.8.5 Council Vision

Council aims to operate in accordance with good governance principles whilst emphasising the importance of service, people and business in the management of its infrastructure assets. Asset management planning reflects this corporate aim.

## 1.9 Asset Management Development Methodology

Figure 1.2 demonstrates the typical steps involved in preparing a comprehensive asset management system.




(Advanced AM Improvement Area)

**Figure 1.2 –** Asset Management Process

This methodology provides a best practice approach to asset management; however, best practice is not always appropriate practice. Setting the right level for asset management practices is part of a needs analysis taking into account factors such as:

- Corporate objectives,
- Legal requirements,
- Community expectation,
- Nature of assets,
- Exposure to risk, and
- Resource availability.

Typically, asset management processes start at a basic level that focus on existing practices, and develop, through commitment, to a more advanced level identifying strategies to reduce lifecycle costs through improved practices and analysis tools.

### 1.9.1 Basic Asset Management

Basic asset management relies on the use of an asset register, maintenance management systems, simple condition and performance monitoring, and defined service levels in order to establish alternative management options.

### 1.9.2 Advanced Asset Management

Advanced asset management uses prediction modelling, risk management, and *optimised renewal decision-making* techniques to evaluate options and identify the optimum long-term plan to deliver a particular level of service.

For the purposes of developing this initial BrAMP, Council has adopted a basic approach to its asset management. This is due to some limitations in the available information and systems utilised. However, this plan will provide recommendations for staged improvement in Council's asset management practices.

# 2.0 LEVELS OF SERVICE

This section defines the level of service or performance criteria that are required and the basis of the decision behind their adoption. The levels of service support Council's strategic goals and are based on customer expectation and statutory requirements.

Level of service is the defined service quality for a particular activity or service area against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.

An important objective of the BrAMP is to match the level of service provided by Council's bridge infrastructure assets with the expectations of the community given financial, technical and legislative constraints.

Asset Management planning requires a clear understanding of the community's needs and preferences. The levels of service standards defined by the BrAMP are used:

- To inform the community of the proposed level of service to be delivered,
- As a focus for the asset management strategies developed to deliver the agreed level of service,
- As a measure of the effectiveness of this asset management plan,
- To identify costs and benefits of the services offered, and
- To enable the community to assess the suitability, affordability and equity of the level of service offered.

The levels of service detailed in this BrAMP reflect the existing service levels provided by Council within current budget allocations. The current levels of service may not entirely meet the community's expectations in terms of cost and quality.

However, it is important to initially document the current levels of service. Levels of service are subject to continued review and can be updated as further detailed information in relation to community and road user expectations becomes available.

## 2.1 Defining Level of Service

The adopted levels of service for Council's bridge assets reflect current industry standards and are based on:

- Legislative requirements – Statutory Acts, Regulations and standards that impact on the way these particular assets are managed
- Community research and expectations – Information gained from the community on expected quality and price of service.
- Council's strategic goals – Provide guidelines for the scope of current and future services offered, the manner of service delivery and define the specific levels that Council desires to achieve.

### 2.1.1 Legislative Requirements

Statutory requirements set the framework for minimum levels of service that bridges and major drainage structures are required to meet.

The foremost legislative powers and duties in relation to Council's management of its bridge assets are:

- *Local Government Act 1989*
- *Road Management Act 2004*

### 2.1.1.1 Local Government Act 1989

This Plan has been developed to reflect the purposes and objectives of Council as specified in *Sections 6* and *7* of the *Local Government Act 1989. Section 6 (1)* of this Act describes the purposes of a Council that includes the following:

- To provide equitable and appropriate services and facilities for the community and to ensure that those services and facilities are managed efficiently and effectively, and
- To manage, improve and develop the resources of its district efficiently and effectively.

The *Local Government Act 1989* contains the legislation relating to the care and management of all public highways vested in the Council and all roads that are the subject of a declaration under *Section 204(2)*.

*Section 205(2)* states 'A Council that has the care and management of a road:

a) Must ensure that if the road is required for public traffic, it is kept open for public use (subject to the exercise of any powers that it has to the contrary under *Schedules 10* and *11*),
b) May carry out work on the road, and
c) Is not obliged to do any particular work on the road, and in particular, is not obliged to carry out any surface or drainage work on an unmade road.

### 2.1.1.2 Road Management Act 2004

The *Road Management Act 2004* establishes improved road management legislation to provide a more efficient and safer road network for all road users.

The aim of the Act is to establish for road management authorities, management systems for the public road network that they manage. The Act assists Council, as a road authority, to determine its own appropriate management plan and standards in order to manage civil liability by defining and achieving its responsibilities.

The objectives of the Act are to:

- Specify the general rights of road users and their obligations in relation to responsible road use,
- Establish a system for the management of safe and efficient public roads that best meets the needs and priorities of the community within the limitations of Council's resources and budgetary frameworks,
- Establish a system of road classification for the division of responsibilities between State and local road authorities,
- Provide for the keeping of a register which records public roads to be constructed, maintained and managed by Council, and
- Clarify the law relating to civil liability for the management of public roads and other public highways.

As a Road Authority, Council has the general management functions of:

- Provision and maintenance of a network of public roads for use by the community,
- Management of the use of public roads having regard that the primary purpose of a road is use by member of the public,
- Management traffic on public roads, and
- Coordinating the installation of infrastructure on public roads in such a way to minimise adverse impacts on the provision of utility services.

### 2.1.2 Community Research and Expectations

Council's knowledge of community expectation is based on:

- Annual community satisfaction survey outcomes (Council Plan – Performance Indicators),
- Quarterly customer surveys,
- Consultation via the Annual Plan process,
- Best Value consultation,
- Councillor feedback, and
- Analysis of customer requests and responses

Council, as a continual improvement process, continues to engage its community to better understand their needs and concerns.

#### 2.1.2.1 Annual Community Satisfaction Survey

The Colac Otway Shire is one of 79 Local Councils who participate in the Annual Community Satisfaction Survey. This survey covers all aspects of Council's operations including asset related activities associated with drainage, parks & gardens and roads.

Table 2.0 summarises the results of this survey for the key service area of local roads and footpaths.

| Performance Indicator | Actual 2004/05 | Actual 2005/06 | Actual 2006/07 |
|---|---|---|---|
| Constituent Satisfaction Survey Index in the key service area of Local Roads and Footpaths | 44 | 52 | 50 |

**Table 2.0 –** Customer Satisfaction Survey Index

The low performance rating attributed to the provision of road and footpath services suggests that relative asset activity allocations do not reflect community expectations.

From the 2006/07 Annual Survey, reasons given by the community for the need in improvement in the delivery of local road and footpath services are, in the order of importance, as follows:

- More frequent/ better re-surfacing of roads,
- Improve/ Fix/ Repair uneven surface of footpaths,
- Improve/More frequent grading etc of unsealed roads,
- More frequent/ better slashing of roadside verges,
- Improve the quality of maintenance on roads and footpaths.
- Improve standard of unsealed roads (loose gravel, dust, corrugations),
- Fix/ improve unsafe sections of roads,
- Fix/ improve edges and shoulders of roads,
- Increase number of footpaths/ widen footpaths, and
- More/better roadside drains and culverts.

Community input into service delivery needs to be considered against its willingness to fund a desired level of service. It is also important that any decision to adopt any changes to the defined levels of service be in the best interest of the overall community.

#### 2.1.2.2 Best Value Consultation

During 2003, Council completed a Best Value Review of the delivery of road services in accordance with the requirements of the *Local Government Act 1989.*

Direct inputs from the community have been included in the preparation of this BrAMP and the development of the defined levels of service for Council's road network.

### 2.1.3 Strategic Goals

The operation and development of bridges and major drainage structures is guided by, and consistent with, Council's corporate goals as stated in its Corporate Plan.

Council's vision in the provision of road infrastructure assets is that -

*'Colac Otway Shire will plan, develop and maintain a network of sustainable infrastructure'*

The concept of sustainability in terms of asset management is focused on the need to balance levels of service, risk and expenditure in a manner that considers intergenerational equity.

## 2.2 Desired Level of Service

A more aware and sophisticated community continually generates demand for increased performance, and consequently, the expectations and demands of the Colac Otway Shire's community are expected to increase.

These expectations and the community's perception of Council's performance are impacted significantly by issues related to resource allocation. Whilst expenditure on road infrastructure has been increased in recent years, community surveys indicate that financial resources are inadequate to maintain this infrastructure to a level of service that the community expects.

To provide appropriate levels of service it is necessary that Council remains focused on customer needs. Typically, community expectations of service delivery are high at the lowest possible cost. This is obviously unsustainable. The community must be educated as to the true cost of service delivery and then be allowed to make an informed decision regarding the levels and type of service delivery required.

These tools must be utilised to ensure that the services and assets provided are those best suited to the community served. Before any attempt is made to reduce or change demand on funding, there must be some assessment of the community's expectations of levels of service. The development of performance measures and targets for road asset service criteria is required. These criteria must consider not only the community's expectations, strategic goals, and legislative requirements, but also technical standards and Council's ability to allocate sufficient resources to meet measures and targets.

# 3.0 FUTURE DEMAND

The Colac Otway Shire is characterised by its significant agricultural and timber industries, growing tourism and widely dispersed population centres connected by an expansive network of sealed and unsealed roads.

The objective of asset management is to create, operate, maintain, rehabilitate and replace assets at the required level of service for present and future customers in a cost effective and environmentally sustainable manner. The asset management plan must therefore forecast the needs and demands of the community in the future and outline strategies to develop the assets to meet these needs.

This section of the BrAMP analyses factors effecting demand including population growth, traffic growth, social and technology change. The impact of these trends is examined and some demand management strategies are recommended as a technique to modify demand without compromising customer expectations.

## 3.1 Factors Effecting Demand

The significant changing demands the Colac Otway Shire needs to consider are:

1. The change in the vehicle types travelling on local roads, especially increased volumes of heavy vehicles. As such, there is an ever growing demand on many of Council's bridges to cater for transport vehicles operating at Higher Mass Limits

2. Continual demand for improvements in the levels of service. This can result from:

    - Advances in available technology,
    - Standards of living improving,
    - A greater understanding of the community's perceptions and expectations,
    - A higher level of road safety conscientiousness,
    - Changing legislative requirements, and
    - Change in the strategic management of assets by Council

## 3.2 Demand Forecast

The overall implications of continual demand for improvements in levels of service, a static population and increasing numbers of heavy vehicles on the bridge network are:

- An increased demand for higher structural capacities,
- An increased rate of deterioration of bridges,
- An increasing focus on road user safety,
- The need for an increased level of expenditure on the assets to maintain the intended levels of service.

Demand forecasting aims to identify factors influencing the demand for an asset and the associated impact on the management and utilisation of the asset.

Travel, for people or goods moving either locally or regionally, dictates the demand for road infrastructure. Factors including the following affect utilisation of the road network include:

- Growth in residential, industrial and commercial areas,
- Changes in land use,
- Population growth,
- Travel patterns,
- Adverse changes in traffic composition, and
- Key stakeholder expectations

Changes in traffic composition involve heavier vehicle loads or greater volumes of traffic than those anticipated in the original design and provision of bridges. These factors in turn have an effect on planned renewal or upgrade of these assets.

Colac is the key industrial, commercial and service centre for the municipality and surrounding region with a population of approximately 12,000. Apollo Bay is the second largest urban township within the shire with a permanent population of 1,000 that swells to over 15,000 during peak holiday times. The current shire population is 20,207.

Whilst forecasts indicate that population growth will be static over the next 20 years, traffic counts consistently show continued growth in traffic volumes and use of roads by heavy vehicles.

High productivity vehicles, such as B-Doubles and vehicles at Higher Mass Limits, are important to the efficiency of the freight task locally and regionally. The larger capacity of these vehicles reduces the number of vehicles required to transport a given amount of freight.

The extent of the potential benefit of these vehicles is related to the degree of access to the road network. Access to local roads within the Colac Otway Shire is allowed where these vehicles can operate safely with other traffic and where road infrastructure, including road pavements and bridges, is capable to carry legal load limits. The current legal loads were adopted in Victoria in July 1999, and are detailed in Figure 3.0.

| Vehicle Type | General Mass Limit (tonnes) | Higher Mass Limit (tonnes) |
|---|---|---|
|  | 15.0* | 15.0* |
|  | 22.5* | 23.0* |
|  | 39.0* | 40.0** |
|  | 42.5* | 45.5* |
|  | 55.5** | 57.0** |
|  | 62.5** | 68.0** |

**Notes**: * Travel on all local roads is approved provided that there is not a 'no truck' sign or a sign displaying a load limit that is less than the gross mass of the vehicle

** Travel on local roads is either by two (2) permits:

1. A general permit as per notice published in the Victoria Government Gazette. This notice details all local roads which are permissible to use.
2. A VicRoads permit for specific local roads – written approval from Council is required for use of local roads prior to a permit being issued from VicRoads.

**Figure 3.0** – Mass Limits by Vehicle Type

In line with these load ratings, a structural capacity assessment program has been established to determine the strength of those bridges on key transport links. It is proposed that this program be extended to other structures on the local road network on a priority basis.

Industry, in particular the timber and dairy sectors, are continually upgrading their transport fleets from semi-trailers operating at General Mass Limits to similar vehicles operating at Higher Mass Limits as a means to achieving operational efficiencies and reducing transport costs,. There is also increased demand for the use of 19-metre and 25-metre B-Double transports operating at Higher Mass Limits on the local road network.

Heavy vehicle use of the road network infrastructure impacts very significantly on its performance and its ability to be maintained. Council works in conjunction with these industries to allow the use of heavier vehicles on the road network where bridge capacities allow and where the safety of other road users is not compromised.

The bearing capacity of Council's road bridges have been assessed via either one of two methods. Theoretical strengths have been calculated in accordance with VicRoads Bridge Assessment Group Guidelines for assessing the load Capacity of Bridges (i.e. a desktop study). Behavioural or dynamic load testing has also been utilised on some bridges to enable the structural performance to be further understood (i.e. in field testing).

### 3.2.1 Timber Industry

The extent of the impact on Council's bridges and major drainage structures by increasing forestry development in the Colac Otway Shire is largely influenced by the specific locations of timber plantations and associated processing facilities.

Victoria's timber industry in the South West Region features native forests, established soft woods and specialist hardwood plantations and value-adding timber industries.

Total annual timber production (softwood and hardwood) will increase from 2.87 million cubic metres in 1998 to at least 7.3 million cubic metres by 2035 and plantation areas will increase by 211,000 hectares.

Transportation of timber from plantations and forests to the various markets represents up to 50% of the cost of timber production. Timber production areas are linked to processing facilities via various networks of transportation including local roads. While arterial networks have been developed to accommodate expected future traffic growth, the supporting local road network needs upgrading to:

- Provide direct and efficient links between plantation and forest areas and the processing mills, ports and railheads.
- Improve transport efficiency and maintain high standards.
- Reduce haulage costs.

Catering for increased heavy vehicle movements in line with the expected growth in tonnages will require strategic planning to manage the supporting transport infrastructure.

### 3.2.2 Dairy Industry

The dairy sector continues to undergo major restructure where farm sizes, dairy herd numbers and production per cow are all continually increasing.

Road infrastructure is critical to agricultural development. This particularly relates to transport infrastructure being able to accommodate heavy vehicles such as B-Doubles. Roads, bridges and other access points need to be progressively upgraded to cater for increasingly larger vehicles.

### 3.2.3 Changes in Technology

Council continually utilises and monitors new asset treatments that may be available to increase the service potential of its bridge assets and to reduce life cycle costs. This includes utilising alternative construction techniques or materials.

The development of Council's Asset Management Systems will also improve the management of this infrastructure category, particularly the co-ordination of maintenance activities through enhanced analysis and dissemination of information or data collected regarding the condition and performance of Council's bridges.

## 3.3 Demand Management Plan

Demand management can be best defined as 'the active intervention in the market to influence the demand for services and the assets generated and/or used in the supply of these services in order to best match available resources to real needs'.

Demand management components include:

- Operation – modification of access to an asset,
- Regulation – restriction on type of use of use of an asset,
- Incentives – Influence the use of an asset, and
- Education – promotion of alternatives.

Successful demand management requires Council to clearly understand that its role is not to provide ever more services, but to provide:

- Effective service outcomes to meet identified community needs,
- Assess if this need is changing, and
- To respond appropriately and within the resources available.

This requires Council to develop a close working relationship with its community based on a thorough knowledge of their characteristics, needs and expectations.

Demand management is not intended to reduce the scope or standard of services provided by an asset, but rather, it is concerned with aligning demand or expectation of service provided by an asset with the available resources to ensure that genuine needs are met and community benefit is maximised.

As detailed previously, one of the major changes in the transport industry affecting road infrastructure is the increasing demand for the use of vehicles operating at Higher Mass Limits on the local road network.

Working in partnership, for example, by establishing designated transport route systems for the timber and dairy industries will significantly improve Council's opportunity to maintain a sustainable road system. An efficient and effective road network will be achieved by each stakeholder accepting their role in the preservation of roading infrastructure.

Council operates a rolling Five (5)-Year Capital Works Program for This program identifies the list of bridges identified as requiring rehabilitation and upgrade and takes into account the following considerations:

- Reports generated from Council's Asset Management Systems,
- Maintenance expenditure history,
- Customer Requests – internal and external,
- Safety issues identified from routine and condition inspections,
- Priority based on road hierarchy or strategic importance, and
- Capacity of asset to meet defined level of service.

# 4.0 RISK MANAGEMENT

Managing risk is considered as part of the Asset Management Process. This involves considering the likelihood and consequence of various occurrences.

The purpose of this section is to describe the basis of Council's strategic risk and investment policies and the manner in which it will manage risk associated with its road network and associated infrastructure.

It essential to note that it is not possible for Council to eliminate all risks, rather, Council's model provides a basis for identifying and managing risks within the resources available to the community through clear priority setting.

## 4.1 Risk Management Process

The risk management process is defined as:

*'the systematic application of management policies, procedures and practices to the tasks of identifying, evaluating, treating and monitoring those risks that could prevent a Local Authority from achieving its strategic or operational objectives or Plans or from complying with its legal obligations'*.

This process needs to be established and accepted to ensure that risk management is an integral part of the culture of Council and those responsible for the management and operation of the community's road infrastructure.

The adopted Colac Otway Shire risk management process is consistent with Australian Standard AS/NZS 4360:2004 – Risk Management (see Figure 4.0), which defines the risk assessment and management.

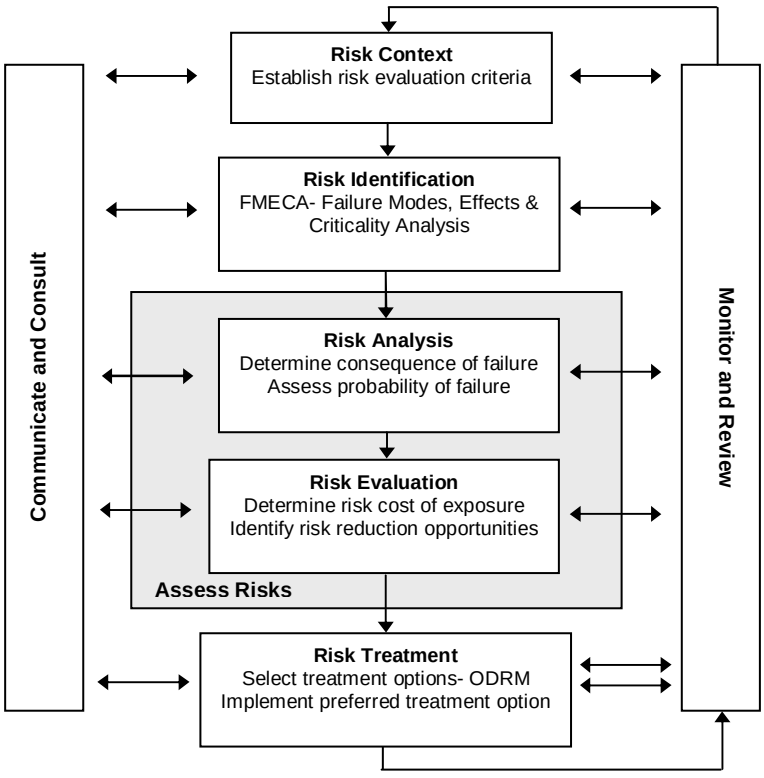



**Figure 4.0** – Risk Management Process

The major elements of the process are:

- **Risk Management Context** establishes criteria against which risk can be evaluated.
- **Risk Identification** identifies the risks that Council may encounter and helps explain the impact of those risks.
- **Risk Assessment** establishes a risk rating for all assets or asset groups, and describes which assets represent the greatest risk to Council.
- **Risk Treatment** identifies what actions are available to reduce risk at asset or asset group level to an acceptable level, and identifies the most cost effective treatment option.
- **Monitor and Review** is the ongoing process to ensure risk levels remain acceptable even if risks change.

### 4.2 Risk Management Framework

Council's Risk Management Framework consists of a Risk Management Policy, a Risk Management Strategy, and a Risk Management Procedure all of which are supported by a risk register. The Risk Management framework incorporates corporate, strategic and operational risks. The framework demonstrates that Council has in place a corporate process to manage risks within the organisation.

#### 4.2.1 Risk Management Policy

The Colac Otway Shire strives to manage risk in a responsible manner to enable property business objectives to be consistently met. The objective of the risk management process is to ensure that:

- All significant operational and organisational risks are understood and identified,
- The highest risks that should be addressed in the short to medium term are identified,
- Risk reduction treatments which best meet business needs are applied, and
- Responsibilities for managing risks are allocated to specific staff.

This is keeping in mind that Council's objective of road infrastructure management is to ensure that a safe and efficient road network is provided primarily for use by the members of the public and is available for other appropriate uses.

Australian Standard AS/NZS 4360:2004 – Risk Management, recommends an approach to risk management based on identification, control and measurement of risk. However, this document does not acknowledge the correlation between resources actually available and response times to effect maintenance.

Without this clear linkage, it may possible to adopt standards for maintenance and response times that the available resources would never allow to be achieved.

The approach taken in developing Council's risk management system for its road assets is to:

- Require routine inspections of the road network and associated assets at specified intervals to identify defects;
- Initiate additional inspections, as required, in relation issues raised by the community or Council employees through Council's customer request system,
- Record defects that may result in a potential hazard to the public, or fail to meet Council's adopted Maintenance Performance Criteria;
- Assess the potential risk to road users due to defects identified;
- Prioritise maintenance activities based on assessment of risk, taking into account the need to complete work in an efficient and cost effective manner, and the need to preserve the assets condition;
- Prepare appropriate work schedules;
- Undertake scheduled maintenance; and
- Record and document all actions taken at various stages throughout this process.

### 4.2.2 Risk Management Strategy

This Bridge Asset Management Plan is supported by high level risk management processes and strategies to minimise risks associated with the provision of Council's services.

The principles of the Risk Management Strategy are to identify evaluate and priorities Council's risk associated opportunities and threats, with a view to:

- Utilise opportunities,
- Reducing, mitigating, transferring or eliminating threats.
- Promote, develop and support risk management processes throughout Colac Otway Shire,
- Recognise that successful risk management relies on input from ALL employees,
- Allow for more effective allocation and use of resources,
- Provide a basis for higher standards of accountability, and
- Protect Council's corporate image as a professional, responsible and ethical organisation.

### 4.2.3 Risk Management Procedure

Council's Risk management Procedure is intended to be read in conjunction with the Risk Management Policy, Risk Management Strategy and the Risk Register.

The procedure outlines the expectations of Council when managing potential and actual organisational risks. All identified risks are entered into Council's Risk Register.

## 4.3 Risk Assessment Process – Bridge Assets

### 4.3.1 Step 1: Context – Risk Criteria and Consequences of Risk

The key risk management criteria relating to Councils road infrastructure assets include:

- Financial risk – direct costs,
- Public health and safety,
- Economic impact on users and businesses,
- Environmental and legal compliance,
- Network, asset and project performance,
- Image, reputation and support, and
- Property damage

The establishment of risk management criteria is one of the most important steps in the risk management process, as it sets the framework for consistent risk decision-making. This criteria has been used to determine the *consequence* of the risk in the Risk Consequence Ratings Table shown in Table 4.0.

### 4.3.2 Step 2: Risk Identification

Risk Identification for road assets can be identified from a number of resources such as:

- Routine inspections,
- Reports from the community, Councillors and other Council staff,
- Industry information and trends,
- Visual ad-hoc inspections,
- Reports and complaints from the general public,
- Details from past insurance claims,
- Advice from professional bodies, and
- Past experience.

### 4.3.3 Steps 3 & 4: Risk Analysis and Evaluation

Risk analysis and evaluation follows the principles as set out by AS/NZS 4360:2004 on Risk Management. The analysis considers both the likelihood and consequence of events and other risks. This process is commonly referred to as a *Risk Assessment*.

#### 4.3.3.1 Consequence

Table 4.0 provides a list of the various risk categories along with descriptions of the different consequences from insignificant to catastrophic that could result. The Assessor undertaking a risk assessment will firstly identify a particular hazard then select the most relevant risk category and the severity of the consequence. A hazard could possibly result in any of the consequences as listed but the one selected should be that which poses the highest probability of occurring.

| Risk Category | 1 - Insignificant | 2 - Minor | 3 - Moderate | 4 - Major | 5 - Catastrophic |
|---|---|---|---|---|---|
| Personal Injury Including OHS and Public Liability Issues | No injury to persons. | No liability on Council First aid treatment. | Minimal liability for loss. Medical expenses, possible lost time. | Significant exposure. Extensive injury resulting in hospitalisation. | Major claim. Fatality or near fatal consequence |
| Legal & Environmental compliance issues | Not in accordance with best practice requirements | Breach of guideline of code of practice | Minor non-compliance in legislation | Substantial non-compliance. Probable fine | Total breach or failure to address requirements of Act |
| Property Damage losses (repair, third party damage, legal costs) | Damage or losses anticipated less than $100. | Damage or losses anticipated to be between $100 - $1000 | Damage or losses anticipated to be between $1,000 - $10,000 | Damage or losses anticipated to be between $10,000 - $100,000 | Damage or losses anticipated to exceed $100,000 |
| Loss of revenue, Business interruption, Financial Risk | Minimal loss 1-2 days Costs <$500 | Loss of 1-2 weeks Costs $500-$5000 | Loss of service for longer term (2 weeks – 6 months) Costs Exceeding $10,000 | Extended period of loss (6 months or more before reinstatement) Costs exceeding $50,000 | Total future loss of revenue for long term. Costs exceeding $100,000 |
| Corporate Image Public relations Political risks | Issue requiring intervention by management. No media attention or damage to reputation. | Issues raised by patrons and/or local media coverage. Minimal media attention, but minor damage to Council image from a small group of community. | Patron and/or Community concern. Negative local media coverage. Community concerned about Council performance. | Significant embarrassment for Council, including negative National media coverage. Major decrease in community support. | Government Intervention. External enquiry Negative international media coverage. Loss of community support. |
| Loss of service, community effect | Brief loss of service limited to acceptable level. Very localised-little disruptive effect. | Service loss not restored within targeted time. Inconvenience to small group. | Significant service loss not back in agreed time. Some disruption to a wider group. | Critical service loss for one to three months. Significant effect on large group. Political involvement. | Critical service loss affecting operating viability. Significant effect to community at large. Community alienation. |

**Table 4.0 –** Consequence Table

#### 4.3.3.2 Likelihood

The next phase in this process is to subjectively estimate the likelihood or probability of a hazard actually occurring. This is achieved with reference to the Likelihood Table (refer Table 4.1) where the most appropriate descriptor of the possibility of the event occurring should be chosen. Due to the subjective nature of these assessments it is recommended that more than one assessor be involved in the process to provide some consistency to the results.

| Code | Likelihood of Occurrence | Descriptor |
|---|---|---|
| A | Almost Certain | Is expected to occur in most circumstances. |
| B | Likely | Will probably occur in most circumstances. |
| C | Possible | Might occur at some time. |
| D | Unlikely | Could remotely occur at some time. |
| E | Rare | May only occur in exceptional circumstances. |

**Table 4.1 -** Likelihood Table

#### 4.3.3.3 Risk Rating

With the above process complete, the risk can then be assigned a risk rating (negligible, minor, moderate, major or catastrophic) by applying the findings from the consequence and the likelihood tables to the Risks Priority Rating Matrix (refer Table 4.2). It should be noted that this process does not mean that a particular hazard is low or catastrophic; it is just that the process has defined it as such and assigned a priority for future action.

| Likelihood | Consequences | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| | Insignificant | Minor | Moderate | Major | Catastrophic |
| A. Almost Certain | H | H | E | E | E |
| B. Likely | M | H | H | E | E |
| C. Possible | L | M | H | E | E |
| D. Unlikely | L | L | M | H | E |
| E. Rare | L | L | M | H | H |

**Table 4.2** - Risks Priority Rating Matrix

#### 4.3.4 Step 5: Treat Risks

Once the risks have been assessed and rated, the most significant risks (for example, those of extreme or high risk) are isolated for treatment or control.

| Risk Rating | Control |
|---|---|
| **Extreme Risk** | Dangerous / Potentially dangerous.<br>Needs to be completed quickly in the interest of public safety. Asset may deteriorate and increase exposure to risk and increase cost of repairs.<br>Asset is in a very poor condition and critical to road transport network. Loss of service impacts significantly on public. |
| **High Risk** | Potentially dangerous<br>Repairs required within 6 months.<br>Needs to be completed, as asset will continue to deteriorate and increase both exposure to risk and cost of repairs.<br>Asset is in a poor condition and important to transport network. |
| **Moderate Risk** | Potentially dangerous<br>Repair within 6 – 18 months.<br>Needs to be completed (12-18 months) as asset will continue to deteriorate and increase cost of repairs.<br>Asset is in a poor condition and important to localised transportation system. |
| **Low Risk** | Potential Capital Works Project<br>Prioritise and program work annually depending on condition rating and availability of resources.<br>Asset requires ongoing monitoring to assess performance. |

**Table 4.3 -** Risk Rating and Control

### 4.4 Economic Decision-making

Options are developed and analysed to treat all 'significant' and 'high' risks identified from the application of the risk process above. Techniques are used to –

- Identify the available options,
- Determine the relative benefits and costs associated with these options,
- Carry out a benefits - costs analysis of all options, and
- Adopt the most cost effective options in terms of the total business needs.

#### 4.4.1 Risk Treatment Options

Options for mitigating risks considered to reduce the cause, probability or impact of failure, are:

- Do nothing - accept the risk.
- Management strategies - implement enhanced strategies for demand management, contingency planning, quality processes, staff training, scats systems, data analysis and reporting; reduce the target service standard, etc.
- Operational strategies - actions to reduce peak demand or stresses on the asset, operator training, documentation of operational procedures, etc.
- Maintenance strategies - modify the maintenance regime to make the asset more reliable or to extend its life.
- Asset renewal strategies - rehabilitation or replace assets to maintain service levels.
- Development strategies - investment to create a new asset or augment an existing asset.

- Asset disposal / rationalisation - divestment of assets surplus to needs because a service is determined to be a non-core activity or assets can be reconfigured to better meets Business needs.

### 4.4.2 Cost/Benefit Analysis

Risk treatment options are ranked on a cost benefit analysis using net present value (NPV) calculations. The inputs considered in the NPV calculation are –

- Capital investment costs,
- Changes in operating and maintenance costs,
- Reduction in risk cost exposure,
- Increase in effective asset life/value, and
- Increase in level of service.

All capital development projects are ranked corporately for inclusion in the annual plan consultation process using cost/ benefit analysis plus the following additional criteria –

- Contribution to Council's strategic plan objectives,
- Contribution to Council's business objectives, and
- Level of project commitment (contractual and legal issues).

## 4.5 Systems Approach

The approach taken in developing Council's risk management system for its bridges is to:

- Require routine inspections of the assets at specified intervals to identify defects,
- Initiate additional inspections, as required, of issues raised by the community or Council employees through Council's corporate request system (MERIT),
- Record defects that may result in a potential hazard to the public, or fail to meet Council's adopted Maintenance Performance Criteria,
- Assess the potential risk to road users due of defects identified,
- Prioritise maintenance activities based on assessment of risk, taking into account the need to complete work in an efficient and cost effective manner, and the need to preserve the assets condition,
- Prepare appropriate work schedules,
- Undertake scheduled maintenance, and
- Record and document all actions taken at various stages throughout this process.

## 4.6 Risk Management Related to Bridge Assets

Council's objective of road management is to ensure that a safe and efficient road network is provided primarily for use by members of the public and is available for other appropriate uses.

The provision of road assets uses a risk management process consistent with Australian/NZ Standard AS/NZS 4360:2004 to identify specific risks associated with their ownership and management. The process has identified a number of operational strategies and activities that will be considered to reduce risk.

The selection criteria for prioritising and programming capital works is based on a consideration of risk and benefits, affordability, existing performance with respect to levels of service and life cycle costs and efficiency. The management practices and works programmes address all current significant risks. The most significant risks have been evaluated as:

| General Details | | Risk Assessment | | | Treatment Strategy | Values after treatment | | |
|---|---|---|---|---|---|---|---|---|
| **Category** | **Risk** | **Likelihood** | **Consequence** | **Risk Rating** | | **Likelihood** | **Consequence** | **Risk Rating** |
| **Asset Management – Bridges** | Lack of maintenance may cause:<br>- Injuries/damage due to condition of trafficable surfaces including bridge approaches and bridge deck | Likely | Moderate | High | ▪ Council's Road Management Plan (RMP) has addressed many of the risks identified. The RMP gives details of maintenance performance criteria, inspection schedules, etc.<br>▪ Programmed inspections are carried out as per RMP. Works carried out are based on these reports.<br>▪ Completed jobs are recorded and entered into Council's Financial Systems | Unlikely | Minor | Low |
| | - Injuries/damage due to condition of structural elements | Almost Certain | Catastrophic | Extreme | | Unlikely | Moderate | Medium |
| | - Injuries/damage due to condition of non-structural elements (e.g. signage, bridge railing, etc | Likely | Major | Extreme | | Unlikely | Insignificant | Low |
| | - Structural damage due to flooding | Likely | Catastrophic | Extreme | | Possible | Moderate | Medium |
| **Asset Management - Legislative** | Non compliance of road management systems (i.e. asset inspections and maintenance response) with standards defined by Council's Road Management Plan | Almost Certain | Catastrophic | Extreme | ▪ Review Asset Inspection Schedule - Inspection frequencies adopted to match existing personnel levels<br>▪ Review Maintenance Performance Criteria – Levels of service to reflect existing resource allocations<br>▪ Develop Audit Process - Process and systems developed to ensure compliance with Road Management Plan<br>▪ Road Management Plan Update Process - Process and time frames developed to review and update Plan on Annual basis | Rare | Major | Medium |

| General Details | | Risk Assessment | | | Treatment Strategy | Values after treatment | | |
|---|---|---|---|---|---|---|---|---|
| **Category** | **Risk** | **Likelihood** | **Consequence** | **Risk Rating** | | **Likelihood** | **Consequence** | **Risk Rating** |
| **Asset Management - Funding** | Asset condition deteriorates at a greater than acceptable rate due to failure to adequately fund routine maintenance programs or renewal programs | Almost Certain | Moderate | Extreme | ▪ Identification and acknowledgment of Infrastructure Renewal Gap<br>▪ Annual Budget process<br>▪ Ensure adequate funding of asset maintenance<br>▪ Focus Capital spending on asset renewal<br>▪ Use of industry 'best appropriate' practice processes for asset management<br>▪ Treatment options to be judged based on life cycle costing, level of service and risk. | Rare | Moderate | Low |
| **Asset Management - Management Processes** | Asset condition deteriorates at a greater than acceptable rate due to poor decision making/asset management practices | Likely | Minor | High | ▪ Use of industry 'best appropriate' practice processes for asset management<br>▪ Asset management practice identifies optimum funding requirements<br>▪ Asset inventory and condition status maintained<br>▪ Whole of life management of assets to be adopted | Rare | Minor | Low |
| **Asset Management - Maintenance Practices** | Poor or inappropriate maintenance practices accelerates network deterioration | Possible | Major | Extreme | ▪ Maintenance programs and treatments developed by experienced staff<br>▪ Experienced and competent maintenance personnel employed on maintenance tasks<br>▪ Competent and experienced contractors used for maintenance tasks | Unlikely | Minor | Low |

| General Details | | Risk Assessment | | | Treatment Strategy | Values after treatment | | |
|---|---|---|---|---|---|---|---|---|
| **Category** | **Risk** | **Likelihood** | **Consequence** | **Risk Rating** | | **Likelihood** | **Consequence** | **Risk Rating** |
| **Asset Management - Construction Practices** | Inappropriate construction and maintenance methods expose work personnel to unacceptable risks | Possible | Major | Extreme | ▪ Compliance with requirements of OH&S Act and Regulations<br>▪ Completion of site specific Risk Assessments<br>▪ Adoption and documentation of safe systems of work<br>▪ Staff training<br>▪ Traffic Management in accordance with relevant Codes of Practice | Unlikely | Minor | Low |
| **Asset Management - Safety** | **Structural Safety** - Bridge failures under the loading of vehicles complying with the legal load limits applicable to each bridge are unacceptable | Almost Certain | Catastrophic | Extreme | ▪ Ongoing structural assessment of bridges to determine existing carrying capacities<br>▪ Implementation of load ratings on structures where required<br>▪ Upgrade of bridges consistent with community demand and costs | Possible | Moderate | Medium |
| | **Barrier Safety –** Damage to structure or risk of personal injury due to inadequate or no bridge railing | Likely | Major | Extreme | ▪ Bridge barrier installation program and implemented commensurate with the desired level of risk to be accepted by the Council and the community | Unlikely | Minor | Low |
| **Demand Management** | **Load Capacity -** Load carrying capacity of structures do not meet present and future demand requirements | Possible | Moderate | High | ▪ Ongoing structural assessment of bridges to determine existing carrying capacities<br>▪ Analysis of future network demands to determine load carrying capacities that are consistent with community demand and costs | Unlikely | Minor | Low |
| | **Bridge Geometry –** Inadequate geometric capacity of bridges and major drainage structures (i.e. bridge width, etc) | Possible | Minor | Medium | ▪ Carriageway widths and alignments on replacement bridges to be consistent with future traffic demand projections | Rare | Insignificant | Low |

**Table 4.4 - Risk Register:** Major Corporate Risks Posed by Road Assets

# 5.0 LIFECYCLE MANAGEMENT PLAN

Lifecycle management focuses on management options and strategies considering all relevant economic and physical consequences as part of an assets life cycle, from initial planning to disposal.

The life cycle management plan for Council's bridges and major drainage assets presents an analysis of all available asset information and the management plans covering the three key work activities necessary to manage the portfolio, these being:

**Operations & Maintenance Plan:** Activities undertaken to ensure efficient operation and serviceability of the assets, and therefore that assets retain their service potential over their useful life.
**Renewal Plan:** To provide for the progressive replacement of individual assets which have reached the end of their useful life. Deteriorating asset condition primarily drives renewal needs.
**Development Plan:** To improve parts of the system currently performing below target service standards and to allow development to meet future demand requirements. Sub-standard asset performance primarily drives asset development needs.

## 5.1 Management Structure

The Infrastructure & Services Unit within Council manages road assets. There are currently three (3) 'operational' teams within the Unit; Asset Development, Major Contracts, and Cosworks. The organisational structure is illustrated in the Figure 5.0. Each team's roles and responsibilities are also briefly described below.

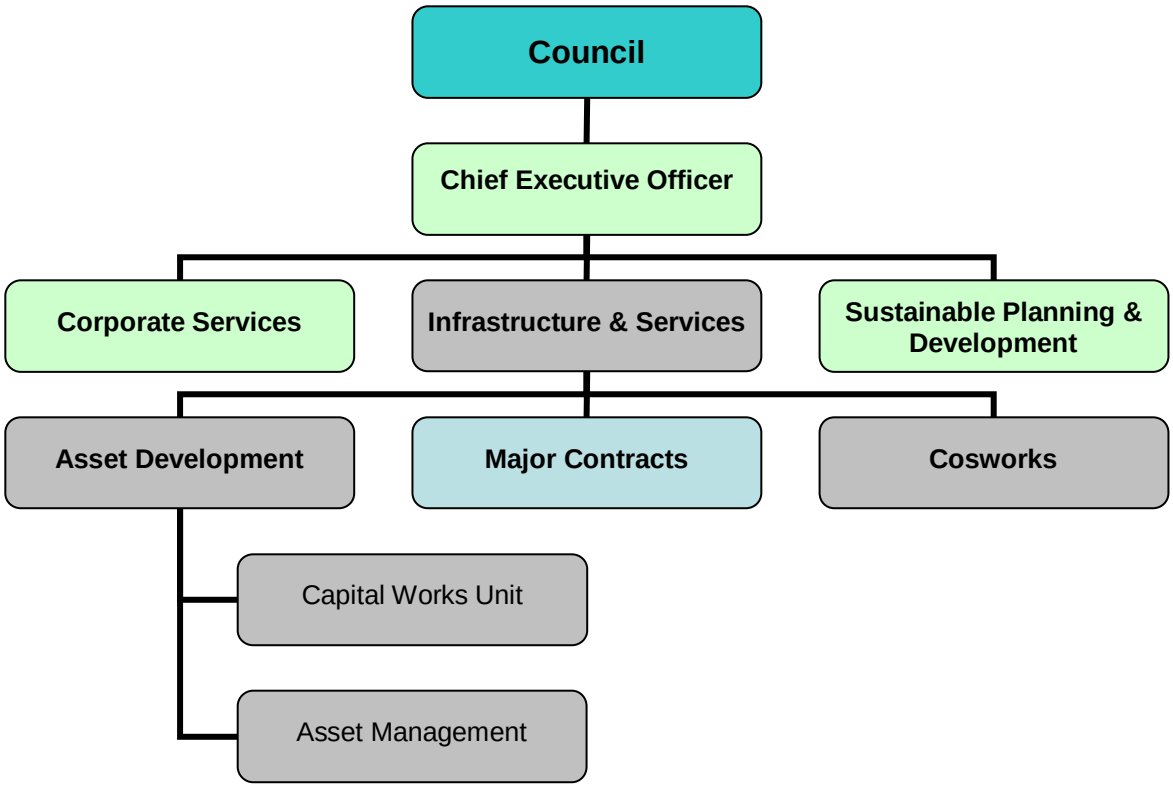



**Figure 5.0 –** Organisational Structure

### 5.1.1 Infrastructure & Services

#### 5.1.1.1 Asset Management

Role:

- To act as the custodian for Council's bridge assets,
- To act as a services provider in relation to asset maintenance for assets under its control, and
- To maintain data accuracy in Council's corporate asset management systems.

Ensure that roads and associated infrastructure is managed and maintained to a specified standard that delivers a range of appropriate community and Council services, including:

- Condition and performance monitoring,
- Refurbishment, replacement, and renewal planning,
- Maintenance planning,
- Setting service standards in conjunction with the community and other key stakeholders for maintenance and operations,
- Consider and process requests for minor new works and improvements.

Establish, maintain and develop Council's Asset Management Systems that assist in determining asset management strategies through the effective access to information, including:

- Implementation of Asset Management Systems in partnership with Information Services (i.e. IT),
- Asset inventories showing location, type and condition/value of asset,
- Maintenance and improvement history,
- Future works programs,
- Maintain information in accordance with Council's need to meet legislative requirements, such as, valuation and depreciation, and
- Coordinate final completion of asset acquisition and handover ownership and asset details.

Provide services in relation to the management of Council's road network including:

- Provide information to support the development of road maintenance programs, and
- Strategic analysis of road maintenance strategies.

These activities, by their nature, need to be undertaken in partnership with maintenance providers. Such partnerships are essential in ensuring both strategic and operational issues are understood.

#### 5.1.1.2 Capital Works Management

Role:

To provide cost competitive design services that deliver quality and value for money infrastructure assets for all stakeholders.

Responsibilities:

- Manage the implementation of the Capital Works Program,
- Coordinate Corporate Services in recommending Capital Works Projects associated with bridge assets, and
- Investigation of road infrastructure needs.

Manage the design and construction of allocated bridge related Capital Works Projects to ensure they reflect stakeholder requirements, incorporate functional and maintenance life cycle considerations, meet statutory requirements, comply with all relevant standards, and achieve the best quality outcomes in the most economic and efficient manner.

#### 5.1.1.3 Maintenance Provider - Cosworks

Role:

Provide Council with best value construction and maintenance services for bridge and major drainage infrastructure.

Cosworks delivers a wide range of services for the Colac Otway Shire. These services are generally in the areas of maintenance and construction work on sealed and unsealed roads, footpaths, kerb & channel, drainage, road furniture, bridges, and roadside vegetation.

Responsibilities:

- This Business Unit or its subcontractors maintain Council bridge assets,

Cosworks is also responsible for the following aspects of Bridge Asset Management:

- Maintain Council's road and related assets on behalf of Council,
- Assist in the development of programs for planned and reactive maintenance,
- Utilise corporate information systems for recording maintenance activities and other asset management activities,
- Provide information to allow forecasts and predictions of future maintenance needs,
- Provide assistance with costing maintenance implications of new works,
- Assist in identifying road related projects for inclusion in the Capital Works Programs, and
- Assist collection of data on asset condition and assess required rehabilitation works.

### 5.2 Background Data

The objective of bridges and major drainage structures is to provide a continuous all weather roading and/or pedestrian access across roads, rivers and drainage or irrigation channels.

This asset group can be divided into two distinct types; these are bridges and major drainage structures. The definitions of each are provided in the below.

A bridge is a structure that allows traffic, (pedestrian or vehicular) to traverse an obstacle through elevation. It must consist of at least one or more of the following elements; piles, piers, headstocks or decking

A major drainage structure is a structure that allows traffic, (pedestrian or vehicular) to traverse an obstacle (usually a watercourse), through elevation. It is a self-contained structure, such as a box or pipe culvert, overlain with the road (or path).

#### 5.2.1 Key Issues

Some of the current key life-cycle issues relating to bridge assets are:

- Increased demand on many of Council's bridges to cater for transport vehicles operating at Higher Mass Limits will more likely impact on the useful life of the structure prior to them reaching the end of their useful life.
- Funding renewal or rehabilitation costs on limited use bridges. Limited use is defined as infrastructure that serves two (2) or less properties.
- Collecting and maintaining current information on the condition and load capacity of structures across the bridge network.

- Some older bridges and major culverts were constructed using non-standard techniques, or in a manner to save costs. These factors have created a number of ongoing maintenance issues which now present a challenge to ensure the ongoing serviceability of these structures.
- Many of Council's bridge and major drainage structures do not presently have guardrail installed on the approaches to, or across the structure.
- Bridges in some areas, particularly in the vicinity of tourist attractions, provide more than just vehicular access. There are also a variety of 'secondary' uses, such as access by pedestrians, cyclists, recreational fisherman. In most instances Council's bridges do not recognise other uses through the provision of protective railing presenting significant safety issues.
- Vegetation, particularly trees, in the close vicinity of bridges can pose a significant risk to the integrity of the structure should the tree fall across it or as a contribution to increased fire load in the event of a bush fire. Clear guidelines need to be established in relation to clearance limits from structures and confirmation. Planning requirements also need to be clarified in relation to removal of trees, particularly when operating under emergency conditions.
- Maintaining a register of stock underpasses to record location and other relevant information. Over recent years there has been an increase in the number of underpasses installed within the municipality. A stock underpass is generally a large concrete structure under a roadway, designed for the specific purpose of allowing safe access for livestock. These structures are built under arrangement with private landholders, and all maintenance and replacement liabilities rest with the landholder.

### 5.2.2 Asset Description

The Colac Otway Shire maintains a bridge inventory database which contains a total listing of 134 bridges and major drainage structures.

Council's bridge database stores all relevant data pertaining to Council's bridges and major drainage assets including, location, structure dimensions (i.e. length, width, number of spans, etc), component listing for each structure with assessed condition, load limit information, etc. This system is also has the capacity to output a valuation summary.

Table 5.0 summarises the present inventory of the Colac Otway Shire's bridge assets. Included in the database are those culverts which have a cross-sectional area of greater than 3.0-$m^2$ or have a single span or diameter of 1.8-metres or greater. Figure 5.1 provides an example of these structure types.


**Major Drainage Structure (Box Culvert)**

**Bridge Structure (Composite)**

**Figure 5.1** – Structure Examples

| Asset Type | Inventory |
|---|---|
| Concrete Structures | 85 |
| Composite Structures | 49 |

**Table 5.0** – Bridge Asset Summary

Structures are classed separately based on their construction type. These two categories are composite and concrete structures as described below.

Composite - These structures are classified as 'Composite' as most 'timber' bridges have at least one major component constructed of either concrete or steel, usually the substructure. This category also includes steel bridges.

Concrete - only those structures whose major components are all concrete are classified as 'concrete'. Large culverts are also classified as 'concrete' structures, as they share similar expected useful lives.

Further attribute data relating Council's bridge and major drainage assets is included in Appendix 'A" – Municipal Bridge Register.

### 5.2.3 Asset Condition

To determine if an asset is meeting the desired service levels requires knowledge of asset condition and performance. Identifying failures and the level of service achieved are also important components.

It is critical to have a clear understanding and knowledge of the condition of assets in order to determine the most cost-effective solution. Management decisions, critical to the success of an asset revolve around decisions regarding the maintenance and renewal of assets. Regular condition monitoring reduces the likelihood of asset failures, which can significantly influence assets service levels and availability as well as meeting customer requirements.

Not knowing the condition or performance level of an asset may well lead to the premature failure of an asset, which leaves the organisation with only one option and is to replace the asset (generally the most expensive option).

Council should also be aware that unforeseen failure of an asset may have severe consequences that constitute a business risk or potential loss to the organisation. By conducting regular condition and performance monitoring exercises, maintenance strategies and/or rehabilitation strategies can be updated and refined and ultimately, renewal programs can be more accurately determined. If failure is imminent, Council will at least have time to look at options other than renewal, or the failure may be able to be managed by alternative means to reduce overall risk exposure.

The principle objective of managing bridges and major drainage structures is to ensure the safe and economic operation of each asset throughout its service life.

In the case of Colac Otway Shire's inventory, this involves a large number of structures of varying form, age and condition that operate in different environments under different loading regimes.

Council must undertake regular inspections of its bridge assets in order to detect and monitor deterioration or defects that may require repair or maintenance.

Inspections of varying detail are completed on a regular basis to continually monitor the condition and performance of the network of bridges which service the community. The

following types of inspections are undertaken:

| | |
|---|---|
| **Level 1 - Routine Maintenance Inspections** | A visual inspection to check the general serviceability of a structure to road users and to identify any emerging defects. These inspections are undertaken on an annual basis in conjunction with routine maintenance activities. Additional inspections are also required after an abnormal event such as a severe flood or fire. |
| **Level 2 - Bridge Condition Inspections** | Comprehensive visual inspections to assess the condition of a structure and its major components. The principal objectives are to identify significant defects in structural members above ground level, and to record the extent, severity and criticality of each defect and the appropriate remedial actions. The frequency of these inspections depends on the structure type and its current condition. Level 2 inspections are conducted on a rolling three (3) year cycle. |
| **Level 3 - Detailed Engineering Inspections** | This represents an inspection or investigation conducted on a needs basis to assess the structural condition and capacity a structure that has been identified as a potential candidate for rehabilitation, strengthening or replacement. This level of inspection may include materials testing and analysis, structural analysis or load testing in addition to the visual inspection to assess and quantify the condition, behaviour and rate of deterioration of a structure. |

All inspections are completed in accordance with VicRoads Bridge Inspection Procedures. Level 2 and Level 3 assessments are undertaken by suitably qualified and experienced structural engineers or bridge practioners. Routine maintenance inspections are completed by Council's bridge crew.

Over the past three (3) years Council has undertaken to complete Level 2 Condition inspections across the entire portfolio of bridges and major drainage assets. Figure 5.2 indicates that, in general, the bridge stock is in good to average condition.

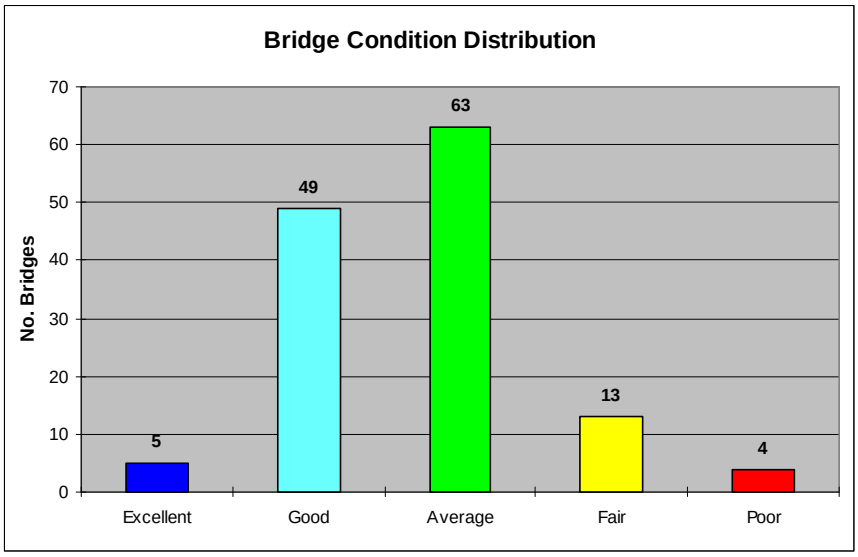



**Figure 5.2** – Bridge Condition Distribution

The results of these inspections indicate that the structural condition of most bridge elements is adequate. The majority of issues or defects identified relate to the delivery of routine maintenance and road user safety. These issues include:

- Clearing of waterways and debris from structures,
- Maintenance of roadway on bridge approaches,
- Provision of guardrail on approaches to unprotected structures,
- Provision and maintenance of railing across structures,
- Maintenance of batters to prevent excessive erosion,
- Maintenance of concrete abutments, wingwalls and headwalls,
- Maintenance of roadway across bridge (i.e. potholing, etc), and
- Maintenance of steel beams to protect against excessive corrosion

Figure 5.2 provides examples of the more common defect types which exist across Council's bridge and major culvert portfolio.

**Corrosion of Steel Beams**

**Blocked Culvert/Waterway**


**Unprotected Structure**


**Poor Maintenance of Bridge Approach**

**Undermining of Concrete Abutment**

**Missing Concrete Wingwall**

**Figure 5.2 –** Common Defect Examples

### 5.2.4 Asset Capacity/Performance

Bridges and major drainage structures are crucial components of the road network by virtue of their capital value, strategic and operational importance, and the effect on the road network

In Colac Otway Shire's largely rural network, where alternative stream crossings are rare, bridge service restrictions can have enormous social and economic impacts.

While both bridges and road pavements are designed and built in accordance with contemporary standards, bridges are far more sensitive to increasing loads and changing vehicle dynamics.

As freight vehicles change and their numbers and masses increase, existing structures designed to now outdated standards become more vulnerable to damage.

These increasing load demands tend to accelerate the deterioration of a structure's condition and hence its load bearing capacity.

The most critical property of a bridge in performing its function is its load capacity. A major objective of the work related to the ongoing recent renewal of bridges has been to improve the efficiency of the transport system by progressively addressing existing constraints and developing knowledge of the bridge stock to allow for future changes in vehicle configuration and loading.

A high risk to Council is the continuing increase of the loading regime that bridges are subjected to.

### 5.2.5 Asset Valuation

The replacement value of Council's bridge and major drainage assets as at June 2007 is $15,519,058. This is made up of the following:

| Asset Class | Inventory | Current Replacement Cost as at June 2007 ($) | Written Down Value of Entire Asset Class ($) | Total Economic Life (Years) | Average Remaining Economic Life (Years) | |
|---|---|---|---|---|---|---|
| **Bridges Group** | | | | | | |
| Concrete | 85 | $11,328,944 | $8,567,400 | 70 | 53 | 76% |
| Composite | 49 | $4,190,113 | $2,996,804 | 50 | 36 | 72% |
| | **Totals** | $15,519,058 | $11,564,204 | | | |

**Table 5.1** – Bridge Asset Valuation Summary

All bridges, be they composite or concrete structures, are valued based on replacement costs. Replacement costs are determined with referenced to actual construction costs of numerous bridges and drainage structures of differing scopes.

The actual costs are used to generate locally applicable unit rates for the cost of replacement of various bridge and major drainage components. These unit rates are then applied to the bridge inventory, producing an aggregated replacement cost for each structure.

The Total Bridge Cost is calculated by Bridgit 2.0 as the sum of all of the individual component costs, based on the measured or estimated quantities stored in the inventory and on the adopted component replacement cost rates.

## 5.3 Risk Management

The following high or significant risks have been identified as relating to Council's bridge assets:

- Knowledge of the load carrying capacity rating of each bridge.
- Confidence that Council's informational structure is current and accurate and of the information being provided to the wider community.
- Increased demand on bridges across the road network to cater for larger and heavier vehicles. Council's bridges are vital elements in the road network to support industry and commerce both within the municipality and on a regional basis.
- Exposure of key structures to the risk of damage as a result of flood and fire events.
- Bridge geometry (i.e. alignment and carriageway width) inadequate to accommodate current and future demands.
- Knowledge of the safety performance of a structure in the context of the section of the network in which it forms a link, and
- Ensuring bridge safety is commensurate with the desired level of risk that is accepted by Council and the community.

## 5.4 Level of Service

The functional level of service for bridges and major drainage structures is to provide and maintain a safe and practical transport network in accordance with relevant legislative and statutory requirements and usage demands.

Levels of service are defined in terms of:

- Type of structure – bridge or major drainage,
- Condition of structure components,
- Bridge service criteria, including trafficable width and load rating,
- The provision of adequate signage, and
- Maintaining the structural integrity of the bridge network

## 5.5 Maintenance Plan

Maintenance activities relate to the repair of faults and attention to an assets structure to ensure ongoing serviceability and to prevent premature deterioration or failure.

Maintenance management is a systematic approach to the planning and execution of maintenance activities. This management method delivers the benefits of operational efficiencies and reduced maintenance costs. Council's maintenance management process addresses the following areas:

- Regular inspections,
- Keeping of proper records,
- Condition rating of road infrastructure to support strategic asset management,
- Program preparation including proper planning, prioritising and scheduling, and
- Effective execution of maintenance operations

### 5.5.1 Maintenance Strategy

Bridge maintenance is the work performed during the service life of a structure to:

- Maintain its designed load capacity, other functional capability and serviceability,
- Protect the investment in assets by ensuring that the structure completes its designed service life, and
- Ensure safety of the public.

Maintenance includes both reactive and proactive activities that preserve or restore the condition of a structure or its components. Restorative works are generally termed rehabilitation or renewal activities.

In order to deliver best value to the community and to ensure safety, the Colac Otway Shire has determined that it is vital to have both proper and frequent inspections and a good preventive maintenance program for its bridge infrastructure.

This means providing adequate maintenance to bridge components to ensure that they do not deteriorate to a condition which inevitably requires expensive their rehabilitation/replacement.

Colac Otway Shire administers and delivers bridge maintenance under the following categories.

### 5.5.2 Routine Maintenance

Routine bridge maintenance comprises those activities, identified primarily by Level 1 inspections, which maintain the serviceability of the structure. Works of this type generally do not change condition and include clearing of drainage, localised repairs to approaches, road surface and timber decking, cleaning and adjusting deck joints, removal of debris, painting and sign maintenance.

### 5.5.3 Programmed Maintenance

Programmed bridge maintenance comprises those activities, identified from bridge inspection programs, which maintain serviceability of the structure but fall outside the scope of routine maintenance.

While these activities generally do not change the structural condition, they may include the replacement of isolated timber bridge members and non-load bearing components in all structures. Programmed maintenance activities include painting of steelwork, repair or replacement of deck joints or seals, barrier repairs, timber member replacement and repair of scour damage to beds and batters.

Council's maintenance performance criteria (refer Appendix B) specify the extent of tolerable defects and the timeliness in which a maintenance response is required. Most defects are identified through Council's formal inspection processes.

### 5.5.4 Rehabilitation

The objective of rehabilitation is to restore a structure to 'as new' condition with respect to the original designed load capacity and level of service. This excludes the strengthening of bridges to provide a greater load capacity than the original design.

Rehabilitation activities include deck replacement, splicing piles, installation of supplementary piles or barrier replacements.

Maintenance programs are developed from the schedule of defects identified during inspections, with a priority given to repairing defects which constitute a risk to public safety.

Repair treatments and priorities are determined by considering the impact on:

- Public safety,
- Traffic movement, and
- Future costs if the work is not done.

Repair work is carried out using similar materials to those being replaced and with materials that will give the longest repair life for the least cost. Maintenance work is completed with reference to VicRoads Bridge Maintenance Repair and Strengthening Guidelines.

### 5.5.5 Maintenance Forecast

When the maintenance items become current they are included in the annual maintenance plan and prioritised. At present with the funding available there exists a deferred maintenance backlog.

The safety of road users is paramount when prioritising bridge maintenance and it is necessary to exercise informed engineering judgement when allocating scarce maintenance funds.

There is always an element of risk involved when maintenance work is deferred. To minimise this risk, major maintenance is carried out as soon as practicable after identification. A conservative temporary load limit may also be put on a structure to discourage traffic from using it until the necessary repairs can be made.

There is some concern with load limited bridges that users may and use the bridge with heavy loads regardless of the posted limit. Over time this accelerates the rate of deterioration of the structure and ultimately there is the likelihood of a bridge collapsing under a heavy load.

Maintenance expenditure for bridge maintenance is budgeted to be $160,000 for 2007/08 (refer Table 5.2).

| Year | Maintenance Expenditure |
|---|---|
| 2005/06 (Actual) | $78,300 |
| 2006/07 (Actual) | $148,700 |
| 2007/08 (Budget) | $160,000 |

**Table 5.2** – Maintenance Expenditure Summary

## 5.6 Renewal Plan

These functions generally relate to a large investment by Council, as the asset requires substantial rehabilitation, replacement or augmentation. Decisions need to assess the merits of the various options and to optimise these options through a well-informed evaluation process.

The following are key factors that need to be considered:

- Cost of rehabilitation versus replacement versus augmentation,
- Possible increases in life through the use of various alternative treatments,
- Benefits to the community,
- Amount and timing of capital investment required, and
- Annual, periodic maintenance and operating costs.

Understanding the different failure modes for each asset and the ability to predict which is likely to occur is essential in this process. The various failure modes can be summarised as follows:

• Lack of capacity,
• Inefficiency,
• Obsolescence,
• Level of service - falls below acceptable levels of functionality,
• Structural integrity, and
• Redundancy.

### 5.6.1 Renewal Strategy

Asset renewal is undertaken when the structure has reached the end of its economic life. The types of renewal works undertaken include:

- Entire bridge replacement, and
- Partial bridge replacement.

Renewal works have historically been programmed on the basis of need and to manage the level of service and condition of Council's bridge assets.

Whilst this is an adequate approach, an economic evaluation should be undertaken in the future with projects being justified when the future saving achieved by doing the work exceeds the actual cost of the work. Cost/Benefit calculations should also include an assessment of any associated risks.

### 5.6.2 Renewal Forecast

The required level of rehabilitation will depend on:

- The age profile of the structures,
- The condition profile of structures,
- The level of on-going maintenance, and
- The economic life of the materials used.

Potential renewals are identified through the each of the different inspection programs. Where a structure has a limited load capacity, is on a route with a large proportion of heavy vehicles, and there are no suitable alternative routes available, the structure may be upgraded or replaced.

When a structure is upgraded or replaced with a new structure it is brought up to current design loadings.

Using a Cost/Benefit model, structures identified as requiring renewal works would have to meet certain economic criteria for bridge replacement to be considered. If a structure did not produce a high enough Cost/Benefit ratio to warrant a full replacement, adequate upgrade works would need to be further investigated.

Figure 5.2 shows a prediction of the level of expenditure required for bridge and major drainage renewal over the next 20 years. This projection indicates the level of renewal funding required for these assets based on a failure profile that would arise if nothing were done to change current asset levels, standards, utilisation, etc.

Renewal projections are based on the default assumptions that all existing bridges and major culverts are to be renewed when a particular condition intervention is reached, and that they will be renewed using components that are substantially the same as the existing.

In considering these required renewal projections it should be noted that if maintenance is kept at adequate levels, it is not uncommon for the service life of a structure to be extended beyond its nominated useful life.

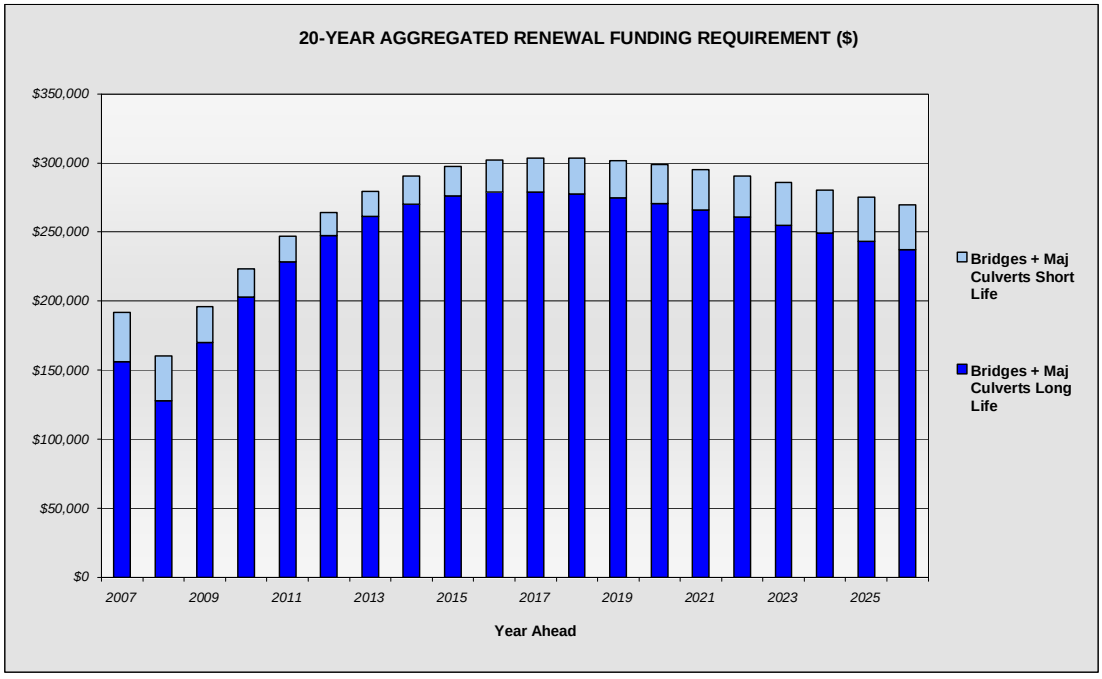



**Figure 5.2** – Renewal Funding Requirement

Historical and budgeted expenditure on bridges and major drainage structures between 2003 and 2007 is shown in Table 5.3.

| Year | Capital Renewal Expenditure |
|---|---|
| 2004/05 (Actual) | $142,460 |
| 2005/06 (Actual) | $235,542 |
| 2006/07 (Budget) | $83,000 |

**Table 5.3** – Bridges Expenditure Summary

Further analysis of available data and maintenance histories is required to develop a comprehensive renewal strategy over the period of this plan.

## 5.7 Standards and Specifications

Standards for the design and construction of new bridges and major drainage structures, and the rehabilitation of existing structures are completed in accordance with all relevant design codes and Australian Standards.

The design of new structures should in all cases be undertaken by suitably qualified and experienced practioners.

## 5.8 Asset Creation/Acquisition/Augmentation Plan

New works are those works that create a new asset that did not previously exist, or works that upgrade or improve an asset beyond its existing capacity.

The Colac Otway Shire is not creating new bridges at present, as the road network is well developed and stable although structures which have reached the end of their useful life are being replaced.

A well-planned bridge capital works program will contribute to Council's efforts to achieve its objective to provide a safe, efficient and effective transport network. Such a program will also improve the efficiency of the transport industry and thereby reduce the total transport cost to the community, as well as, provide continued efficient access to fire prone areas by emergency services.

A bridge capital works program requires the establishment of a rational bridge enhancement program. This program will ensure that cost effectiveness and value for money to the community is delivered.

It is proposed that the primary selection driver for a bridge upgrade program be based on a combination of Council's local road classification system, heavy transport routes, emergency service accessibility, and the results of the bridge inspection reports.

### 5.8.1 Selection Criteria

Asset creation / acquisition projects are ranked based on user need. Projects which provide the greatest increase in level of service to road users and benefit the transport network, will receive the highest ranking and level of funding.

### 5.8.2 Standards and Specifications

As with replacements where new assets are created they will be designed using all relevant design codes and Australian Standards and by using materials to achieve the greatest asset life while trying to minimise maintenance costs through the life of the structure.

To achieve this, reinforced concrete structures will generally be used but where this is impractical, composite steel and concrete structures are considered the next best option.

## 5.9 Disposal Plan

Disposal works are those activities necessary to retire, or dispose of, decommissioned assets if required or necessary.

Disposal works involve a logical examination of the asset to be able to answer a number of questions about the asset, including:

- Is the asset still required by the community?
- Can the need be satisfied by a less expensive or alternative asset?

- Is it the role of Council to provide a particular service delivered by the asset?

The prime component in planning for asset disposal is having the required information to be able to make an informed decision on any disposal. Understanding the current condition and ramifications of failure are critical. Disposal and rationalisation policies need to be determined so that the most cost-effective options are considered. These options include:

- Sale,
- Donation,
- Exchange, and
- Disposal

The upgrading of bridges and changes to road alignment may bring about the retirement of old bridges and structures. Hence there is no disposal strategy for this asset class as bridges and major drainage assets are rarely, if ever, disposed.

# 6.0 FINANCIAL SUMMARY

This section outlines the long-term operations, maintenance and capital financial requirements for the operation, maintenance, renewal and development of roading assets based on long-term strategies outlined earlier in the plan. Funding issues are discussed and key assumptions made in preparing the financial forecasts are noted.

## 6.1 Historical Expenditure

A financial summary is provided in Table 6.0 which details past expenditure on road infrastructure for the previous two (2) financial years and approved allocations for 2005-06.

| ***Maintenance*** | **Actual 2005/06** | **Actual 2006/07** | **Budget 2007/08** |
|---|---|---|---|
| **Bridges Group** | $78,300 | $148,700 | $160,000 |
| **Total** | **$78,300** | **$148,700** | **$160,000** |
| ***Capital Renewal*** | **Actual 2005/06** | **Actual 2006/07** | **Budget 2007/08** |
| **Bridges Group** | $142,460 | $235,542 | $83,000 |
| **Total** | **$142,460** | **$235,542** | **$83,000** |
| ***Capital Upgrade*** | **Actual 2005/06** | **Actual 2006/07** | **Budget 2007/08** |
| **Bridges Group** | $0 | $0 | $32,000 |
| **Total** | **$0** | **$0** | **$32,000** |
| ***Capital Expansion*** | **Actual 2005/06** | **Actual 2006/07** | **Budget 2007/08** |
| **Bridges Group** | $323,345 | $15,325 | $20,000 |
| **Total** | **$323,345** | **$15,325** | **$20,000** |

**Table 6.0 –** Expenditure on Assets History

### 6.1.1 Expenditure Types

Infrastructure expenditure is categorised as follows.

| | |
|---|---|
| **Maintenance** | The ongoing day-to-day work required to keep assets operating at the required level of service. |
| **Renewal** | Significant work that restores or replaces an existing asset towards its original condition or capacity |
| **Upgrade** | Works to upgrade or improve an existing asset beyond its original capacity or performance |
| **Expansion** | May be best described as the creation of new assets which provide new services to the community that did not exist beforehand. |

**Table 6.1 –** Asset Expenditure Types

## 6.2 Valuation of Bridge Assets

As part of its annual accounts and reporting, Council is required to declare the value of its asset base. This includes Council's bridge and major drainage assets.

Council is currently meeting its requirements in terms of asset reporting, however consideration needs to be given to reviewing these current practices to determine any potential improvements in valuation calculations and associated levels of capital investment.

Issues to be included in such a consideration are associated with the asset valuation parameters of replacement cost, depreciation, useful life and remaining useful life.

Asset replacement costs require regular re-calculation to account for changes in unit rates due to fluctuations in material, plant and labour costs.

Depreciation indicates the rate of loss of value of an asset and the level of investment required to maintain a fixed asset value. Financial models employ a straight line depreciation which does not truly reflect road infrastructure assets deterioration which may accelerate rapidly depending on the timing of treatment intervention.

The annual review of strategic asset renewal/replacement needs, undertaken through Council's Asset Management Systems, will provide inputs for the development of annual capital renewal/replacement works programs for consideration within the annual budget planning process.

The BrAMP's longer term projections are useful in identifying likely trends and expenditure patterns for various funding models.

## 6.3 Predicted Funding Requirements

### 6.3.1 Asset Renewal

Overall, Council has developed a strategy for portraying life-cycle requirements and predictions of road infrastructure condition and performance over the next 20 years. In general, the model used to assist in predicting future asset renewal demands and requirements was developed through Council's involvement in the MAV Step Asset Management Program.

Each of the key asset types and components that make up Council's road infrastructure have been examined and the respective renewal needs of each asset assessed to determine the overall annual renewal funding gap and the 'level of service' required to meet the needs of the community.

Figure 6.1.indicates the Renewal Funding Gap profile for Council's bridge and major drainage infrastructure over the next twenty (20) years.

The renewal gap profile has been modeled on the expected funding levels adopted by Council's Strategic Resource Plan 2007/08 – 2010/11. The levels of funding for bridge replacement are sufficient to undertake necessary projects until this need increases moderately in about 6 to 7 years.

Based on the expected capital expenditure levels adopted in the Strategic Resource Plan Council has demonstrated that it is managing its renewal gap across all infrastructure categories into the medium term. In order to reduce the projected renewal funding gap identified for bridge assets, Council has the ability to sustainably redistribute funding from other infrastructure asset categories available within the annual Capital Works Budget.

It should be noted that these renewal projections do not take into account needs to upgrade bridges by either widening for traffic capacity and safety or strengthening to improve carrying capacity. These aspects would generally be undertaken when structural replacement is required.

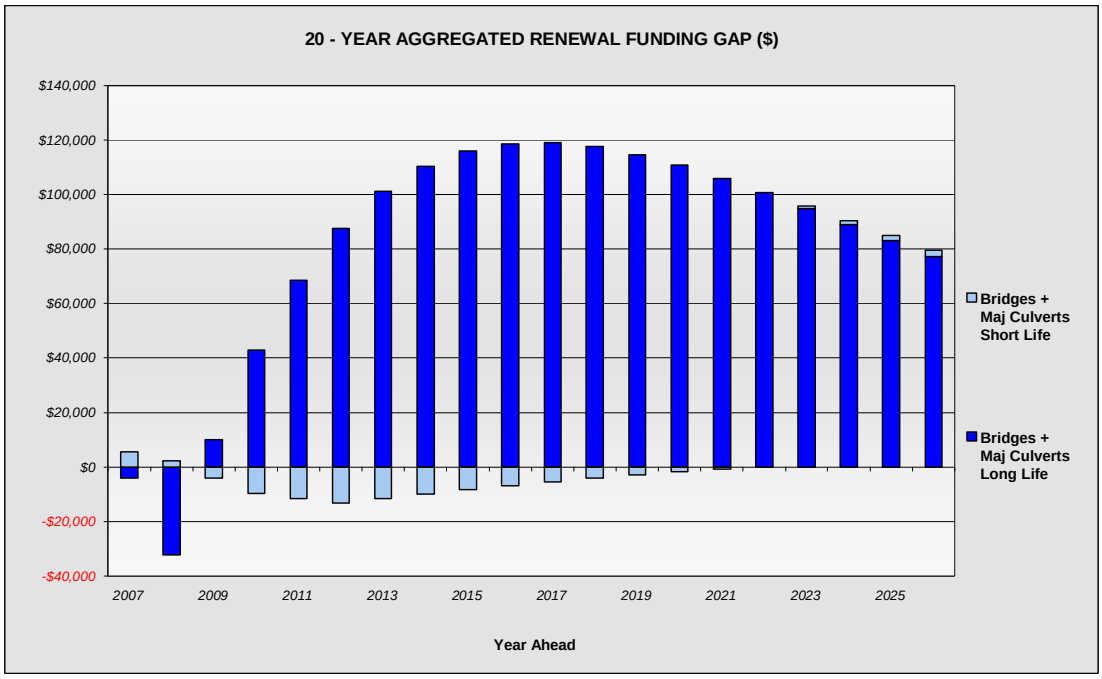



**Figure 6.1** –Bridge Asset Renewal Funding Gap Profile

## 6.4 Funding Strategy

The aim of Council's Strategic Resource Plan is to assist it in understanding the medium to long term implications of its policies and strategies which are proposed each year and subsequently adopted in the annual budget process. It is intended that the principles of the BrAMP are incorporated into the planning of future budgets.

The Strategic Resource Plan is closely aligned to the Council Plan and provides Council with a broader understanding of the financial implications of its strategic decisions. It guides Council and management in the preparation of future corporate strategies and associated allocation of budgets.

Council's Annual Budget Process is based on the following principles:

1. Deliver the results sought by Council as specified in the outcome statements in each program area.
2. Deliver outcomes as identified in Council's Annual Plan.
3. Reflect Council's capital expenditure priorities as identified in the Five (5)-Year Capital Investment Program, including no new major capital projects.
4. Emphasise the implementation of adopted strategies and priorities identified in Business Plans.
5. Increase funding levels for infrastructure asset renewal and maintenance.
6. Increase working capital and cash reserves.
7. Minimise rates and charges increases.
8. Not exceed existing staff levels.
9. Undertake no new loan borrowing's

## 6.5 Funding Sources

Sources for the funding of expenditure on municipal road assets include the following:

- Council rate revenue,
- Roads to Recovery and AusLink program funding from the Federal Government,
- Special Charge Schemes, and
- Other State or Federal government funding programs (when available) e.g. Black Spot, Better Roads Funding Programs

In order to meet the needs of its rapidly developing community, Council has a role to:

- Ensure that there is sufficient funding to sustain growing levels of road assets for which it is responsible; and
- Promote awareness and understanding of road funding needs within the community.

In general, Council has the following priorities with respect to expenditure on bridge assets:

- Maintain the existing network in a "reasonable condition", approximating the present general condition of the network. These maintenance activities include:
    - Asset maintenance activities, and
    - Asset renewal activities.
- Accept donated assets from subdividers to extend the network and to similarly maintain those assets.
- Upgrading of existing road assets to meet the demands of changing population, traffic patterns, traffic volumes and traffic type.

Strategies for asset maintenance and renewal are discussed below.

Maintaining bridge and major drainage assets requires a definition of the levels of service for each activity. Sufficient funding is also required to retain those levels of service; otherwise the condition of the network will deteriorate.

Any contemplated reduction in levels of service requires careful consideration to avoid compromising road user safety and causing unfavourable community reaction.

### 6.5.1 Funding of Asset Maintenance

Asset maintenance activities for bridge assets include minor deck repair including tightening, painting of railing, repair/replacement of damaged bridge furniture (e.g. signage, delineators, etc), repair/replacement of damaged guardrail, repairs to bridge approaches, cleaning of scuppers, waterway maintenance, and similar activities.

These activities aim to maintain public safety and keep road assets in reasonable condition for the user and to prevent further accelerated deterioration.

Maintenance activities are not only important to ensuring the maximum 'useful' life of an asset is achieved, but also impacts directly on aspects of risk management and the delivery of expected levels of service to the community.

Bridges deteriorate as a result of repeated traffic loading and environmental influences. Maintenance is a 'day to day' activity required to provide an acceptable level of service for the road user and allow these assets to continue to function as built.

In most cases, the commencement of a maintenance or operational activity is triggered by the asset showing certain measurable defects or conditions. This trigger is termed the Maintenance Performance Criteria. Examples of these defects include size of potholes or

corrugations in a road, or the length of grass on a roadside.

Budget constraints may result in undesirable asset deterioration. Council is responsible to ensure that budget funding levels are allocated adequately to ensure undesirable asset deterioration does not occur.

Funding for bridge maintenance, both major and minor, must compete against a wide range of services that Council delivers. The following factors are considered by Council during its annual budget process to determine and review its maintenance funding levels:

- The ability to meet the specified levels of service in regards to its adopted maintenance performance criteria within the limitations of funding levels,
- Maximisation of asset life and reduction in whole of life costs,
- Priorities for maintenance are consistent with the objectives of the Road Management Plan,
- All relevant information relating to the gap between what maintenance works are funded by Council and listings of any deferred maintenance required to be completed, and
- Annual Community Satisfaction Survey outcomes (Council Plan – performance indicators)

Table 6.0 details expenditures on the routine maintenance of bridge infrastructure as provided in Council's 2007-08 Budget.

In terms of future funding for maintenance activities:

- Funding availability in maintenance programs requires adjustment in successive years due to asset growth. Growth will immediately impact some expenditure areas whilst others will 'lag', pending future deterioration,
- Funding allocations based on providing a level of service require flexibility for 'changing priorities,
- Work method improvements,
- Effects of some plant replacement on unit costs, and
- Research towards better funding prediction could be based on performance / deterioration indicators

### 6.5.2 Funding of Capital Works

Capital Works can be defined as expenditure that either creates a new asset or improves or restores the current function of an existing asset, for example, reconstruction of a road or bridge.

Capital Works may be split into three distinct categories, Renewal, Upgrade, and Expansion.

Funding for Capital Works is viewed as an essential component of the Five (5)-year Capital Investment Plan. Traditionally, Council's approach to Capital Works and other major non-recurrent expenditure have been to include funding in the Capital Investment Plan where identifiable. Identifiable Capital Works funding is regularly incorporated for most Infrastructure expenditure.

#### 6.5.2.1 Renewal

Capital renewal expenditure returns the service potential or the life of the asset up to that which it had originally. Renewal spending is periodically required expenditure, relatively large (material) in value compared with the value of the components or subcomponents of the asset being renewed.

As renewal investment reinstates existing service potential, it has no impact on revenue, but may reduce future operating and maintenance expenditure if completed at the optimum time.

Examples of such renewal activities are:

- Resurfacing or resheeting part of a road network
- Reconstruction of a failed section of sealed pavement

#### 6.5.2.2 Upgrade

Capital upgrade expenditure enhances an existing asset to provide a higher level of service or expenditure that will increase the life of the asset beyond that which it had originally.

For example widening the sealed area of an existing road, or completing structural improvements to a bridge to increase carrying capacity can be both defined as capital upgrade projects.

Upgrade projects improve service delivery to the community; however, consideration must be given to their long-term sustainability. Most of the projects that fall into this category are fully or partially funded by external contributions.

Capital upgrade expenditure increases future operating and maintenance expenditure as this investment type increases the extent of council's asset base.

#### 6.5.2.3 Expansion

Capital expansion expenditure may be best described as the creation of new assets, to the same standard as is currently enjoyed by residents, to service new ratepayers.

An example of this would be the construction of new infrastructure (e.g. roads, footpaths, drainage, etc) as part of a new subdivision development.

All expansion work is externally funded, and in some cases, can be termed as 'donated assets'. Long term operation, maintenance and renewal of these assets may be of concern because, as the asset portfolio increases, the annual cost of sustaining that portfolio increases respectively.

Funding of new assets can come from:

- Developer contributions,
- Rate revenue and
- Special Charge Schemes targeted at specific improvements for property owners who gain special benefit from those improvements.

Whilst donated assets do not in themselves create a capital cost the increase in the asset base will increase future operating, and maintenance expenses which need to be considered in Council's long-term finance allocations.

Table 6.0 details both historical and proposed capital expenditure on Council's bridge stock as provided in the Capital Works Program.

Prioritised programs are developed in support of the budget. In the development of these programs, consideration is given to the following factors:

- Asset condition assessments,
- Asset hierarchy,
- Analysis of maintenance costs,
- Relative risk to the travelling public, and
- Available funding

Additional funding for asset renewal is available from Roads to Recovery funding. This is designed to bring forward renewal programs which would otherwise be difficult to fund. This program has previously been used for rehabilitation of failed road pavements and replacement of bridges having a low load bearing capacity.

These funds could also be used to contribute to the upgrade of assets which could otherwise become backlog items. This is especially important where network capacity improvements are required to accommodate the effects of growth and demand changes.

### 6.5.3 Summary

All three classifications of Capital Investment, Renewal, Upgrade and Expansion are warranted in differing circumstances:

- Renewal works maintain assets,
- Upgrade works satisfy changes in demand or rectify assets that are perceived as insufficient in meeting community needs, and
- Expansion projects accommodate growth

Council has a current budget strategy that responds to community demand and asset renewal requirements. Council's current emphasis is on asset renewal expenditure rather than asset development.

## 6.6 Evaluation of Capital Works

Council's Capital Evaluation Process provides the framework for an objective evaluation process for all projects to be considered for the Capital Works Program.

This process enables projects of competing priority being considered for inclusion within the Capital Investment Program to be evaluated in a coordinated approach involving the collation of project information, costings and business case assessments.

The outcome of this process provides a prioritised list of projects forming the basis of the Annual Capital Works Program and future years within the Five (5) -Year Capital Investment Program. Capital Works Projects are assessed on the following criteria:

- Council plan, asset management plan or other strategy references
- Timing or project
- Population benefiting
- Revenue opportunities
- Future annual costs
- Future demands on other council resources
- Alternative investment opportunities
- Risk level
- Health and safety issues
- Capital investment type (i.e. renewal, upgrade, expansion)

# 7.0 ASSET MANAGEMENT PRACTICES

This section outlines the nature and sophistication of current practices used for Asset Management decision-making.

## 7.1 Accounting/Financial Systems

The primary issues in the accounting of infrastructure assets relate to valuation and the change in service potential associated with depreciation and renewals. Council's financial systems must be sufficiently robust and have the capacity to provide the required statutory and regulatory reporting requirements.

Non-current, or infrastructure, assets are those community facilities that provide for the delivery of services and sustained standards of living. They primarily comprise Council's fixed utility systems including roads, footpaths, kerb & channel, and bridges.

Infrastructure assets are deemed to have the following attributes:

- They are large networks comprising of sub components.
- The have long economic (useful) lives.
- They provide a benefit and/or social service rather than a commercial service, i.e. the assets are used by the community, both servicing the municipality's residents and visitors. These assets are not usually capable of subdivision for ready disposal, due to legal or other restrictions, and consequently are not readily disposable within the commercial sector.
- The network of assets is not normally depleted as their service potential is maintained in perpetuity, i.e. they are expected to have an indefinite life if adequately maintained although portions of the network will be replaced from time to time.

### 7.1.1 Asset Revaluation Policy

Council's Asset Revaluation Policy establishes a definitive revaluation program for Council's non-current assets that complies with Australian Accounting Standards and assists in the allocation of resources to future valuations. The policy has been developed to take into account issues such as; current Australian Accounting Standards, Victorian Local Government best practice and Council' corporate objectives.

The introduction of the *Local Government (Reporting and Accounting) Regulations 1992* resulted in the application of Australian Accounting Standards to local government financial reporting.

Australian Accounting Standards AAS27 Financial Reporting by Local Governments, among other things, requires:

- The recognition of all non-current assets acquired on or after 1 October 1992 at the date of acquisition, and also
- The recognition of all non-current assets acquired on or before 30 September 1992

Additionally, the policy is cognisant of other mandatory reporting requirements, including the requirements of the *Local Government Act 1989*, and *Local Government (Finance and Reporting) Regulations 2004,* and other industry standards and guidelines.

Colac Otway Shire's financial systems utilise fair value valuation for non-current assets, and depreciation is recognised on a straight line basis.

## 7.2 Asset Management Systems

An asset management system is a combination of processes, data, and software applied to provide the essential information outputs for effective management of risk and optimum infrastructure maintenance and renewals needs.

Council currently has a number software systems and data sources relating to asset management.

2000Plus and the BizeAsset Asset Management System are the two primary systems utilised for data storage and asset registers. These systems contribute to the overall management of the long term planning of Council's infrastructure assets in order to:

- Know what and where the assets are that the organisation owns or is responsible for;
- Know the condition of assets;
- Establish suitable operational, maintenance and renewal regimes to suit the assets and level of services required of them by present and future customers;
- Establish asset function and asset maintenance to meet the needs of the present and future customers;
- Review maintenance practices and optimising operational procedures;
- Implement management strategies for resources and work programs;
- Improve risk management techniques; and
- Identify the true cost of operations and maintenance and predict future capital investments and maintenance expenditure required to optimise the asset function and lifecycle.

Asset management systems using software have become an essential tool for the management of Council's infrastructure assets. 2000Plus and BizeAsset are independent software systems.

Asset management draws on the information contained in these systems, which are briefly outlined below.

### 7.2.1 Information Systems

#### 7.2.1.1 2000Plus

The 2000Plus system is Councils finance and property and rates management systems which has a number of general purpose or specific purpose general ledgers with their own unique user defined account structure. These include:

- General Ledgers,
- Accounts Receivable Ledgers,
- Accounts Payable Ledgers,
- Budgets Ledgers,
- Forecast Ledgers, and
- Commitments Ledgers.

#### 7.2.1.2 BizeAsset

The BizeAsset system is designated as the prime asset management system. The BizeAsset AMS is a web based asset management system which utilises the power of the latest GIS technology. Council's GIS is used to display the spatial aspect of the asset data.

BizeAsset has broad asset management functionality incorporating an asset register, asset valuation and depreciation tools, maintenance management, predictive analysis and reporting.

Some of the key aspects of the BizeAsset system are:

- BizeAsset has been developed by using MapInfo functionally. MapInfo is the Graphical Information System used to provide linkage with corporate information (i.e. property and asset information) to Council's digital map base.
- BizeAsset comes in a package with separate modules for roads and footpaths, bridges, signs, buildings, recreation facilities, and drainage assets.

BizeAsset has a number advanced asset management tools including:

- Valuations (and monthly depreciation calculator). These calculations include tracking additions, disposals, revaluing assets (based on condition calculated remaining lives or asset age), residual values, asset sales. BizeAsset also allows the user to track changes (audit trial) that have occurred between the current database and a previous valuation.
- Tools for easy data editing and maintenance.
- Tracking maintenance history and reporting maintenance history through a mapping interface that includes dynamic links between maps, graphs and reports.
- Predictive analysis that shows the user (through maps, graphs and tables) where assets need to be replaced, how much it is going to cost to replace them and when it is most prudent to do so. This can be used to generate a program of works.
- A Contract Management system.
- Functionality to generate asset related works orders (including linking customer service requests and contracts to works orders, progress payments of works orders, multiple tasks, etc.)
- Customer Service Request system.
- Asset Inspection system that allows the user to produce a user defined overall condition and performance index and remaining life index.
- An efficient and user friendly mapping interface.

System improvement activities currently in progress include the ongoing implementation of the BizeAsset AMS.

#### 7.2.1.3 Bridgit

Managing all the data associated with bridges is a complex task ideally suited to a computerised system, Council's Bridgit Bridge Asset Management System provides the repository for, and a means of managing, all data pertaining to Council's bridges and major drainage assets.

This is a simple database system that is used to store inventory and inspection data. This system also provides the functionality to undertake asset valuations in accordance with the relevant statutory reporting requirements. This database also has linkages to the Council's asset management system and GIS which permits the graphical representation of data and queries.

#### 7.2.1.4 Customer Request System Description

Requests for maintenance of Council's infrastructure assets are recorded on Council's customer request system, MERIT. These requests are generally made by the public, Councilors, and Council staff. Each request is inspected to meet the established response time as detailed for that particular request type.

The MERIT system records each action associated with a particular customer request and is able to its show a complete history through to finalisation. For those request that require a maintenance response, the costs, location, date, and nature of the work completed are recorded within Council's financial systems.

The customer request system described above is able to provide management with measures of effectiveness by providing valuable data on the workload and the level of service being achieved in a given time period. MERIT provides the ability to report on:

- Time taken to complete inspection,
- Priority allocation made at inspection,
- An indication of the number of requests received for a particular locality,
- Number of requests complete,
- Average number of days to completion,
- Requests for each maintenance activity, and
- Responsiveness

The 2000Plus, MERIT and BizeAsset systems are all important corporate systems; however there currently exists no integration between them.

The following issues have been identified:

- Some systems are not being used to their full potential,
- The systems lack integration, therefore duplication of effort is often required,
- Linkage between customer request systems and asset data,
- Sophisticated asset management functionality such as predictive modelling is yet to be implemented.

Council is currently in the process of linking financial and request based information, as it relates to asset maintenance, to its asset data to enable improved management and capital investment decisions.

#### 7.2.1.5 Other Systems

The available asset management data includes:

- Road data available in MapInfo and other database/spreadsheet sources,
- Footpath information, with condition data, available in MapInfo and other spreadsheet sources,
- Bridge data in MapInfo, VicRoads Bridge Inspection Database, and other data sources,
- Drainage asset information is available in BizeAsset

#### 7.2.1.6 Systems Functionality

BizeAsset in conjunction with the Maloney Asset Management modelling Tool allows the capacity to undertake advanced financial forecasting and modelling on any asset group to establish the 'appropriate life-cycle' based on required expenditure (condition intervention) and proposed expenditure (financial sustainability) over the life of the asset.

This assists in determining asset information for long-term capital and maintenance funding requirements to ensure that assets do not fall below their nominated minimum asset condition rating.

### 7.3 Asset Inspections

In order for Council to carry out effective planning and competent management of its road infrastructure, both in a strategic and operational sense, it is essential to collect maintenance-related information through disciplined and regular inspections of the whole of the network.

Council's inspection activities can be grouped into the following categories based on definition and purpose:

- Routine Inspections (Level 1 and Level 2 Bridge inspections),

- Request Inspections,
- Incident Inspections, and
- Condition Inspections (Level 3 Bridge Inspections)

### 7.3.1 Routine Inspections

As stated previously the Colac Otway Shire has adopted the practices of the VicRoads Inspection Manual to monitor the condition of its bridges and major drainage structures. Routine monitoring involves the following hierarchy of inspections:

#### 7.3.1.1 Level 1 – Routine Maintenance Inspections

Inspections of this type are general visual checks carried out by Council's bridge crew on an annual basis to check the general serviceability of the structure for road users and to identify emerging problems.

The scope of the inspection includes an assessment of the substructure and superstructure to identify routine maintenance work that does not require further engineering assessment.

#### 7.3.1.2 Level 2 – Bridge Condition Inspections

Level 2 inspections are comprehensive visual inspections carried out by an accredited bridge inspector. These inspections are carried out on a certain frequency depending on the risk profile of the structure.

The main purpose of this level of inspection is to identify current maintenance needs, forecast future changes in condition. Information from these inspections can be used to estimate future budget requirements.

Bridge condition assessments are essential for proper management of bridge infrastructure, and in ensuring that Council fulfills its commitment in this regard. They identify the immediate and priority bridge works required and provide much of the background information for strategic decision making and future programming.

### 7.3.2 Request Inspections

A maintenance request is any request to undertake maintenance on an infrastructure asset. Customers or users of the asset generally make these requests. To provide the highest level of service, Council's objective in relation to maintenance requests is to inspect and prioritise the work requests within the time frames as specified.

Upon record of a request for maintenance or report of a defect received from the public, Council Officers or Councillors, an inspection will be carried by an appropriately experienced Council Officer within 1 day of notification, dependant on assessed urgency. As with routine maintenance inspections, any recorded defects beyond the maintenance performance criteria for that particular asset will be prioritised and rectified to satisfy established response times.

Council aims to obtain best value for its maintenance budget within the constraint of the resources made available. Maintenance works delivered under an 'Emergency Response' will inevitably cost more than maintenance delivered under the Routine or Periodic Maintenance Programs.

To ensure that the best value is obtained for the available maintenance dollar, work of the same nature must be grouped in a given area so that work is completed efficiently. Therefore, most maintenance work will be completed on the Routine and Periodic Maintenance Programs. Only true emergency works will be actioned immediately.

The benefit of adopting such a strategy means that for example, over a year, more potholes may be repaired from the limited funds available than if completed on a reactive basis. This provides an improved overall level of service and consequently reduces the risk to the community

If works identified are beyond what is considered maintenance, then the project will be referred to and be considered for inclusion in Council's 3–year Capital Investment Program. Council reviews projects for its Capital Investment Program annually, in conjunction with its budget planning process.

### 7.3.3 Incident Inspections

If a person proposes to commence legal proceedings or wishes to make a claim for damages in relation to an incident arising from the condition of a public road or infrastructure on a public road then the person must give written notice of the incident to Council within 30 days of its occurrence. This notice must provide sufficient information to enable Council to undertake an inspection and prepare all reporting requirements.

Within 14 days of receipt of any report of an incident, an inspection of the road or associated infrastructure specified will be undertaken by the Asset Inspection Officer or suitably qualified Council Officer. A report is then prepared detailing the outcomes of this inspection, and provides the following:

- A description of the condition of the relevant section of the public road or infrastructure, providing adequate photographic evidence of the site of the incident,
- Reference to Council's Road Management Plan and in particular its construction and maintenance criteria relating to the public road or infrastructure,
- A summary of, or any reference to, any records relating to the condition of the road or infrastructure from previous inspections and reports, and
- A summary of inspections relating to the condition and maintenance of that part of the public road or infrastructure conducted in the 12 months prior to the incident.

A copy of this report is then filed in Council's Electronic Document Management System for future reference.

### 7.3.4 Condition Inspections

Condition inspections are undertaken specifically to identify deficiencies in the structural integrity of the various components of the road infrastructure that if untreated, are likely to adversely affect network values. The deficiencies may well impact on short-term serviceability as well as the ability of the component to continue to perform at the required level of service for the duration of its intended useful life.

Detailed engineering inspections and analysis (Level 3 Bridge Inspections) are undertaken when issues requiring further investigation are identified during the Level 2 inspection process. They are carried out by an accredited bridge inspector with the purpose of assessing the capacity of a structure, identifying and quantifying the current and projected deterioration of the structure, and recommending appropriate management options.

Regular or periodic assessment, measurement and interpretation of the resulting condition data is required so as to determine the need for any preventive or remedial action and is used in the development of relevant programs of rehabilitation or renewal works.

## 7.4 Asset Data Management

A vast array of bridge asset information is contained within Council's various data sources and systems. The minimum requirement to this point has been to ensure that sufficient detail is collected for each asset to quantify and value the asset portfolio.

The next improvement phase is to determine the extent of additional information required in order to manage, maintain and report on infrastructure assets, including bridges, to ensure optimal asset function and asset lifecycle as well as considering risk management.

### 7.4.1 Data Collection

A common asset data condition rating system has been established to assess the remaining life of an asset assuming regular maintenance and renewal continues for the life of the asset.

The performance of an asset is closely aligned to the level of service provided to the community and can be generally measured in terms of reliability, availability, capacity, and meeting customer demand and need.

A simple ranking (or rating) system defining the condition of assets has been adopted. The five (5) condition states for Council's bridges is detailed in Table 7.0. These condition ratings are determined based on the information collected from Level 2 Bridge Inspections.

| Asset Condition | Condition | Condition Description | Works Required |
|---|---|---|---|
| 1 | Excellent | New or near new condition. Asset performing in a safe condition and as installed. | No work required. No change to inspection regime. |
| 2 | Good | Very well maintained and in a sound condition. Asset exceeds minimum performance specification standards. Nil - Routine maintenance. | Minor work maybe required. No change to inspection regime. |
| 3 | Average | Requires minimal maintenance. Asset meets minimum performance specification standards. Routine maintenance required. | Some work required. No change to inspection regime. |
| 4 | Fair | Asset useable but requires urgent remedial works to meet minimum performance standards. Possible - reactive maintenance. Renewal works planned within two to five years and scheduled for inclusion in the Capital Works program. | Some renewal or rehabilitation work needed within 2-5 years. Schedule further engineering inspection/assessment. |
| 5 | Poor/Unserviceable | Very poor condition with health or safety implications. Asset in an unsafe condition and requires immediate renewal works. Priority renewal item for Capital Works program. Failure imminent or has failed. | Urgent replacement/rehabilitation required. Requires management intervention to control risk. |

**Table 7.0 –** Asset Condition Rating System

Having a common condition rating system generally provides for improved asset reporting and monitoring.

### 7.4.2 Data Maintenance

One of the essential aspects of asset management is to maintain data records to ensure that they are current and accurate. The Asset Development Unit is responsible for updating and maintaining the asset data to meet the organisations operational and financial requirements in delivering efficient and effective asset management.

# 8.0 IMPROVEMENT STRATEGY AND MONITORING

## 8.1 Plan Review

Council's Bridge Asset Management Plan is based on current asset management practices and in some areas limited data.

The continuing development of asset management systems and data collection programs will enable Council to build on and expand on this plan and improve the accuracy of financial forecasts. To improve the quality of the output of this asset management plan, considerable work is still required.

The BrAMP is a living document which is relevant and integral to Council's asset management activities. To ensure the plan remains useful and relevant the following on-going process of AM plan monitoring and review activities are proposed to be undertaken.

- Formal adoption of the plan by Council.
- Review and formally adopt levels of service. Council will undertake a service level review (public consultation process) to determine an accurate understanding of both the current and future needs and expectations of customers. The explicit levels of service and performance measure defined will be formally adopted by Council.
- Revise the contents of the BrAMP annually to incorporate outcomes of service level review and new knowledge resulting from the asset management improvement program.
- Quality assurance audits of asset management information to ensure the integrity and cost effectiveness of data collected.

Table 8.0 details the activity and timetables adopted to achieve these objectives.

| Task | Action | Completion Date |
|---|---|---|
| **AMP Development** | Annual update and enhancement of the plan, including the extension of the timeframe by one year | August each year |
| **AMP Plan Review** | Annual review of plan context by AM Team:<br>- AM plan context<br>- compliance with agreed AM improvement programs<br>- effectiveness and adequacy of AM processes, systems and data | August each year |
| **Levels of Service Review** | Review levels of service targets (including public consultation) and formally adopt results | Tri annually |
| | Measure actual levels of service delivered | Annually |
| **Asset Management System Review** | Confirm data collection, entry standards and quality assurance processes not yet defined | June each year |
| | Undertake annual quality audits on data integrity and report on results | Annually |
| | Annually review data collection, entry standards and quality assurance processes not yet defined | Annually |

**Table 8.0 -** AM Plan Review Program

## 8.2 Performance Review

Council shall ensure that there is ongoing review of its asset management practices to ensure continued suitability and effectiveness having regard to:

- Asset performance following delivery of maintenance and construction programs,
- The level of achievement of Council's asset management improvement strategy, and
- The consideration of any external factors, including legislative requirements, ongoing development of Council Policies, Plans, and other major system implementations, that may effect the contents of the Bridge Asset Management Plan.

Records of any such reviews shall be maintained.

## 8.3 Improvement Strategy

This section summarises the asset management improvement strategies made by this plan. It is presented in table format to allow Council to consider the relative priorities of the various items. At this stage draft priorities and schedule completion dates have been assigned.

| Task | Improvement Strategy | Priority | Target Date |
|---|---|---|---|
| **Level of Service** | Engage the community in discussing the true cost of assets and services. Match service levels with public expectations and willingness/ability to pay. | High | December 2008 |
| | Establish appropriate and measurable levels of service and performance measures, and monitor. | High | March 2009 |
| | Develop relationship between levels of service, demand and cost. | High | April 2009 |
| **Information Management** | Continue ongoing implementation of the BizeAsset Asset Management System. | High | Ongoing |
| | Investigate possible integration between AMS and other corporate systems including customer service and finance systems. | Medium | In progress |
| | Investigate system to capture donated Asset information. | High | In progress |
| | Review and establish asset classification systems (e.g. hierarchy) and apply to all bridges and major drainage structures. | High | June 2008 |
| | Establish and adopt suitable asset identification system for bridge stock. This includes identification plates installed structures. | Medium | In progress |
| | On-going programme of condition & performance data collection based on risk, asset value and rate of decay for all assets in accordance with Road Management Plan. | Medium | Ongoing |
| **Asset Practices and Improvement** | Improve staff awareness of AM principles and practices (also a corporate issue). Commitment from all relevant staff required for continued implementation of the AM improvement plan. | High | Ongoing |
| | Consider graphical display of overall/summary condition and performance of bridge network. | Medium | Completed |
| | Continue long term renewals forecasting for bridge and major drainage assets. | High | Ongoing |

| Task | Improvement Strategy | Priority | Target Date |
|---|---|---|---|
| **Modelling** | Continue current program of obtaining traffic count data to allow the modelling of future network demand and growth (predictive modelling). | Medium | Ongoing |
| | Maintain historical condition data to allow trend analysis and to develop deterioration profiles. | Medium | Ongoing |
| | Establish understanding of bridge capacity needs, based on industry growth and development trends. | Medium | December 2008 |
| **AMP Lifecycle Strategies** | Establish renewal strategies for key bridge/major drainage assets, including annual renewal programs. | High | March 2008 |
| | Establish, document, and implement economic analysis tools to be utilised in Capital Works evaluation processes (e.g. cost/benefit analysis). This is to ensure that overall funding implications are considered so that resources are used effectively for their long term impact. | Medium | Completed |
| | Enhance the availability of life-cycle cost data to provide historical location/cost/work type information. | Medium | Ongoing |
| **Risk Management** | Develop a risk management strategy to identify those bridges believed to provide the greatest risks to Council and the transport network. | High | December 2008 |
| | Relevant staff to review the risk register to ensure all necessary risks associated with bridge infrastructure are included in the register, with risk ratings assigned for critical assets. | High | Annually as required |
| | Incorporate risk in AM decision making when identifying projects and annual programs. | High | Annually as required |

| Task | Improvement Strategy | Priority | Target Date |
|---|---|---|---|
| **Long Term Financial Plans** | Continue data capture improvement programmes to improve confidence in financial forecasts. | High | Ongoing |
| | Undertake a revaluation of road infrastructure asset in accordance with Asset Revaluation Policy. | High | Annually as required |
| | Assign useful lives for all asset groups based on an assessment of condition profiles and renewal history. | Medium | Ongoing |
| | Complete assessment/review of asset useful lives in the asset register. | High | Annually as required |
| | Develop and document robust process to track annual updates based on actual work done – additions, disposals, renewals, etc. | High | April 2008 |
| | Current life cycle costs recorded and analysed for all significant asset types. | Medium | Ongoing |
| | Develop and adopt Capital Works Evaluation criteria for prioritising all project proposals. | High | Completed |
| **Maintenance Management** | Historical maintenance tasks and costs recorded for significant individual assets in AM systems. | Medium | Ongoing |
| | Process for monitoring and reporting compliance with maintenance performance criteria and asset inspection schedules. | High | Quarterly as required |
| | Review the maintenance budgets taking into consideration the possibility of increasing programmed works with a reduction in reactive works. | High | April 2008 |
| | Review bridge infrastructure to identify assets that require upgrading to improve transport efficiency. | Medium | December 2008 |

# Appendix A

## Register of Municipal Bridges

Colac Otway Shire
"Naturally Progressive"

# Municipal Bridge Register

| AssetID | Bridge No | Road Name | Locality | Location | Crossing | Construction Date | Age | Posted Load Limit | Maximum Span Length (m) | Beam/Slab Type | Beam/Slab Depth | Beam/Slab Spacing | Deck Type | Culvert Structure Length (m) | Cell Diam (m) | Cell Width (m) | Width Along Invert (m) | Cell Height (m) | No. Cells | Bridge Length (m) | Bridge Width (m) | No. of Spans | No. Beams/Slabs | Traffic Width (m) | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | CS010 | Carlisle Gellibrand Road | Gellibrand | 1km West Of Colac-Lavers Hill Rd | Charleys Ck - Ccl No. 10 | 1950 | 57 | No Limit Posted | 9.15 m | HSUS old 30's design - No skew | 400 mm | Abutting | Sealed HSUS | | | | | | | 18.7 | 8.85 | 2 | 14 | 7.5 | Bridge |
| 12 | CS012 | Binns Road | Beech Forest | 2.6km From S Forrest Rd | Aire River | 1950 | 57 | 10 tonne | 11.1 m | Timber girder | 560 mm | 1.2 m | Timber deck | | | | | | | 20.4 | 4.15 | 2 | 3 | 3.85 | Bridge |
| 17 | CS017 | Casino Avenue | Apollo Bay | 0.1km From Tuxion St | Milford Creek | 1950 | 57 | No Limit Posted | 7.2 m | 610 x 193 mm RSJ - No skew | 610 mm | 1.85 m | Steel trough decking with RC infiller | | | | | | | 7.2 | 6 | 1 | 4 | 5.4 | Bridge |
| 18 | CS018 | Barham River Road | Apollo Bay | 1.0 Km From Old Apollo Bay Post Office | Andersons Creek | 1950 | 57 | No Limit Posted | 8.1 m | HSU slab | 400 mm | 610 mm | Precast U-slab | | | | | | | 8.1 | 8.3 | 1 | 13 | 6.8 | Bridge |
| 19 | CS019 | Barham River Road | Apollo Bay | 2.2 Km From Old Apollo Bay Post Office | Drain | 1965 | 42 | No Limit Posted | 9.35 m | HSU slab | 450 mm | 610 mm | HSU slab deck | | | | | | | 27.85 | 8.2 | 3 | 13 | 6.8 | Bridge |
| 20 | CS020 | Barham River Road | Apollo Bay | 4.05 Km From Old Apollo Bay Post Office | Barham River | 1950 | 57 | No Limit Posted | 9.45 m | RC beam | 720 mm | 1.4 m | RC deck slab | | | | | | | 18.9 | 5.5 | 2 | 4 | 4.86 | Bridge |
| 21 | CS021 | Barham River Road | Apollo Bay | 8.76 Km From Old Apollo Bay Post Office | Barham River | 1950 | 57 | No Limit Posted | 10.0 m | 2 No. 24inch x 7.5 inch RSJ @ 1.83m cts | 210 mm | 1.83 m | Timber transverse deck | | | | | | | 10 | 3.91 | 1 | 2 | 3.7 | Bridge |
| 22 | CS022 | Upper Gellibrand Road | Barramunga | 4.4 Km From Colac Forest Rd | Roadknights Ck Ccl No 22 | 1950 | 57 | 5 tonne | 8.25 m | 24 in x 7.5 in RSJs - no skew | 610 mm | 2.3 m | Longit 200 x 100 mm plank unsealed timber | | | | | | | 24 | 4.05 | 3 | 2 | 3.75 | Bridge |
| 23 | CS023 | Hennigan Crescent | Forrest | 0.3 Km East Of Station St. | Barwon River West Ccl No 23 | 1950 | 57 | No Limit Posted | 19.6 m | PSC super T Beams - No Skew | 750 mm | 2.3 m | RC Slab over Beams | | | | | | | 19.6 | 4.24 | 1 | 2 | 4.04 | Bridge |
| 24 | CS024 | Roadknight Creek Road | Forrest | 0.2 Km South Of Colac - Forest Road | Roadnight Creek | 2005 | 2 | No Limit Posted | 9.25 m | PSC longitudinal slabs 2.31 m wide - 0 skew | 500 mm | Abutting | PSC longitudinal slabs - 2 legs & intergral kerb | | | | | | | 9.25 | 4.62 | 1 | 2 | 4.46 | Bridge |
| 25 | CS025 | Boundary Road | Forrest | 7 Km From Colac Forrest Rd | Barwon River (West) - Ccl No. 25 | 1950 | 57 | No Limit Posted | 12.3 m | 3 N0 24 in x 7.5 in RSJ - No skew | 610 mm | 1.55 m | Concrete deck in transverse rail lines | | | | | | | 12.3 | 4.46 | 1 | 3 | 4.3 | Bridge |
| 26 | CS026 | Wonga Road | Kawarren | 0.12 Km Off Colac - Lavers Hill Road | Love Creek | 1950 | 57 | No Limit Posted | 9.08 m | PSC transversely stressed planks | 300 mm | 610 mm | PSC transversely stressed planks | | | | | | | 9.3 | 4.42 | 1 | 7 | 3.67 | Bridge |
| 27 | CS027 | Gellibrand East Road | Gellibrand | 0.65 Km East Of Colac Lavers Hill Road | Lardners Creek | 1971 | 36 | No Limit Posted | 9.15 m | HSU slab | 340 mm | 610 mm | HSU slab deck | | | | | | | 21.65 | 6.8 | 3 | 11 | 6.2 | Bridge |
| 29 | CS029 | Sand Road | Glenaire | 5.8km From Gt Ocean Rd | Aire River | 1950 | 57 | 5 tonne | 9.85 m | 350 to 550 mm dia hardwood | 350 to 550 mm | 1.2 m | Transverse 200 x 100 HW unsealed- No skew | | | | | | | 73.67 | 3.8 | 8 | 3 | 3.5 | Bridge |
| 30 | CS030 | Aire Settlement Road | Johanna | 1.5 Km Ne Of Great Ocean Road | Ford River | 1950 | 57 | No Limit Posted | 8.75 m | Slab | 300 mm | 0.2 m | Rails in Concrete slab | | | | | | | 23.1 | 4.55 | 3 | 22 | 3.85 | Bridge |
| 31 | CS031 | Red Johanna Road | Johanna | 4.7 Km From Great Ocean Road | Stafford Creek | 1950 | 57 | No Limit Posted | 12.5 m | Waldren type decking | 650 mm | Abutting | Unsealed deck slabs | | | | | | | 13 | 5 | 1 | 2 | 4.54 | Bridge |
| 38 | CS038 | Sand Pit Road | Chapple Vale | 0.8km From Laver Hill-Cobden Rd | Chapple Creek | 1950 | 57 | No Limit Posted | 12.8 m | Precast U slab | 660 mm | 0 | U slab deck | | | | | | | 12.8 | 5.03 | 1 | 2 | 4.5 | Bridge |
| 41 | CS041 | Lyness Road | Carlisle River | 1.5km From Colac Carlirk Rd | Gellibrand Rv | 1950 | 57 | 25 tonne | 18.97 m | 610 x 300 mm Heavy Universal Beam - no skew | 610 x 300 mm Heacy Universal Beam | 2.8 m | Transverse Timber Deck | | | | | | | 18.97 | 4.2 | 1 | 3 | 3.95 | Bridge |
| 42 | CS042 | Hordern Vale Road | Hordern Vale | 2.1km From Gt Ocean Rd | Duck Creek - Ccl No 42 | 1950 | 57 | No Limit Posted | 7.7 m | Prestressed Concrete U-Slab - No Skew | 500mm | Abuting | Poorly sealed deck | | | | | | | 7.7 | 5 | 1 | 2 | 4.5 | Bridge |
| 43 | CS043 | Skenes Creek Road | Skenes Creek | 0.7km From Great Ocean Rd | Skenes Creek | 1950 | 57 | No Limit Posted | 600 mm | RC pipe - 30 degree +ve skew | 0.6 m | 0.8 m | RC deck slab - new floodway | 0.6 | 0.6 | | 3.67 | 0.6 | 6 | | | | | 3.67 | Pipe Culvert |
| 44 | CS044 | Apollo Bay Recreation Reserve | Apollo Bay | 0.1km From Rec Reserve Apollo Bay Entrance | Barham Riverrec Res Apollo Bay | 1950 | 57 | No Limit Posted | 12 m | 2 No.24 x 7.5 in RSJs no X frame - No skew | 610 mm | 1.8 m | Transverse timber deck | | | | | | | 23 | 4.3 | 2 | 2 | 4.1 | Bridge |
| 45 | CS045 | McPhees Access | Apollo Bay | 4.0km From Po Apollo Bay | Barham Rivermcphee's Access | 1950 | 57 | No Limit Posted | 9.15 m | HSUSlab - all spans 9.15 m. No skew | 600 mm | 0.6 m | HSUslab | | | | | | | 27.73 | 4.2 | 3 | 7 | 3.7 | Bridge |
| 46 | CS046 | Cartys Access | Apollo Bay | 7.1km From Po Apollo Bay/0.1 Off Bv Rd | Barhamcarty's Access | 1950 | 57 | No Limit Posted | 16.62 m | 5 No.3.05 x 2.1 m crown unit cells - No skew | 2.1 m | Abutting | RC slab over box culvert | 16.5 | | 3.05 | 3.18 | 2.1 | 5 | | | | | 3.18 | Box Culvert |
| 47 | CS047 | Pearces Access | Apollo Bay | 10.1km From Po Apollo Bay | Barham Rf. Pearce's Access | 1950 | 57 | No Limit Posted | 11.9 m | 24 in x 7.5 in RSJ - 20 degree +ve skew | 610 mm | 1.85 m | Diagonal timber deck | | | | | | | 11.9 | 2.93 | 1 | 2 | 2.7 | Bridge |
| 50 | CS050 | Kents Road | Barwon Downs | 1.3km From Birregurra-Forrest Rd | Barwon River (West) | 1950 | 57 | No Limit Posted | 8.6 m | Old rail lines | 200 mm | Abuting | Unsealed concrete slab in railway lines | | | | | | | 8.6 | 4.55 | 1 | 41 | 3.9 | Bridge |
| 51 | CS051 | Rollings Access | Kawarren | 0.05km From Colac-Lavers Hill Rd | Love's Creek | 1950 | 57 | No Limit Posted | 12.5 m | 24 in x 7.5 in RSJ @ 2.3 m cts - No skew | 610 mm | 2.3 m | Transverse timber | | | | | | | 12.5 | 4.22 | 1 | 2 | 4 | Bridge |
| 52 | CS052 | Veseys Access | Kawarren | 0.05km From Colac-Lavers Hill Rd | Love's Creek | 1950 | 57 | No Limit Posted | 11 m | 24 in x 7.5 in RSJ - No skew | 610 mm | 2 m | Longitudinal timber deck | | | | | | | 11 | 2.4 | 1 | 2 | 2.1 | Bridge |
| 53 | CS053 | Daffys Lane | Gellibrand | 0.4km From Old Beech Forrest Rd | Gellibrand Riverdaffys Access | 1950 | 57 | No Limit Posted | 7.6 m | 610 mm x 190 mm RSJ - No skew | 610 mm | 2.5m | Transverse timber decking | | | | | | | 22.65 | 3.6 | 3 | 2 | 3.35 | Bridge |
| 54 | CS054 | Clancys Access | Gellibrand | 0.3 Km Off Lardners Track | Gellibrand River | 1950 | 57 | 20 tonne | 13.45 m | 610 x 190 mm RSJ - No skew | 610 mm | 1.35 m | Transverse timber deck | | | | | | | 13.45 | 3.73 | 1 | 3 | 3.37 | Bridge |
| 55 | CS055 | Raffertys Road | Gellibrand | 0.12km From Gellibrand East Rd | Gellibrand Riverrafferty's Access | 1950 | 57 | 10 tonne | 7.4 m | 610 x 190 mm RSJ - No skew | 610 mm | 2.0 m | Longitudinal timber decking | | | | | | | 18.85 | 3.26 | 3 | 2 | 3.2 | Bridge |
| 57 | CS057 | James Access | Gellibrand | 0.3km From Lardners Track | Gellibrand Riverleggs Access | 1950 | 57 | No Limit Posted | 8.0 m | Steel RSJ | 610 mm | 1.45 m | Transverse Timber Deck | | | | | | | 23.15 | 4.3 | 3 | 3 | 3.95 | Bridge |
| 58 | CS058 | Carlisle Valley Road | Carlisle River | 3.5km From Colac - Lavers Hill Rd | Carlisle River | 1950 | 57 | No Limit Posted | 11.5 m | 24 x 7.5 in RSJ - No skew | 610 mm | 2.0 m | 200 x 100 longitudinal timber deck - always damp | | | | | | | 11.5 | 3.5 | 1 | 2 | 3.25 | Bridge |
| 59 | CS059 | Old Ocean Road | Yuulong | 4.0km From Gt Ocean Rd (O.3 Off Old Ocean Rd) | Ford River - Ccl No 59 | 1961 | 46 | No Limit Posted | 7 m | 410 mm x 150 mm RSJs - No Skew | 410 mm | 2.1 m | Longitudinal H/W Deck 200 x100 mm | | | | | | | 17 | 3.95 | 3 | 2 | 3.68 | Bridge |
| 60 | CS060 | Scorcis Access | Johanna | 5.4km From Gt Ocean Rd/Off Johanna Rd | Johanna River | 1950 | 57 | No Limit Posted | 9.7 m | 2 No 24inch x 7.5 inch RSJ @ 2.1 inch cts | 610 mm | 2.1 m | Timber Longitudinal deck | | | | | | | 9.7 | 3.95 | 1 | 2 | 3.65 | Bridge |
| 61 | CS061 | Barham River Road | Apollo Bay | 2.2 Km From Old Apollo Bay Post Office | Drain | 1950 | 57 | No Limit Posted | 600 mm | Culvert pipe | 600 mm | 0 | Sealed pavement | 0.6 | 0.6 | | 9.3 | 0.6 | 1 | | | | | 7 | Pipe Culvert |
| 62 | CS062 | Gellibrand East Road | Gellibrand | | Creek | 1950 | 57 | No Limit Posted | 900 mm | RC culvert | 900 mm | 0 | Unsealed gravel pavement | 0.9 | 0.9 | | 11 | 0.9 | 1 | | | | | 7.8 | Pipe Culvert |
| 64 | CS064 | Walls & Skinners Access | Carlisle River | 0.2km From Colac- Carlisle Rd | Creek - Ccl No. 64 | 1950 | 57 | No Limit Posted | 1.8 m | 1.8 m dia cts RC Pipe - No skew | 1.8 m | N/A | Gravel pavement over top of culvert | 1.8 | 1.8 | | 5 | 1.8 | 1 | | | | | 5 | Pipe Culvert |
| 65 | CS065 | Ganes Access | Carlisle River | 1.0km From Colac-Carlisle Rd | Gellibrand River | 1950 | 57 | 5 tonne | 7.3 m (spans 6.5- | 350 mm round timber stringers - No skew | 350 mm | 1.4 m | 200 x 110 longitudinal decking | | | | | | | 20.35 | 3.95 | 3 | 3 | 3.65 | Bridge |
| 66 | CS066 | Silks Access | Carlisle River | 1.0km From Colac-Carlisle Rd | Gellibrand River | 2006 | 1 | No Limit Posted | 8.95 m | 610 mm UB & RSJ - No skew | 610 mm | 2.15 m | 200 x110 mm longitudinal decking | | | | | | | 17.7 | 3.53 | 2 | 2 | 3.23 | Bridge |
| 67 | CS067 | King Track | Chapple Vale | .8 Km Off Gellibrand River Road | Gellibrand River | 1950 | 57 | 25 tonne | 10.3 | RSJ 24 m x 7.5in - no skew | 610 mm | 2.2 m | Transverse Timber Decking 200 x 120 mm | | | | | | | 34.9 | 3.8 | 4 | 2 | 3.5 | Bridge |
| 69 | CS069 | Devondale Road | Chapple Vale | 6.5 Km South Of Junction Of Colac Tree Road & D | Nariel Creek | 1950 | 57 | No Limit Posted | 1.2 m | 1.2 m dia. Corrugated galvanised steel pipe | 1.2 m | NA | Unsealed gravel pavement over pipe - no skew | 6 | 1.2 | | 5 | 1.2 | 1 | | | | | 5 | Pipe Culvert |
| 70 | CS070 | Devondale Road | Chapple Vale | 6.53 Km South Of Colac Tree Rd Junction | Nariel Creek | 1950 | 57 | No Limit Posted | 1.05 m | 1.05 m dia RC Pipe - 5 degree -ve skew | 1.05 m | N/A | Unsealed gravel pavement over pipe | 4.8 | 1.05 | | 4.1 | 1.05 | 1 | | | | | 4.1 | Pipe Culvert |
| 71 | CS071 | Devondale Road | Chapple Vale | 6.6 Km South Of Colac Tree Rd | Nariel Creek | 1950 | 57 | No Limit Posted | 0.53 m | RC Pipe - No skew | 0.53 m | N/A | Unsealed gravel pavement over pipe | 4.8 | 0.5 | | 4.2 | 0.5 | 1 | | | | | 4.2 | Pipe Culvert |
| 74 | CS074 | Skenes Creek Road | Skenes Creek | 0.5km From Gt Ocean Rd | Skenes Ckhowells Access | 1950 | 57 | No Limit Posted | 12.3 m | 24 in x 7.5 in RSJs | 610 mm | 1.96 m | Transverse timber deck | | | | | | | 12.3 | 3.38 | 1 | 2 | 3.18 | Bridge |
| 75 | CS075 | Irrewillipie Road | Barongarook West | 50m South Of Forans Road | Unnamed - Ccl No 75a | 1950 | 57 | No Limit Posted | 1.2 m | RC Pipe - No skew | 1.2 m | N/a | Sealed pavement over culvert | 20 | 1.2 | | 10.4 | 1.2 | 1 | | | | | 10.4 | Pipe Culvert |
| 78 | CS78 | Swan Marsh Road | Pirron Yallock | 8.4km From Princes Hwy | Tirrengower Ck | 1950 | 57 | No Limit Posted | 1.2 m | RC box culvert | 900 mm | 0 | Sealed gravement pavement | 1.2 | | 1.2 | 11.1 | 0.9 | 1 | | | | | 9 | Box Culvert |
| 80 | CS080 | Carpendeit Bungador Road | Bungador | 0.85 Km From Bungador School Road | Creek | 1950 | 57 | No Limit Posted | 1.2 m | Box culvert | 0.9 m | 0.17 m | Sealed gravel pavement | 8 | | 1.2 | 9.2 | 0.9 | 6 | | | | | 7.4 | Box Culvert |
| 81 | CS081 | Nalangil Road | Nalangil | 3.5km From Colac Ballarat Rd | Diversion Channel | 1950 | 57 | No Limit Posted | 12.2 m | Steel I-Beam | 610 mm | 2.0 m | Steel Trough Deck | | | | | | | 12.8 | 9.18 | 1 | 5 | 9 | Bridge |
| 82 | CS082 | Hearn Street | Colac | 0.7km From Forest Rd | Barongarook Ck | 1950 | 57 | No Limit Posted | 2.25 m | Precast Box culvert | 1.5 m | 300 mm | Precast Box culvert | 4.9 | | 2.25 | 13.6 | 1.5 | 2 | | | | | 9.8 | Box Culvert |
| 83 | CS083 | Forest Street | Colac East | 0.7km From Colac-Forrest Rd | Barongarook Ck | 1956 | 51 | No Limit Posted | 6.98 | RC beams | 585 mm | 1.38 m | RC slab | | | | | | | 20.83 | 7.04 | 3 | 5 | 6.35 | Bridge |
| 84 | CS084 | J Barrys Road | Elliminyt | 2.1km From Forrest Rd | Barongarook Ck | 1950 | 57 | No Limit Posted | 25.3 | Steel Truss | 3.2 m | 1.18 m | Steel Trough Deck | | | | | | | 25.3 | 3.86 | 1 | 2 | 3.69 | Bridge |
| 85 | CS085 | Pound Road | Elliminyt | 0.3km From Station St | Barwon R (West Br)T - Ccl No. 86 | 1950 | 57 | No Limit Posted | 0.61 m | 3 No. 610 mm dia. RC Pipe - no skew | 0.61 m | 0.3 m | Unsealed Gravel over RC Pipe | 6.4 | 0.6 | | 5.3 | 0.6 | 3 | | | | | 5.3 | Pipe Culvert |
| 86 | CS086 | Pound Road | Elliminyt | 0.36km From Station St | Floodway | 1950 | 57 | No Limit Posted | 0.91 | 2 No. 0.91 m dia. RC Pipe - no skew | 0.91 m | 0.35 m | Unsealed Gravel over RC Pipe | 8 | 0.9 | | 5.9 | 0.9 | 2 | | | | | 5.9 | Pipe Culvert |
| 88 | CS088 | Seven Bridges Road | Gerangamete | 0.7km From Colac Forrest Rd | Barwon Rv(West Branch) | 1950 | 57 | No Limit Posted | 12.15 m | 4 No 24inch x 7.5 inch RSJ@2.2m cts | 610 mm | 2.2 m | Steel Trough Deck | | | | | | | 12.65 | 7.02 | 1 | 4 | 6.9 | Bridge |
| 89 | CS089 | Seven Bridges Road | Gerangamete | 1.1km From Colac Forrest Rd | Callanas Ck | 1950 | 57 | No Limit Posted | 3.1 m | Precast RC box culvert | 2.4 m | 3.1 m | Sealed deck slab | 10.1 | | 3.1 | 8.7 | 2.4 | 3 | | | | | 8.3 | Box Culvert |
| 93 | CS093 | Dewings Bridge Road | Gerangamete | 2.6km From Birregurra Forest Rd | Barwon Rv(East Branch) | 1950 | 57 | No Limit Posted | 10.7 m | 24 inch x 7.5 inch RSJ | 610 mm | 1.65 m | Steel Trough Deck | | | | | | | 11.14 | 5.84 | 1 | 4 | 5.66 | Bridge |
| 94 | CS094 | Division Road | Murroon | 0.05km From Birregurra-Forrest Rd | Unknown | 1956 | 51 | No Limit Posted | 6.2 m | Precast U slab | 340 mm | 610 mm | U slab Deck | | | | | | | 6.2 | 5.85 | 1 | 10 | 5.31 | Bridge |
| 96 | CS096 | Colac Lorne Road | Birregurra | 1.23 Km West Of Forrest Road | Creek | 1950 | 57 | No Limit Posted | 9 m | HSU slab | 400 mm | 610 mm | RC deck overlay | | | | | | | 27.05 | 10.6 | 3 | 17 | 9.7 | Bridge |
| 97 | CS097 | Colac Lorne Road | Birregurra | 1.05 Km Off Forrest Road | Creek | 1950 | 57 | No Limit Posted | 3.1m | Precast Culvert cell | 2.4 m | 0.3 m | Sealed pavement | 13.75 | | 3.1 | 8.6 | 2.4 | 4 | | | | | 8.08 | Box Culvert |
| 101 | CS101 | Barongarook Road | Barongarook | 3.0km From Colac-Lavers Hill Rd | Boundary Ck | 1950 | 57 | No Limit Posted | 2.44 m | Box culvert | 1.83 m | 300 mm | Seal gravel pavement | 5.44 | | 2.44 | 8.55 | 1.83 | 2 | | | | | 8.3 | Box Culvert |
| 102 | CS102 | Old Yeo Road | Yeo | 1.2km From Colac-Forrest Rd | Barongarook Ck | 1960 | 47 | No Limit Posted | 11.8 | RSJ I-Beams | 560 mm | 1.72 m | Steel Trough deck | | | | | | | 11.8 | 6.11 | 1 | 4 | 5.95 | Bridge |
| 104 | CS104 | Warncoort Cemetery Road | Warncoort | 4km South Of Warncoort - Birregurra Rd | Unnamed Creek | 1950 | 57 | No Limit Posted | 1.2 m | .5 dia. RC Pipe - no skew | 1.2 m | NA | Unsealed Rough Gravel Surface | 1.2 | 1.2 | | 5.9 | 1.2 | 1 | | | | | 5.9 | Pipe Culvert |
| 105 | CS105 | Warncoort Cemetery Road | Warncoort | 100 M Sth Of Collyers Rd | Atkin Creek | 1950 | 57 | No Limit Posted | 1.2 m | 1.2 m dia. RC Pipe - no skew | 1.2m | NA | Unsealed Gravel over RC Pipe | 16 | 1.2 | | 6.5 | 1.2 | 1 | | | | | 6.5 | Pipe Culvert |
| 106 | CS106 | Strachan Street (Footbridge) | Birregurra | 0.1 Km From Birregurra -Waurn Court Rd | Railway Dam Creek - Ccl No250 | 1950 | 57 | Pedestrian Bridge | 12.05 m | 24 in x 7.5 in RSJ - No skew | 610 mm | 1.65 m | Steel checker plate | | | | | | | 12.05 | 1.83 | 1 | 2 | 1.51 | Bridge |
| 114 | CS114 | Eurack Road | Eurack | 0.53 Km East Of Storan's Road | Drain | 1950 | 57 | No Limit Posted | 950 mm | RC slab | 1 m | 0 | RC slab | 0.95 | | 0.95 | 7.3 | 1 | 1 | | | | | 5.75 | Box Culvert |
| 118 | CS118 | Sunnyhills Road | Beeac | Cnr Sunny Hills Road & Buckley Road | Drain | 1950 | 57 | No Limit Posted | 1.2 m | RC box culvert | 900 mm | 1.2 m | Precast RC box culvert | 0.9 | | 1.2 | 6 | 0.9 | 2 | | | | | 4 | Box Culvert |
| 121 | CS121 | Williss Road | Nalangil | 1.0 Km From Nalingal Road | Drain - Ccl No 251 | 1950 | 57 | No Limit Posted | 0.75 m | 0.75 m wide x 0.91 m high masonry boc culv | 0.91 m | Not applicable - 30 degree +ve skew | Unsealed gravel pavement over concrete cis lid. | 6.7 | | 0.75 | 5.4 | 0.91 | 1 | | | | | 5.4 | Box Culvert |
| 122 | CS122 | Conns Lane | Birregurra | 0.8km From S Of Princess Hwy | Birregurra Creek | 1950 | 57 | No Limit Posted | 6.4 m | HSU Slab | 430 mm | 610 mm | HSU slab | | | | | | | 6.8 | 5.55 | 1 | 9 | 5 | Bridge |
| 123 | CS123 | Conns Lane | Birregurra | 3.2km From Princess Hwy | Drain | 1950 | 57 | No Limit Posted | 9.7 m | RC Pipe Culvert | 1.35 m | 2.2 m | Sealed Road | 1.35 | 1.35 | | 9.7 | 1.35 | 5 | | | | | 9.3 | Pipe Culvert |
| 124 | CS124 | Conns Lane | Birregurra | 4.1km From Princess Hwy | Barwon River | 1950 | 57 | No Limit Posted | 31.17 m | Tee Beam Deck - as new | 1.4 m | 2.5 m | Tee Beam Deck | | | | | | | 31.17 | 5.1 | 1 | 2 | 4.53 | Bridge |
| 125 | CS125 | Cape Otway Road | Birregurra | 0.6 Km East Of Birregurra-Deans Marsh Road | Deans Marsh Creek | 1974 | 33 | No Limit Posted | 7.6 m | HSU slab | 40 mm | 610 mm | R deck overlay | | | | | | | 23.22 | 9.2 | 3 | 15 | 8.6 | Bridge |
| 126 | CS126 | Whoreel Station Road | Whoreel | 0.15 Km From Birregurra-Deans Marsh Road | Deans Marsh Creek - Ccl No. 126 | 1950 | 57 | No Limit Posted | 14.6 m | 2 No. 24 in x 7.5 in RSJ - No skew | 610 mm | 2.1 m | Transverse RC deck slab | | | | | | | 24.75 | 3.56 | 3 | 2 | 3.53 | Bridge |
| 127 | CS127 | Rifle Butts Road | Whoorel | 0.4km From Birregurra Rd | Pennyroyal Ck - Ccl No 127 | 1984 | 23 | No Limit Posted | 10.7 | 3 No. 10.7 m HSUS - 40 degree -ve skew | 500 mm | 0.6 m | CIS Slab over HSUS | | | | | | | 32.5 | 8.1 | 3 | 13 | 7.5 | Bridge |
| 129 | CS129 | Murroon Road | Murroon | 1.2km From Bushes Lane | Matthews Ck | 1950 | 57 | No Limit Posted | 1650 mm | Steel beam | 610mm / 560mm | 800 mm - 1650 mm | Precast Transverse deck | | | | | | | 30.7 | 5.93 | 3 | 6 | 5.33 | Bridge |
| 130 | CS130 | Griffins Road | Barwon Downs | 0.6km From Birregurra Forest Rd | Dewing Ck - Ccl No.130 | 1950 | 57 | No Limit Posted | 1.22 m | 4 cell RC pipe - 20 degree -ve skew | 1.22 m | 0.7 m | Unsealed pavement over culvert | 6.8 | 1.22 | | 6.4 | 1.22 | 4 | | | | | 6.4 | Pipe Culvert |
| 131 | CS131 | Deepdene Road | Birregurra | 1.8km From W Of Deans Marsh Rd | Matthews Ck | 2004 | 3 | No Limit Posted | 19 m | Tee Beam x 4 No | 900 mm | 2.4 m | Tee Beam Deck | | | | | | | 19 | 10.03 | 1 | 4 | 9.53 | Bridge |
| 132 | CS132 | Division Road | Murroon | 3.3km From Bushes Lane | Flood Land | 1992 | 15 | No Limit Posted | 3.3 m | Precast RC box culvert | 1.8 m | 0 | RC deck | 3.3 | | 3.3 | 13.4 | 1.8 | 1 | | | | | 7.2 | Box Culvert |
| 138 | CS138 | Trotters Road | Carlisle River | 0.8km From Colac-Carlisle Rd | Gellibrand River | 1950 | 57 | Closed | 11.3 | 2/ 24 in x 7.5 in RSJ - No skew | 610 mm | 2.0 m | Longitudinal Timber - removed | | | | | | | 22.6 | 3.6 | 2 | 2 | 3.3 | Bridge |
| 139 | CS139 | Chapel Street | Colac | 0.2km From Queen St | Barongarook Ck | 1950 | 57 | No Limit Posted | 7.27 m | Flat Concrete slab | 350 mm | 0 | Concrete slab | | | | | | | 30.62 | 9.36 | 6 | 1 | 6.63 | Bridge |
| 140 | CS140 | Wilson Street | Colac | 0.25km From Queen St | Barongarook Ck | 1950 | 57 | No Limit Posted | 1.7 m | 0 | 1.7 m | 1.0 m | RC Pipe | 9.3 | 1.7 | | 17.1 | 1.7 | 4 | | | | | 11.05 | Pipe Culvert |
| 141 | CS141 | Red Johanna Road | Johanna | | | 1950 | 57 | No Limit Posted | 2.75 m | Precast RC Large box culvert 2750mm x 2100mm | 2.1 m | 2.1 m | RC box culvert | 6.2 | | 2.75 | 7.4 | 2.1 | 2 | | | | | 7 | Box Culvert |
| 142 | CS142 | Barham River Road | Apollo Bay | 10.06 Km From Old Apollo Bay Post Office | Barham River | 1950 | 57 | No Limit Posted | 3.1 m | RC box culvert | 2.13 m | 3.1 m | RC deck slab | 16.7 | | 3.1 | 4.9 | 2.13 | 5 | | | | | 4.4 | Box Culvert |
| 143 | CS143 | Silks Access | Carlisle River | 0.8 Km Off Colac-Carlisle Rd | Creek - Ccl No. X5 | 2002 | 5 | No Limit Posted | 3.0 x 1.83 m | Precast RC Box culvert - No skew | 1.83 m | Abutting | Concrete slab over precast crown units | 6.5 | | 3 | 4.45 | 1.83 | 2 | | | | | 4.45 | Box Culvert |
| 145 | CS145 | Carsons Road | Swan Marsh | 3.1km From Swan Marsh Rd | Drain - Ccl No 145 | 1950 | 57 | No Limit Posted | 6.9 m | RSJ 150 x 300 mm - No skew | 300 mm | 0.7 m | Timber longitudinal deck | | | | | | | 6.9 | 3.65 | 1 | 4 | 3.45 | Bridge |
| 146 | CS146 | Mcnamaras Road | Swan Marsh | 0.4km From Swan Marsh Rd | Drain | 1950 | 57 | No Limit Posted | 10.15 m | 20 x 6.5 in RSJ @ 1.5 m cts - No skew | 505 mm | 1.2 m | Longitudinal timber deck | | | | | | | 10.15 | 4 | 1 | 3 | 3.75 | Bridge |
| 147 | CS147 | Swan Marsh Road | Swan Marsh | 8.48 Km From Princes Hwy | Drain | 1950 | 57 | No Limit Posted | 9.9 m | Steel RSJs | 610 mm | 1.53 m | Steel Trough Deck | | | | | | | 10.1 | 7.28 | 1 | 5 | 7.1 | Bridge |
| 148 | CS148 | Swan Marsh-Irrewillipe Road | Swan Marsh | 2.0km From Swan Marsh Rd | Drain | 1950 | 57 | No Limit Posted | 1.50 m | Precast pipe | 1.50 m | 3.70 m | Sealed gravel pavement | 7.7 | 1.5 | | 8.55 | 1.5 | 4 | | | | | 7.58 | Pipe Culvert |
| 149 | CS149 | Melville Road | Swan Marsh | 0.6km From Sexton Rd | Tirren Gower Drain - Ccl No 149 | 1950 | 57 | No Limit Posted | 3.05 m | 2 cell 3.05 x 2.4 RC Box C.- 20 degrees +ve skew | 2.4 m | Abutting | Unsealed gravel pavement | 7.2 | | 3.05 | 6.8 | 2.4 | 2 | | | | | 6.7 | Box Culvert |
| 150 | CS150 | Sextons Road | Swan Marsh | 1.38 Km From Swan Marsh Rd | Drain - Ccl No 150 | 1950 | 57 | No Limit Posted | 3.05 m | Twin cell 10 in x 4 in Box culvert | 1.24 m | N/A | Unsealed pavement over PC box | 7.4 | | 3.05 | 6.9 | 1.2 | 2 | | | | | 6.8 | Box Culvert |
| 151 | CS151 | Swan Marsh Stoneyford Road | Swan Marsh | 0.65km From Princes Highway | Drain | 1950 | 57 | No Limit Posted | 12.25 | Steel RSJs | 610 mm | 1.5 m | Steel Trough Deck | | | | | | | 12.65 | 7.7 | 1 | 5 | 7.52 | Bridge |
| 152 | CS152 | Sladen Street | Birregurra | 0.08km From Strachan St | Creek - Ccl No. 152 | 1992 | 15 | No Limit Posted | 3.05 m | Twin 3.05 x 1.5m RC Box | 1.5 m | Abuting | Sealed pavement over Box culvert | 7.2 | | 3.05 | 6.9 | 1.5 | 2 | | | | | 6.8 | Box Culvert |
| 155 | CS155 | Christies Road | Elliminyt | 1.4km From Harris St | Deans Creek | 1950 | 57 | No Limit Posted | 5.3 m | PSC slab | 240 mm | 610 mm | PSC slab deck | | | | | | | 5.3 | 5.72 | 1 | 9 | 5.15 | Bridge |
| 157 | CS157 | Pound Road | Elliminyt | 0.9km From Main St | Deans Creek | 1950 | 57 | No Limit Posted | 12.5 m | Steel RSJs | 550 mm | 2.0 m | Concrete slab | | | | | | | 12.4 | 7.36 | 1 | 5 | 6.75 | Bridge |
| 158 | CS158 | Deans Creek Road | Elliminyt | 0.6km From Princes Highway | Deans Creek | 1961 | 46 | No Limit Posted | 14 | Steel RSJs | 610 mm | 1.25 m | Concrete slab | | | | | | | 14 | 7.51 | 1 | 6 | 6.1 | Bridge |
| 159 | CS159 | Back Larpent Road | Elliminyt | 1.0km From Deans Creek Rd | Drain | 1950 | 57 | No Limit Posted | 2.5 | RC box culvert | 1.52 m | 300 mm | Sealed RC box culvert | 8.4 | | 2.5 | 8.6 | 1.52 | 3 | | | | | 8.2 | Box Culvert |
| 160 | CS160 | Phalps Road | Nalangil | 1.6 Km South Of Princes Hwy | Creek | 1950 | 57 | No Limit Posted | 9.32 | RSJs I-Beams | 510 mm | 2.4 m | Steel Trough Deck | | | | | | | 18.62 | 4.01 | 2 | 2 | 3.85 | Bridge |

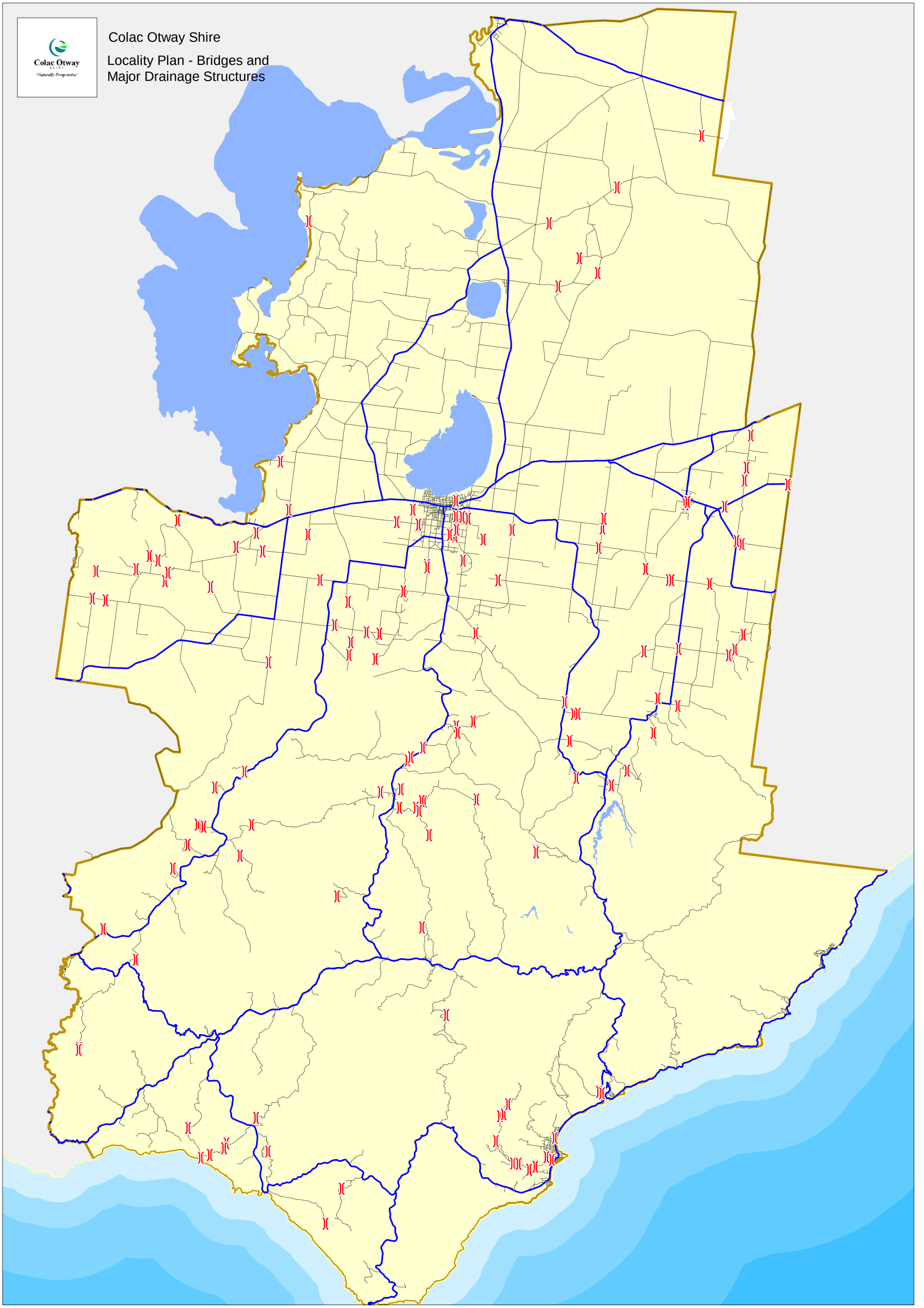
Colac Otway Shire
"Naturally Progressive"

# Municipal Bridge Register

| AssetID | Bridge No | Road Name | Locality | Location | Crossing | Construction Date | Age | Posted Load Limit | Maximum Span Length (m) | Beam/Slab Type | Beam/Slab Depth | Beam/Slab Spacing | Deck Type | Culvert Structure Length (m) | Cell Diam (m) | Cell Width (m) | Width Along Invert (m) | Cell Height (m) | No. Cells | Bridge Length (m) | Bridge Width (m) | No. of Spans | No. Beams/Slabs | Traffic Width (m) | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 161 | CS161 | Gellibrand East Road | Gellibrand | 3.37 Km Off Colac -Lavers Hill Road | Creek | 1993 | 14 | No Limit Posted | 2.1 m | PVC culvert | 2.1 m | 700 mm | Sealed pavement | 8.5 | 2.1 | | 11.8 | 2.1 | 3 | | | | | 6.4 | Pipe Culvert |
| 163 | CS163 | Mingawalla Road | Beeac | 3.1 Km East Of Colac-Ballarat Road | Calvert Lough | 1950 | 57 | No Limit Posted | 0.6 m | 2 No / 600mm dia. pipe - No skew | 0.6 m | 0.25 m | Sealed pavement over pipe | 0.6 | 0.6 | | 8.5 | 0.6 | 2 | | | | | 8.5 | Pipe Culvert |
| 164 | CS164 | Eurack Road | Beeac | 4 Km East Of Beeac Road | Calvert Ough Overflow | 1950 | 57 | No Limit Posted | 1.2 m | 1.2 m dia RC pipe - Monitor cracking - No skew | 1.2 m | n/a | Sealed pavement over RC pipe | 1.2 | 1.2 | | 8 | 1.2 | 1 | | | | | 8 | Pipe Culvert |
| 165 | CS165 | Stones Road | Larpent | 2.92km Off Tomahawk Creek Road | Creek | 1950 | 57 | No Limit Posted | 2.15 m | cis box culvert | 2.4 m | 200 mm | Sealed cis box culvert | 4.85 | | 2.15 | 6.6 | 2.4 | 2 | | | | | 6.44 | Box Culvert |
| 167 | CS167 | Tuckers Orchard Road | Carlisle River | 1.4 Km From Gellibrand-Carlrole Rd | Unknown | 1950 | 57 | No Limit Posted | 1.2 m | 3 No. 1.2 dia. RC Box Culvert - no skew | 0.6 m | Abutting | Unsealed Gravel Pavement | 6 | 1.2 | | 5.6 | 1.2 | 3 | | | | | 5.6 | Pipe Culvert |
| 168 | CS168 | Meadowell Road | Gerangamete | 0.2 Km West Of Colac - Forrest Road | Major Drain | 1950 | 57 | No Limit Posted | 1.2 m | Precast RC box culvert | 900 mm | 1.2 m | Sealed surface | 2.8 | | 1.2 | 7.4 | 0.9 | 2 | | | | | 7 | Box Culvert |
| 169 | CS169 | Kents Access | Kawarren | 0.24 Km East Of Kawarren East Road | Serpentine Creek | 1950 | 57 | No Limit Posted | 910 m | Culvert pipe | 910 mm | 300 mm | Unsealed gravel pavement | 4 | 0.91 | | 8.7 | 0.91 | 3 | | | | | 5.6 | Pipe Culvert |
| 170 | CS170 | Ackerleys West Road | Barongarook West | 0.62 Km Off Irriwillipe Road | Creek | 1950 | 57 | No Limit Posted | 900 mm | RC pipe culvert | 900 mm | 250 mm | Unsealed gravel Road | 2.7 | 0.9 | | 12.4 | 0.9 | 2 | | | | | 5.2 | Pipe Culvert |
| 174 | CS174 | Kervins Road | Pirron Yallock | 1.45 Km West Of Tomahawk Creek Road | Drain | 1950 | 57 | No Limit Posted | 2.0 m | RC pipe | 2.0 m | 2.5 m | Unsealed gravel | 2 | 2 | | 8.55 | 2 | 5 | | | | | 8 | Pipe Culvert |
| 175 | CS175 | Swan Marsh Road | Pirron Yallock | 0.7 Km From Princes Hwy | Creek | 1950 | 57 | No Limit Posted | 2.0 m | RC pipes | 2.00 m | 550 mm | Sealed gravel pavement | 15.3 | 2 | | 12.3 | 2 | 6 | | | | | 8.9 | Pipe Culvert |
| 177 | CS177 | Old Friends Road | Yeo | 0.52 Km Off Old Yeo Road | Creek | 1950 | 57 | No Limit Posted | 6.9 m | Steel RSJs | 450 mm | 2.4 m | Steel Trough Deck | | | | | | | 6.9 | 4 | 1 | 2 | 3.8 | Bridge |
| 178 | CS178 | Queen Street | Elliminyt | 0.1km North Of Ayres St | Unnamed | 1950 | 57 | No Limit Posted | 1.85 m each span | CIS Deck Span - no skew | 200 mm | NA | Sealed pavement over CIS Deck Slab | | | | | | | 3.7 | 7.4 | 2 | 1 | 6 | Bridge |
| 179 | CS179 | Aireys Street | Elliminyt | 0.34 Km East Of Queen's Street | Creek | 1950 | 57 | No Limit Posted | 2.44 m | Box culvert | 1.83 m | 360 mm | Sealed concrete Box culvert | 5.5 | | 2.44 | 8.65 | 1.83 | 2 | | | | | 8.2 | Box Culvert |
| 180 | CS180 | Forest South Street | Elliminyt | 0.5km From Woodrovale Rd | Barongarook Crk - Ccl No. 180 | 1950 | 57 | No Limit Posted | 0.75 m | 0.75 m dia. RC Pipe - no skew | 0.75 m | N/A | Gravel deck over RC Pipe | 0.75 | 0.75 | | 6.4 | 0.75 | 1 | | | | | 6.4 | Pipe Culvert |
| 183 | CS183 | Mount Hesse Road | Beeac | 1.1km From Magawalla Rd | Beeac Drain | 1950 | 57 | No Limit Posted | 4.4 m | U-Slab | 350 mm | 610 mm | U-Slab deck | | | | | | | 4.4 | 8.35 | 1 | 14 | 8.05 | Bridge |
| 184 | CS184 | Warncoort Cemetery Road | Warncoort | 100 M Sth Of Colac Murroon Rd | Atkins Creek | 1950 | 57 | No Limit Posted | 1.2 m | 1.2 m dia. RC Pipe - no skew | 1.2 m | NA | Sealed Pavement over RC Pipe | 6 | 1.2 | | 4.8 | 1.2 | 1 | | | | | 4.8 | Pipe Culvert |
| 190 | CS190 | Irrewillipe Road | Irrewillipe East | 0.52 Km From Carlisle -Colac Road | Spring Gully | 1950 | 57 | No Limit Posted | 1.98 m | 5 No. RC pipe - No skew | 1.98 | 0.5 m | Sealed pavement over culvert pipe | 12.2 | 2 | | 7.1 | 2 | 5 | | | | | 7.1 | Pipe Culvert |
| 191 | CS191 | South Larpent Road | Larpent | 1.5 Km Off Colac - Carlisle Road | Creek | 1946 | 61 | No Limit Posted | 1.83 | Twin cis Box culvert | 2.15 m | 150 mm | Unsealed gravel pavement | 4 | | 1.83 | 7.94 | 2.15 | 2 | | | | | 7.65 | Box Culvert |
| 192 | CS192 | South Larpent Road | Barongarook West | 1.8 Km Off Colac - Carlisle Road | Creek Ccl No. 192 | 1950 | 57 | No Limit Posted | 0.9 | 2 cell pipe culvert - 600 mm & 900 mm dia | 0.6 & 0.9 m | 0.5 m - No skew | Unsealed gravel pavement over pipes | 10 | 0.9 | | 6.5 | 0.9 | 2 | | | | | 6.5 | Pipe Culvert |
| 196 | CS196 | Colac Lorne Road | Yeodene | 0.55 Km From Yeodene - Birregurra Road | Major Drain | 1950 | 57 | No Limit Posted | 15.5 m | Armco Pipe Culvert | 3.5 m | N/A | Gravel road | 3.5 | 3.5 | | 15.5 | 3.5 | 1 | | | | | 8.55 | Pipe Culvert |
| 198 | CS198 | Corangamite Lake Road | Dreeite | 1.36 Km North Of South Dreeite Road | Creek | 1950 | 57 | No Limit Posted | 600 mm | Pipe culvert | 600 mm | 300 mm | Sealed pavement | 0.6 | 0.6 | | 15.3 | 0.6 | 2 | | | | | 8.5 | Pipe Culvert |
| 200 | CS200 | Silks Access | Carlisle River | 0.7km From Colac-Carlisle Rd | Creek | 1950 | 57 | No Limit Posted | 1.35 m | 2 No. 1.35 m dia RC pipe - 10 degree +ve skew | 1.35 m | 0.8 m | Gravel pavement over RC pipe | 6 | 1.35 | | 3.8 | 1.35 | 2 | | | | | 3.8 | Pipe Culvert |
| 201 | CS201 | Cape Otway Road | Birregurra | 0.15 Km West Of Shire Boundary (East Side) | Creek | 1950 | 57 | No Limit Posted | 1200 mm | RC Box Culvert | 900 mm | 1.4 m | Sealed pavement | 1.2 | | 1.2 | 7.75 | 0.9 | 12 | | | | | 7.2 | Box Culvert |
| 202 | CS202 | Irrewillipe Road | Larpent | 1 Km From East Of Larpent Road | Unnamed - Ccl No. 75 | 1950 | 57 | No Limit Posted | 1.2 m | 1.2 m dia RC pipe - 30 degree -ve skew | 1.2 m | n/a | Sealed pavement over RC pipe | 1.2 | 1.2 | | 9 | 1.2 | 1 | | | | | 9 | Pipe Culvert |
| 203 | CS203 | South Larpent Road | Larpent | 0.9 Km South Of Irrewillipe Road | Unnamed - Ccl No. X01 | 1950 | 57 | No Limit Posted | 1.06 m | 1.06 m dia Twin RC pipe - No skew | 1.06 m | 500 mm | Unsealed pavement over culvert | 2.5 | 1.06 | | 5.3 | 1.06 | 2 | | | | | 5.3 | Pipe Culvert |
| 213 | CS213 | Barunah South Road | Wingeel | Cnr Barunah Sth Rd & Barunah Plains Rd | Barunah Drain | 1950 | 57 | No Limit Posted | 3.16 m | RC U slab | 300 mm | 610 mm | HSU slab | | | | | | | 6.32 | 6.55 | 2 | 11 | 6.25 | Bridge |
| 214 | CS214 | Carpendeit Bungador Road | Bungador | 1.8 Km From Bungador School Road | Creek | 1950 | 57 | No Limit Posted | 0.91 m | Box culvert | 600 mm | 150 mm | Sealed gravel pavement | 4.4 | | 0.9 | 9.4 | 0.6 | 4 | | | | | 8.2 | Box Culvert |
| 215 | CS215 | Gubbins Road | Barongarook West | 1.6 Km Off Irriwillipe Road | Creek | 1950 | 57 | No Limit Posted | 6.9 m | Steel RSJ girder | 460 mm | 2.4 m | Steel Trough Deck | | | | | | | 6.9 | 4 | 1 | 2 | 3.82 | Bridge |
| 216 | CS216 | Mcdonalds Road | Kawarren | 0.36 Km | Serpentine Creek - Ccl. No. X4 | 1973 | 34 | No Limit Posted | 1.53 m | 4/1.53 m dia. pipe - no skew | 1.53 | 400 mm | Unsealed gravel pavement over pipes | 12.3 | 1.53 | | 6.7 | 1.53 | 4 | | | | | 6.7 | Pipe Culvert |
| 217 | CS217 | Tomahawk Creek Road | Irrewillipe | 3.1 Km From Timboon-Colac Road | Tomahawk Creek | 1950 | 57 | No Limit Posted | 6.8 m | 2.3 x 3.15 m - 2 no. crown unit - No skew | 2.3 m | Abutting | Sealed deck over box culvert | 7.4 | | 3.15 | 6.7 | 2.3 | 2 | | | | | 6.7 | Box Culvert |
| 220 | CS220 | Old Yeo Road | Yeo | 1.17 Km South Of Colac - Forrest Road | Barongarook Creek Overflow | 1950 | 57 | No Limit Posted | 1.83 | RC pipes | 1.83 m | 0.5 m | Sealed gravel pavement | 10 | | 1.83 | 8.55 | 1.83 | 4 | | | | | 6.7 | Box Culvert |
| 225 | CS225 | Sinclairs Lane | Swan Marsh | 0.5 Km From Marsh Road | Creek | 1950 | 57 | No Limit Posted | 8.8 m | PSC slab | 350 mm | 1.0 m | Unsealed PSC slab | | | | | | | 8.8 | 4.35 | 1 | 4 | 4.1 | Bridge |
| 226 | CS226 | Murroon Road | Murroon | 0.55 Km From Division Road | Major Drain | 1950 | 57 | No Limit Posted | 900 mm | RC Pipe Culvert | 900 mm | 0 | RC pipe culvert | 0.9 | 0.9 | | 19 | 0.9 | 1 | | | | | 8.3 | Pipe Culvert |
| 227 | CS227 | Callahans Lane | Barwon Downs | 0.3 Km North Of Forrest Road | Creek | 1950 | 57 | No Limit Posted | 1.9 m | RC cis arch culvert | 1.9 m | 0 | Unsealed granetic pavement | 1.9 | 1.9 | | 11 | 1.9 | 1 | | | | | 7.2 | Pipe Culvert |
| 241 | CS241 | Christies Road | Elliminyt | 1.2 Km Off Harris Road | Deans Creek | 1950 | 57 | No Limit Posted | 1.53 m | RC pipe culvert | 1.53 m | 460 mm | Unseal gravel pavement | 4 | 1.5 | | 6.15 | 1.53 | 2 | | | | | 5.6 | Pipe Culvert |
| 244 | CS244 | Stafford Road | Johanna | 0.6 Km North Of Johanna Red Road | Drain | 1950 | 57 | No Limit Posted | 900 mm | Pipe culvert | 900 mm | 0 | Pipe culvert | 0.9 | 0.9 | | 10 | 0.9 | 1 | | | | | 3.5 | Pipe Culvert |
| 245 | CS245 | Red Johanna Road | Johanna | 2.62 Km West Of Great Ocean Road | Drain | 1950 | 57 | No Limit Posted | 1.35 m | Pipe culvert | 1.35 m | 0.55 m | Sealed pavement | 5.2 | 1.35 | | 6.3 | 1.35 | 2 | | | | | 5.7 | Pipe Culvert |
| 246 | CS246 | Mcdonalds Road | Kawarren | 2 Km East Of Kawarren East Road | Porcupine Creek - Ccl No 246 | 1950 | 57 | No Limit Posted | 1.2 m | 4 no. 1.2 m 0.9 m box culvert - No skew | 0.9 m | N/A | Gravel pavement over box culvert | 6.1 | | 1.2 | 5.6 | 0.9 | 4 | | | | | 5.6 | Box Culvert |
| 249 | CS249 | Upper Gellibrand Road | Barramunga | 4.5 Km From | Gellibrand River | 1950 | 57 | No Limit Posted | 9.6 m & 6.6 | 24 in x 7.5 in RSJ @ 1.1 m cts - No skew | 610 mm | 1.1 m | Transverse timber deck | | | | | | | 16.2 | 4 | 2 | 3 | 3.6 | Bridge |
| 250 | CS250 | Strachan Street | Birregurra | 0.1km From Warncourst-Birregurra Rd | Railway Dam Ck - Ccl No 106 | 1950 | 57 | No Limit Posted | 10.4 m | Heavy 22in x 8in RSJ- 35 degree -ve skew | 560 mm | 1.55 m | Asphalt filled steel trough decking | | | | | | | 10.4 | 7.45 | 1 | 5 | 7.25 | Bridge |
| 252 | CS252 | Carlisle Gellibrand Road | Carlisle River | 3.18 Km East Of Colac-Carlisle Road | Carlise River | 1950 | 57 | No Limit Posted | 1.83 m | 1.83 m dia. RC pipe - 20 degree -ve skew | 1.83 m | 300 mm | Unsealed gravel road over pipe | 6.2 | 1.83 | | 7.2 | 1.83 | 3 | | | | | 7.2 | Pipe Culvert |
| 253 | CS253 | Mahers Road | Barwon Downs | 0.7 Km From Birregurra-Forest Road | Callahans Creek - Ccl No. 253 | 1950 | 57 | No Limit Posted | 1.22 m | Twin RC pipe - 1.22 m dia. - No skew | 1.22 m | 0.5 m | Unsealed pavement over RC pipe | 7.2 | 1.22 | | 6 | 1.22 | 2 | | | | | 6 | Pipe Culvert |
| 254 | CS254 | Jacksons Track | Gellibrand | 1.14 Km Old Lardner's Track | Ladner's Creek Tributary | 1950 | 57 | No Limit Posted | 11.7 m | 2 No. 24" x 7.5" RSJ | 610 mm | 2.13 m | Timber transverse decking | | | | | | | 11.7 | 3.91 | 1 | 2 | 3.67 | Bridge |
| 255 | CS255 | Zapelli's Access | Beech Forrest | 3.35 Km Nth Of Beech Forest Junction Main Rd | Martins G Xing -Ccl No. 255 | 2004 | 3 | No Limit Posted | 0.915 m | RC pipe - no skew | 0.915 m | N/A | Dirt track 2 m over pipe | 7.2 | 0.9 | | 3.2 | 0.9 | 1 | | | | | 3.2 | Pipe Culvert |
| 257 | CS257 | Hennigan Crescent | Forrest | 0.4 Km East Of Station Steet Forest | Barwon River Floodway - Ccl No 257 | 1950 | 57 | No Limit Posted | 1.0 m | 7 cell 1 m dia RCPipes - No skew | 1.0 m | 0.2 m | Unsealed gravel pavement over pipes | 9.6 | 1 | | 6.5 | 1 | 7 | | | | | 6.5 | Pipe Culvert |
| 258 | CS258 | Wilson Street | Colac | 0.7 Km East Of Queen's Street | Barongarook Creek | 1961 | 46 | No Limit Posted | 9.15 m | PSC transversely stressed deck | 220 mm | 610 mm | PSC transversely stressed deck planks | | | | | | | 21.3 | 8.24 | 3 | 13 | 6.84 | Bridge |

Colac Otway Shire

Locality Plan - Bridges and
Major Drainage Structures



# Appendix B

## Maintenance Performance Criteria & Response

## Defects Response Codes

| Response Code | Target Response Time | Action, Response & Control |
|---|---|---|
| 2D | Within **2 working days** of defect identification via inspection or notification | Inspect and rectify defect within defined target response time |
| 10D | Within **10 working days** of defect identification via inspection or notification | Inspect and rectify defect within defined target response time |
| 15D | Within **15 working days** of defect identification via inspection or notification | Inspect and rectify defect within defined target response time |
| 20D | Within **20 working days** of defect identification via inspection or notification | Inspect and rectify defect within defined target response time |
| 1W | Within **1 week** of defect identification via inspection or notification | Inspect and rectify defect within defined target response time |
| 2W | Within **2 weeks** of defect identification via inspection or notification | Inspect and rectify defect within defined target response time |
| 3W | Within **3 weeks** of defect identification via inspection or notification | Inspect and rectify defect within defined target response time |
| 1M | Within **1 month** of defect identification via inspection or notification | Inspect and rectify defect within defined target response time |
| 2M | Within **2 months** of defect identification via inspection or notification | Inspect and rectify defect within defined target response time |
| 3M | Within **3 months** of defect identification via inspection or notification | Inspect and rectify defect within defined target response time |
| AP | Maintenance works to be considered within **annual programs** having regard to competing priorities, available resources and budget limitations. | |
| N/A | Not Applicable | |
| ***** | Appropriate response within **1 working day** if defect is assessed as exposing the travelling public to a high level of risk exposure Inspect, rectify defect if practicable, or provide appropriate warning. [#] | |

[#] **Note –** Where, because of the nature of the repair, availability of resources required or existing workload, it is not possible to rectify a defect within its prescribed response time, appropriate warning of the hazard is to be provided until necessary repairs can be completed.

An appropriate warning may include, but is not limited to –

- Provision of warning signage,
- Traffic control action,
- Diversion of traffic around the site,
- Lane closure,
- Restriction of use of road by vehicles of a certain size (eg. Load limit), or
- Temporary Road Closure.

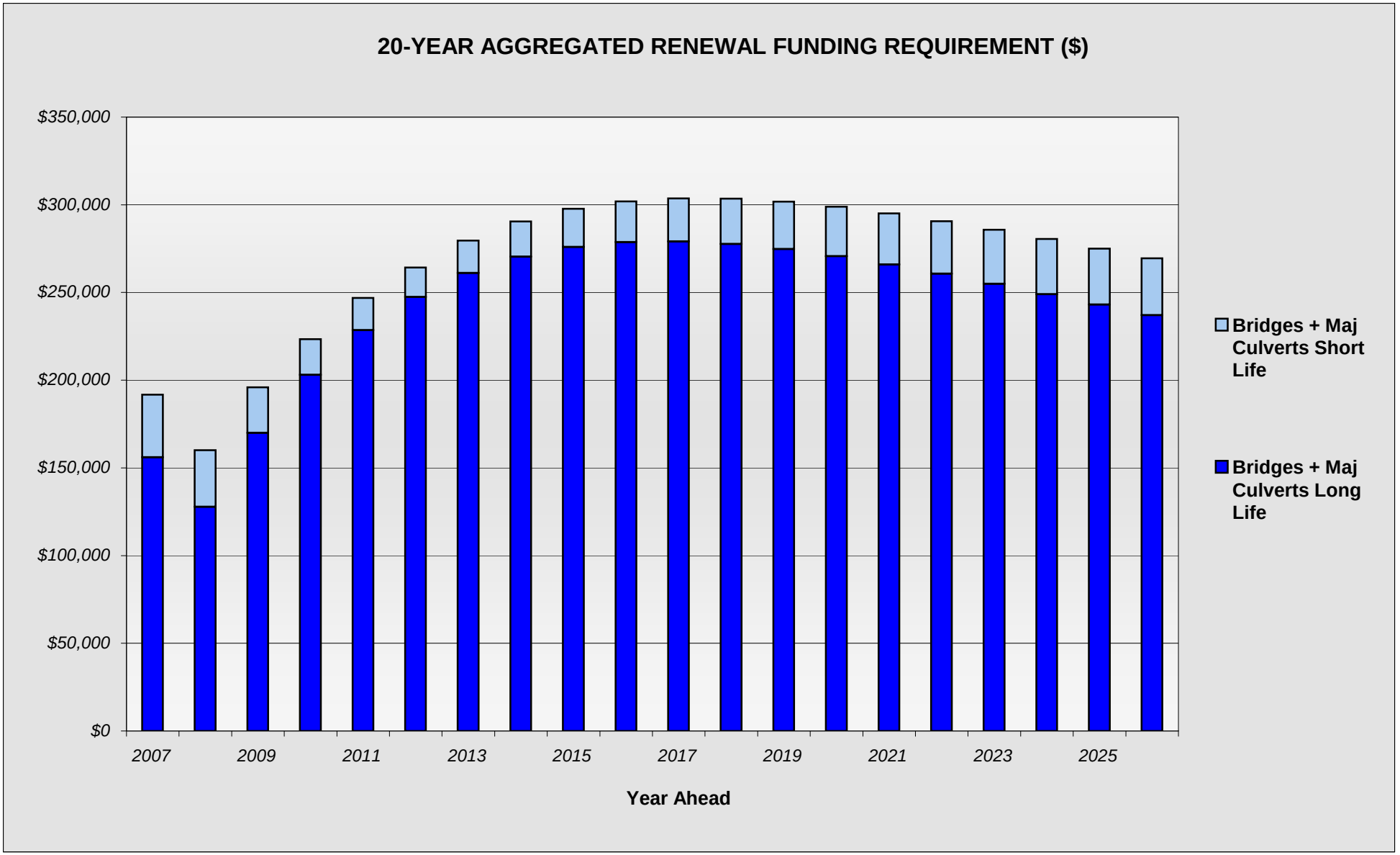
An intermediate response of this type is to manage any risk associated with a particular defect until further remedial action may be undertaken.

| ACTIVITY | DEFINITION / DESCRIPTION | LEVEL OF SERVICE | TARGET RESPONSE TIMES | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Urban | | | Rural | | |
| | | | Link | Collector | Access | Link | Collector | Access |
| **BRIDGE AND STRUCTURES MAINTENANCE** | | | | | | | | |
| **Routine Maintenance – Deck Cleaning** | Cleaning and clearing of deck, expansion joints, drainage scuppers, etc. | Clear and clean when any accumulation of material causes interruption to the escape of drainage water or the operation of expansion joints. | AP* | AP* | AP* | AP* | AP* | AP* |
| **Routine Maintenance – Substructure Clearance** | Cleaning and clearing of dirt and debris from superstructure and substructure, and vegetation from in and around bridge. | Clear and clean when stream flows are obstructed at structure. | AP* | AP* | AP* | AP* | AP* | AP* |
| **Minor Repair / Painting** | Minor repair and minor painting, including repair of spalled posts and parapets. Includes repair, tightening and painting of railing. | Undertake minor repair or replacement, painting, etc to enure safe and effective condition of bridge components. | AP* | AP* | AP* | AP* | AP* | AP* |
| **Running Deck Repair** | Treatment of timber running planks rotted at the ends or edges, severely split and/or cracked through significantly loose or highly weathered. | Repair deck when timber running planks very loose, defective or missing to ensure safe running surface. Includes retightening of coach screws or re-driving of spikes. | AP* | AP* | AP* | AP* | AP* | AP* |
| **Major Repairs** | Replace or undertake major repairs or replacement when structure condition suggests that infrastructure is beyond repair and/or non- functional | Structure in dangerous condition, not serviceable, structurally unsound or unsafe. | AP* | AP* | AP* | AP* | AP* | AP* |

# Appendix C

## Renewal Funding Requirement Projection

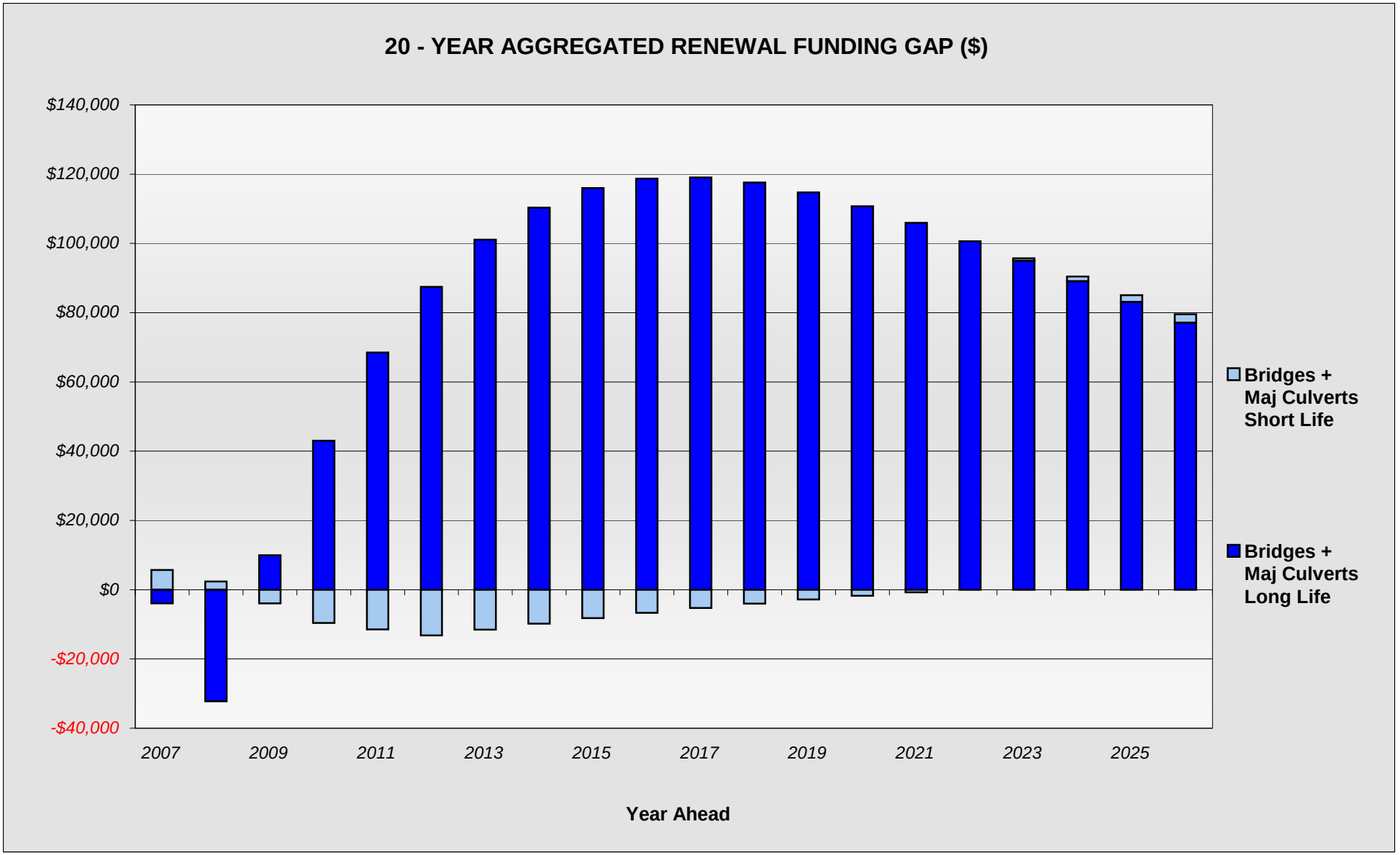
| Asset Group | Asset Type | Year No | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Year 11 | Year 12 | Year 13 | Year 14 | Year 15 | Year 16 | Year 17 | Year 18 | Year 19 | Year 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Year Date | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
| Bridges Group | Bridges + Major Culverts - Long Life | Required Capital Expenditure | $156,056 | $127,802 | $169,963 | $203,048 | $228,470 | $247,466 | $261,114 | $270,350 | $275,976 | $278,682 | $279,054 | $277,585 | $274,692 | $270,721 | $265,959 | $260,641 | $254,958 | $249,063 | $243,077 | $237,097 |
| | | Predicted Maint. Requirement | $40,169 | $40,559 | $40,728 | $40,722 | $40,580 | $40,332 | $40,006 | $39,624 | $39,203 | $38,759 | $38,304 | $37,846 | $37,394 | $36,953 | $36,527 | $36,119 | $35,733 | $35,368 | $35,027 | $34,708 |
| | | ***Total Required Capital Expenditure*** | *$156,056* | *$127,802* | *$169,963* | *$203,048* | *$228,470* | *$247,466* | *$261,114* | *$270,350* | *$275,976* | *$278,682* | *$279,054* | *$277,585* | *$274,692* | *$270,721* | *$265,959* | *$260,641* | *$254,958* | *$249,063* | *$243,077* | *$237,097* |
| | Bridges + Major Culverts - Short Life | Required Capital Expenditure | $35,695 | $32,357 | $25,982 | $20,339 | $18,442 | $16,740 | $18,436 | $20,113 | $21,721 | $23,235 | $24,642 | $25,937 | $27,119 | $28,190 | $29,152 | $30,007 | $30,757 | $31,406 | $31,955 | $32,407 |
| | | Predicted Maint. Requirement | $99,605 | $101,740 | $103,940 | $106,068 | $108,046 | $109,830 | $111,400 | $112,751 | $113,886 | $114,812 | $115,540 | $116,082 | $116,450 | $116,656 | $116,712 | $116,630 | $116,423 | $116,101 | $115,677 | $115,163 |
| | | ***Total Required Capital Expenditure*** | *$35,695* | *$32,357* | *$25,982* | *$20,339* | *$18,442* | *$16,740* | *$18,436* | *$20,113* | *$21,721* | *$23,235* | *$24,642* | *$25,937* | *$27,119* | *$28,190* | *$29,152* | *$30,007* | *$30,757* | *$31,406* | *$31,955* | *$32,407* |


20-YEAR AGGREGATED RENEWAL FUNDING REQUIREMENT ($)
$350,000
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$0
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
Year Ahead
Bridges + Maj Culverts Short Life
Bridges + Maj Culverts Long Life

# Appendix D

## Renewal Funding Gap Projection

| Asset Group | Asset Type | Year No | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Year 11 | Year 12 | Year 13 | Year 14 | Year 15 | Year 16 | Year 17 | Year 18 | Year 19 | Year 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Year Date | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
| Bridges Group | Bridges + Maj Culverts - Long Life | Capital Funding Gap | -$3,944 | -$32,198 | $9,963 | $43,048 | $68,470 | $87,466 | $101,114 | $110,350 | $115,976 | $118,682 | $119,054 | $117,585 | $114,692 | $110,721 | $105,959 | $100,641 | $94,958 | $89,063 | $83,077 | $77,097 |
| | | Maintenance Funding Gap | -$18 | -$165 | -$114 | $116 | $481 | $945 | $1,477 | $2,067 | $2,716 | $3,389 | $4,084 | $4,806 | $5,511 | $6,189 | $6,833 | $7,441 | $8,009 | $8,535 | $9,020 | $9,462 |
| | Bridges + Maj Culverts - Short Life | Capital Funding Gap | $5,695 | $2,357 | -$4,018 | -$9,661 | -$11,558 | -$13,260 | -$11,564 | -$9,887 | -$8,279 | -$6,765 | -$5,358 | -$4,063 | -$2,881 | -$1,810 | -$848 | $7 | $757 | $1,406 | $1,955 | $2,407 |
| | | Maintenance Funding Gap | $9,670 | $6,063 | $2,419 | -$519 | -$2,742 | -$4,693 | -$6,367 | -$7,773 | -$8,922 | -$9,833 | -$10,525 | -$11,015 | -$11,323 | -$11,467 | -$11,465 | -$11,333 | -$11,089 | -$10,747 | -$10,324 | -$9,835 |
| | | ***Total Capital Funding Gap*** | *$1,751* | *-$29,841* | *$5,945* | *$33,387* | *$56,912* | *$74,205* | *$89,551* | *$100,462* | *$107,697* | *$111,917* | *$113,695* | *$113,522* | *$111,811* | *$108,912* | *$105,111* | *$100,648* | *$95,715* | *$90,468* | *$85,032* | *$79,504* |
| | | ***Total Maintenace Funding Gap*** | *$1,733* | *-$30,006* | *$5,831* | *$33,504* | *$57,393* | *$75,150* | *$91,028* | *$102,530* | *$110,413* | *$115,306* | *$117,779* | *$118,328* | *$117,322* | *$115,100* | *$111,945* | *$108,089* | *$103,724* | *$99,004* | *$94,052* | *$88,966* |


20 - YEAR AGGREGATED RENEWAL FUNDING GAP ($)
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$0
-$20,000
-$40,000
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
Year Ahead
Bridges + Maj Culverts Short Life
Bridges + Maj Culverts Long Life