

Source catchments as water quality
treatment assets: industry best practice
and triple bottom line cost evaluation of
catchment management practices

Catchment Management Investment Standard

May 2016



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Overview of WSAA

WSAA is the industry body that supports the Australian Urban Water Industry. WSAA members provide water and wastewater services to over 20 million Australians and many of Australia's largest industrial and commercial enterprises. The Association facilitates collaboration, knowledge sharing, networking and cooperation within the urban water industry. It is proud of the collegiate attitude of its members, which has led to industry-wide approaches to national water issues. WSAA can demonstrate success in the standardisation of industry performance monitoring and benchmarking, as well as many research outcomes of national significance. The Executive of the Association retains strong links with policy-makers and legislative bodies and their influencers, to monitor emerging issues of importance to the urban water industry. WSAA is regularly consulted and its advice sought by decision makers when developing strategic directions for the water industry.

Overview of Water Research Foundation

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ISBN 1 92076074 1

Acknowledgements

WSAA would like to acknowledge and thank the Water Research Foundation, the Project Steering Committee and Consultants for their input into this report:

- Katie Henderson (Water Research Foundation)
- Cameron Wearing (Seqwater),
- Jacqueline Frizenschaf (SA Water)
- Rhys Blackmore and John Simpson (Hunter Water)
- Suzie Sarkis and Nicholas Crosbie (Melbourne Water)
- Lara Odell (Icon Water)
- Rod McInnes and Stuart Naylor (WaterNSW)
- Michael Bettanin and Doug Halloran (Barwon Water)
- Barry Floyd (Coliban Water)
- David Warne (NYC Environmental Protection)
- Steve Skull (Alluvium)
- Jeremy Cheesman (Marsden Jacob Associates)

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Glossary

Asset	Any item, thing or entity (physical or intangible) that has value to an organisation (ISO 55000). For example the source water from the catchment may be defined as the asset.
Base case	In investment, the base case is a realistic option that involves the minimum expenditure to sustain existing standards of service delivery or to achieve previously agreed minimum service standards. Therefore, the base case does not always mean 'do nothing'; rather it is the minimum essential expenditure option (e.g. carrying out obligatory works to meet safety and health regulations).
Built infrastructure	Refers to the human-engineered infrastructure for water resources such as treatment plants and dams.
Catchment/Watershed	A discrete area of land which has a common drainage system. A watershed/catchment includes both the water bodies that convey the water and the land surface from which water drains into these bodies.
Desired Level of Service	Describes the long term future level of service that is desired to be achieved.
Impaired water	A waterbody (i.e. stream reaches, lakes, waterbody segments) with chronic or recurring monitored violations of the applicable numeric and/or narrative water quality criteria.
Investment Management Standard	A best-practice approach applied over the life of an investment that aims to reduce the risk of investment failure, provide greater value-for-money and drive better outcomes. It is designed to enable the investor to shape and control investments throughout their lifecycle.
Funder(s)	The person(s) who will make the decision about the project going ahead or not. There can be internal funders(s) (e.g. senior management within your organization) and / or external funders(s) (for example an economic regulator or Treasury Department).
Stakeholder(s)	A person, group or organization with an interest.
Levee	An elongated naturally occurring ridge or artificially constructed fill or wall, which regulates water levels.
Level of Service	Is the defined service quality for a particular activity or service area against which service performance may be measured. ISO 55000 describes LOS as parameters (including safety, customer satisfaction, quality, quantity, capacity, reliability, responsiveness, environmental acceptability, cost and availability) that reflect outcomes the organisation delivers.
Lifecycle cost	Lifecycle cost is the total cost of an item or system over its full life. It includes the cost of development, production, ownership (operation, maintenance, support), and disposal, if applicable.
Minimum or Base Level of Service	Minimum or base Level of Service is the minimum standard of service to be provided
Multi-barrier system	Where source water is to be used for drinking, the Australian Drinking Water Guidelines (ADWG) (NHMRC/NRMMC, 2011) and the US standards established under the <i>Safe Drinking Water Act</i> recommend a <i>multiple barrier (or multi-barrier)</i> catchment-to-customer approach to providing safe drinking water. The multiple barrier approach refers to the various components in the train of providing safe drinking water to the customer—from the source (whether ground or surface water), to a water treatment facility, through a distribution systems, and ultimately to the customer at the tap.

	<p>This proactive approach means that if one barrier fails, the effective operation of other barriers will ensure safe drinking water is maintained throughout the water supply. Protection and management of the <i>source catchment</i> is the first barrier in protecting water quality; subsequent barriers include water storage, treatment and disinfection.</p>
Natural infrastructure	<p>Strategic use of networks of natural lands, working landscapes, and other open spaces to conserve ecosystem values and functions and provide associated benefits to human populations. Forests, wetlands, riparian buffers, and other natural elements on the landscape can comprise natural infrastructure when strategically used and managed to provide services for communities, such as through land acquisition and conservation easements, low-impact development, conservation practices on agricultural and forest lands, and even beaver dams. As such, it is commonly referred to as “watershed protection,” “land conservation,” or several other more traditional terms. Natural infrastructure is also sometimes referred to as “green infrastructure”—although the latter term is also used more broadly for things such as rain gardens or even water meters and energy efficient equipment.</p>
Options analysis	<p>A process in which a range of options (both asset and non-asset) are evaluated. The most cost-effective options are then selected for more detailed evaluation through a business case.</p>
Scenario analysis	<p>Scenario analysis is a procedure for providing the decision-maker with some information about the effect of risks and uncertainties on an investment. In a scenario analysis, a set of critical parameters and assumptions that define a particular scenario are identified and varied to reflect a best-case and a worst-case scenario.</p>
Service	<p>An action or series of actions performed or enabled through our assets to seek a specific customer outcome.</p>
Social benefit	<p>The estimated direct increase in the welfare of society from an economic action. It is the sum of the benefit to the agent performing the action, plus the benefit accruing to society as a result of the action.</p>
Social cost	<p>The estimated direct total cost to society of an economic activity. It is the sum of the opportunity costs of the resources used by the agent carrying out the activity, plus any additional costs imposed on society from the activity.</p>
Source catchment	<p>A catchment/watershed that provides source water.</p>
Source water	<p>Untreated water from rivers, streams, lakes, reservoirs or aquifers that supplies public drinking-water systems and private wells.</p>
Source water protection	<p>A general term for the protection of all kinds of water uses, including water for drinking, recreation and the maintenance of aquatic ecosystems.</p>
Source water risk assessment	<p>The most important tool in determining where to implement preventative barriers within the source is through the application of a source water risk assessment.</p> <p>Source water risk assessments involve assessing the risks presented to drinking water quality that arise in that particular source recharge area, with the results determining the appropriate risk management actions and their prioritisation</p>
Threatened	<p>Water that meet standards but exhibit a declining trend in water quality such that they will likely exceed standards in the near future.</p>

1. Introduction

This Catchment Management Investment Standard (CMIS) document is part of a broader Water Services Association of Australia (WSAA) and the Water Research Foundation (WRF) project “*Source catchments as water quality treatment assets: Industry best practice and triple bottom line cost evaluation of catchment management practices*”. The project aimed to develop new best practice standard for source catchment protection and management investment. This new standard delivered for the project has been developed in close collaboration with water utilities from both Australia and the United States to enable stronger business cases for catchment management as a viable alternative to more capital intensive (traditional) investments. **For a summary of the project outputs, please refer to the *Synthesis Report* document.**

The central element of the project is this Catchment Management Investment Standard (CMIS). This provides users with a summary of the key steps and practices that need to be completed to develop a robust and evidence based investment in source catchment management activities. The CMIS is the type of document that will benefit from ongoing refinement over time as it is tested and further utilised by water utilities. The CMIS is supported by two key tools:

- **A Catchment Investment Assessment Tool** – This project tool helps users prepare financial and economic analyses of source catchment investments that they are considering.
- **The Source Value Transfer Database** – The project developed a searchable database of more than 200 estimates of the economic and financial benefit values of source catchments as water treatment assets.

Each of these tools is covered by a separate report.

1.1. Objectives

The CMIS provides users with a summary of the key steps and practices towards developing and gaining support for robust and evidence based investments in source catchment management activities. It is important to note that not every step may be required in every instance and that many of the steps may need to be run in parallel.

These steps and practices are supported by a toolbox of resources (templates, examples, case studies, evidence databases and other guidance). These resources have been developed with support of industry stakeholders.

1.2. Who should use the CMIS

We have designed the CMIS to be used by agencies and organisations who are managing source catchments, especially impaired multi-use catchments.

To use the CMIS effectively you should have a good level of understanding about source catchments, their processes, and the major components of a source catchment management plan. You should also have a basic understanding of stakeholder engagement and benefit-cost analysis.

1.3. What if you already have an approach to catchment management investment?

Many utilities have in place or are developing source catchment plans and investment strategies. Our literature review and experience shows these operate at varying levels of scale, scope, and specificity.

The CMIS is intended to complement and bolster existing strategies, not replace them. Existing plans and strategies can be adapted as appropriate using information and tools from the CMIS, or used as building blocks for developing and implementing source catchment investment plans that contain the minimum elements the CMIS recommends including in source catchment investment plans that address impaired or threatened waterbodies.

1.4. How the CMIS was developed

The CMIS was developed using the following key sources and evidence:

Investment standards, logics and frameworks	<p>We have drawn on the investment logics and frameworks for developing an investment framework to support investments. The key references we have relied on are:</p> <ul style="list-style-type: none"> • Fundamental elements of economic regulation of water utilities and other regulated businesses Essential Services Commission (ESC) 2004; Independent Pricing and Regulatory Tribunal (IPART) 2008. These elements relate to: <ul style="list-style-type: none"> • defining the objectives and required outputs or outcomes for the utility (and other obligations) • determining the efficient costs and revenue requirement to deliver these requirements • The Victorian Government’s approach to evaluating and substantiating high-risk high-value investments: The Investment Management Standard and the Victorian Department of Treasury Investment Management Standard (IMS)¹. The IMS is a collection of simple, common sense ideas and practices that help organisations to direct resources to deliver the best outcomes. The CMIS has been tailored from the IMS steps and tools. • Australian Drinking Water Guideline (ADWG) approaches to risk and economic evaluation (NRMMC, 2011) • Risk Assessment for Drinking Water Supplies (Guice, Miller, & Deere, 2009) this report provides examples to implement the Framework for Management of Drinking Water Quality (Framework) given in Chapters 2 and 3 of the ADWG. It includes a step-by- step catchment risk assessment methodology based on the Framework within the context of broader source water management environmental objectives. • Managing Catchments as Business Assets: An Economic Framework (WSAA, 2010). This project addressed a key requirement of the ADWG by assisting utilities to develop programs applying the multiple-barrier approach, particularly in respect to catchments as the first barrier. A key issue of concern in applying the ADWG is the difficulties of comparing investment in the catchment barrier with downstream alternatives. To fill this gap, the project developed risk and evaluation methods to apply across the barriers. We have drawn many of these into the current project. • US EPA Handbook for Developing Watershed Plans to Restore and Protect Our Waters these guidelines provide guidance for watershed plan development, and include subject specific activities and community engagement tools that can be readily transferred to source catchment management projects • Strategic Asset Management Planning frameworks and investment steps used by water utilities, catchment managers and NRM sectors in Australia and the US
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¹ <http://www.dtf.vic.gov.au/Publications/Investment-planning-and-evaluation-publications/Investment-management/Investment-management-standard-version-5>

Source catchment critical success factors and barriers	<p>We have tailored the CMIS and tools to address identified critical success factors and key barriers of (source) catchment programs and investments. We identified these critical success factors and barriers from our literature review as part of this source catchments project.</p> <p>Attachment A summarises these critical success factors and barriers.</p>
Tools in use and challenges	<p>The CMIS and developed tools have been tailored taking into account the tools and techniques currently being used to justify and sustain investments in source catchment management activities, and issues that these methods are encountering.</p> <p>Attachment C summarises these methods and issues.</p>
Consultation	<p>To develop the CMIS, a wide ranging consultation process has been conducted with water authorities, regulators and water quality managers to benchmark current best practice catchment management. Our consultation has allowed us to test and refine the tools in the toolkit and the CMIS process.</p>

1.5. Principles that underpin the CMIS

Principles that underpin the CMIS are drawn from the Victorian Government *Investment Management Standard* and the fundamental requirements of regulators for investments. These have been augmented through consultations with current Australian and international leaders in source catchment management.

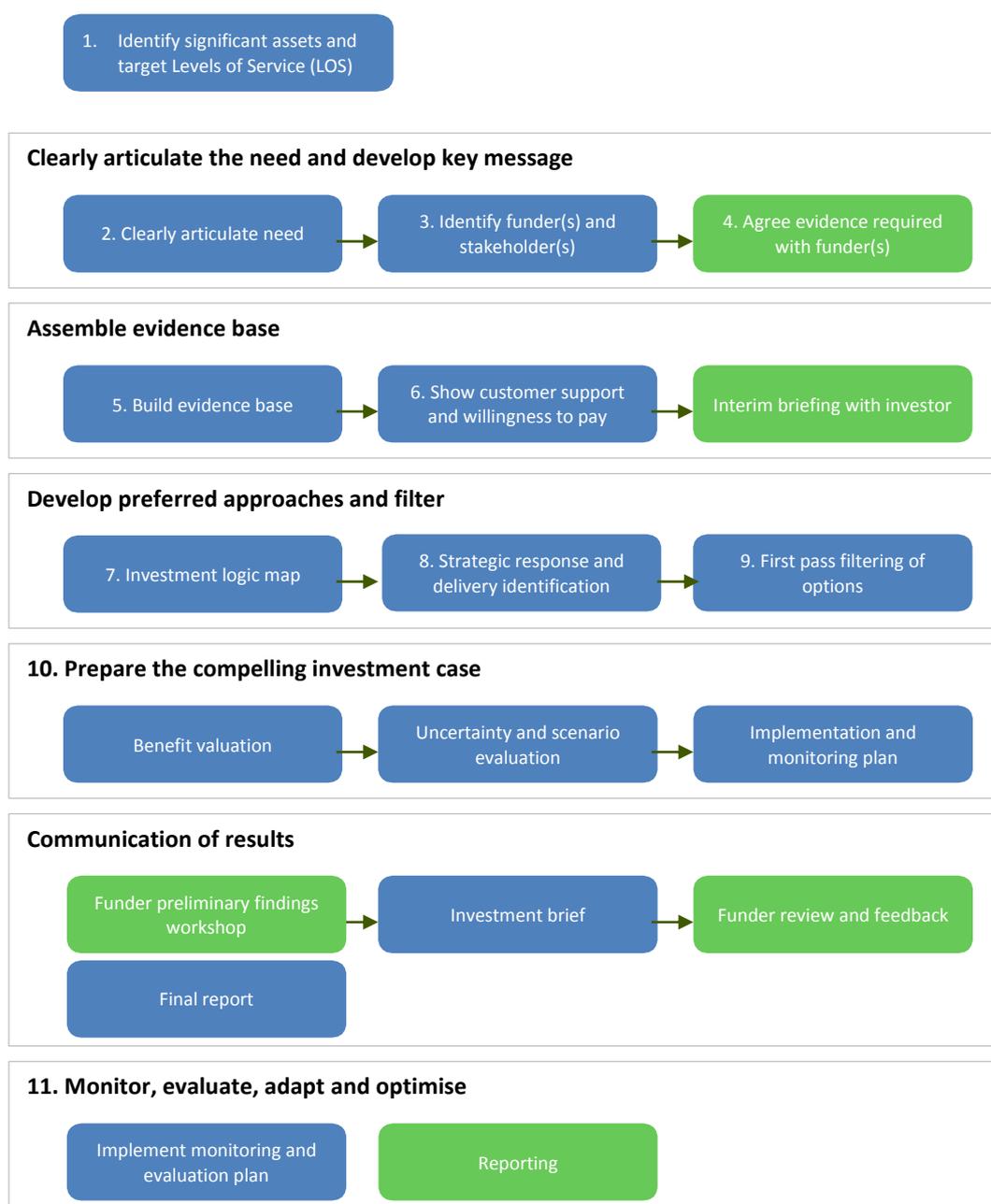
Concept	Description
A multiple-barrier based approach	<p>The CMIS is grounded in the principle that the most effective means of consistently ensuring the safety of a drinking water supply is through the use of a comprehensive approach that encompasses all steps in water supply from catchment to consumer. The source catchment is the key first barrier in the multiple barrier approach.</p> <p>Catchment management and source water protection provide the first barrier for the protection of water quality. Where catchment management is beyond the jurisdiction of drinking water suppliers, the planning and implementation of preventive measures will require a coordinated approach with relevant agencies such as planning authorities, catchment boards, environmental and water resources regulators, road authorities and emergency services.</p> <p>Effective catchment management and source water protection include the following elements (NRMMC, 2011):</p> <ul style="list-style-type: none"> • developing and implementing a catchment management plan, which includes preventive measures to protect surface water and groundwater • ensuring that planning regulations include the protection of water resources from potentially polluting activities, and are enforced • promoting awareness in the community of the impact of human activity on water quality. <p>Built in redundancy to enable resilience is a key feature of the multiple barrier approach. The multiple barrier approach aims to employ as many of these barriers as necessary so that a failure in one area does not immediately expose consumers to unsafe water. Successful catchment management investments can clearly show its contribution in the multiple-barrier system, and how the catchment investment builds system redundancy and resilience.</p>

A logic based approach	<p>Consultation shows that the logic expressed in catchment management investment cases is often fragmented. Some catchment investment cases strongly articulate the need to invest but can't explain how they arrived at the proposed solution. Others are not able to clearly describe the benefits they are likely to deliver. Many catchment investment cases describe the solution in detail but fail to clearly identify the problem and why the solution is the most cost effective approach, given other drinking water barriers are in place.</p> <p>The CMIS has established a structure that identifies the five primary elements of an investment proposal (objectives, assets, benefit, strategic response and solution) and connects them in a stream of logic. This structure aims to address each entity in sequence and logically connect one to the next to form the completed 'investment story'.</p>
Clear objectives and alignment with regulatory requirements	<p>The regulator is often a key investor or operates in the background of decision makers minds when deciding what to invest in. We have designed CMIS to address the fundamental requirements of regulator – i.e. what a regulator wants to see to before they approve source catchment investment. Consultation shows there are two key requirements here:</p> <ul style="list-style-type: none"> • that the action aims to address a regulatory requirement. That is, the regulator will likely require a clear articulation of the regulatory requirements and evidence that any source water protection activities undertaken by the water utility is contributing to particular objectives, obligations and/or outcomes, possibly including explicit links to particular governing legislation and regulation (McInnes, de Groot, Plant, Chong, & Olszak, 2010). • If there is not a regulatory requirement, the investment case needs to prove additionality and that (1) customers are willing to pay for the additional services that are being delivered or (2) the works contribute towards achieving regulatory objectives more effectively than alternative mechanisms
An asset based approach	<p>The CMIS is an asset-based approach. Asset based approaches direct investment towards the areas of the most value (i.e. economic, environmental, social, or cultural significance and beneficial use) rather than areas most under threat (e.g. areas in the worst condition). The areas of most value / beneficial use are considered priority areas for investment and provide the basis for prioritising investment. Consultations show that water utilities and catchment managers are increasingly shifting towards asset based management approaches.</p> <p>The focus on investing in priority areas means that environmental condition may not improve, or might decline, in some other areas. This is considered acceptable.</p>
A risk based approach to identify high value assets at risk	<p>The CMIS uses a simplified set of criteria to identify high value assets that are at risk, now or in the future. Using risk-based approaches to prioritise investment is a generally accepted approach adopted by most water utilities consulted. The asset based risk management approach provides a framework for catchment managers to identify critical assets and priority areas and assets, understand the overall risk exposure, risk tolerance, and to plan to manage risk to acceptable levels.</p>
An evidence based case (demonstrating links between activities and outcomes). Evidence needs set commensurate to the asset value at risk	<p>A key principle is that the CMIS encourages evidence based catchment investments. Our experience is that regulators and investors want to see the technical and scientific links between expenditure in source water protection and regulatory requirements before they invest. As asset value at risk increases, regulators and investors want a stronger level of evidence (Miller et al., 2009).</p> <p>The CMIS has been designed so that the level of evidence required is agreed with the investor up-front, and is commensurate with the asset value at risk.</p>

Clear demonstration of efficient costs of source catchment activities over alternatives	<p>Successful catchment management investments can demonstrate that source catchment activities are a more cost effective means of achieving the regulatory obligations or required outcomes, both within the specific regulatory period and in the longer-term.</p> <p>The CMIS and its tools have been developed to support clear and simple cost effectiveness analysis.</p>
Explicit valuation of benefits when justifying investments above minimum / base Levels of Service (LOS)	<p>Source catchment management activities generally generate (positive and negative) impacts that extend well beyond water health outcomes and contribute towards multiple regulatory requirements and / or outcomes that provide community benefit. To the extent that these benefits are good for society they are relevant for the CMIS and relevant to investment decision making.</p> <p>The CMIS toolkit has been built to include a comprehensive database of studies that have evaluated the economic, environmental and social values for source catchment management in monetary terms. This database can be used to support determining an optimal portfolio of these assets, having regard to the value placed on service reliability (see Griffin & Mjelde, 2000) and the cost of in-built system redundancy.</p>
Clear and fully evaluated strategic responses	<p>Consultation shows that water utilities and catchment managers often focus on asset-based responses to source catchment management risks. This can mean that other approaches to addressing source management issues do not make it to the table.</p> <p>The CMIS has been developed to provide users with a logical framework that can identify asset and non-asset based solutions. It encourages users to substantially improve the way things will be done in the future. Instead of just solving problems the way they have always been solved, innovative approaches that are better and cheaper can be explored.</p>
Clear accounting for uncertainties	<p>Source catchment investments can have uncertain impacts and over uncertain timeframes. We have developed the CMIS so that utilities can systematically identify sources of uncertainty and incorporate these into their investment cases.</p>
Monitoring, evaluation and adaptation	<p>Demonstrating that catchment management investments are working, and that they are working effectively and efficiently is important to getting the next investment case up. The CMIS provides tools and techniques to set up a cost-effective monitoring, evaluation and adaptation program.</p>
A clear engagement process	<p>Engagement is a key principle underpinning the CMIS. Engagement involves having the funder(s) and stakeholder(s) involved in developing catchment management activities through a series of informed discussions. The principles underpinning informed discussions (Attachment G) help to ensure that the right people are at the table for the investment discussions, and that discussions are structured to provide clear understanding of expectations, requirements, outcomes and understanding of next steps.</p>
Usable and used	<p>Develop a streamlined process that can be picked up and used. Prohibitive and time-consuming frameworks generally fail to get traction with end-users. We have aimed to keep the CMIS lean and as simple as possible. The CMIS can be completed as an end-to-end process, or sections and tools drawn on as needed by users.</p>
Not recreating the wheel	<p>The intent has been not to create new tools and approaches in the CMIS. There are already a large body of evidence and tools in use. The aim in developing the CMIS has been to bring together the best of the evidence and tools in a logical and clear approach. This means the focus has been drawing on existing tools and resources directly in this CMIS, rather than re-presenting them in a slightly different format to their source document.</p>

1. Key steps in the CMIS

The eleven key steps in the CMIS and supporting tools are shown below. Each of these key steps is explored more fully in Table 1 below, including the tools that support the step. The CMIS process and supporting tools are suitable for investments and decisions of any level of complexity or regulatory background. Irrespective of complexity all catchment management investment decisions can follow the same basic sequence of enquiry. The process and tools are suitable for shaping new investments, prioritising investment proposals, developing new source catchment management policy, and monitoring and measuring the benefits of delivery



■ Indicates steps involving the funder

Step 1: Identify significant assets and set minimum and target levels of service (develop a Strategic Asset Management Plan)

Outcome	Why are we doing this?	How we achieve this?	Toolbox
<p>A Strategic Asset Management Plan (SAMP) that defines asset performance requirements, what is being done to meet these requirements, and how service levels will be sustained.</p> <p>The SAMP includes Levels of Service (LOS) for drinking water and other asset objectives (for example other values of water may also be appropriate e.g. ecological needs, waterway condition). For each of these key assets, a SAMP should clearly distinguish between LOS and their drivers (McInnes, de Groot, Plant, Chong, & Olszak, 2010):</p> <ul style="list-style-type: none"> regulatory or operating license drivers that are in place to meet minimum standards and obligations with respect to service provision (e.g. water quality standards) broader environmental or social requirements or constraints associated with the delivery of minimum services (e.g. other catchment and river health obligations) and the provision of services to a standard exceeding a minimum regulatory requirement where there is evidence that this is efficient / customers are willing to pay for this higher level of service (see ESC 2004; IPART 2008). <p>The SAMP identifies both minimum LOS and desired LOS. Where the desired LOS exceeds the minimum LOS it</p>	<p>A clear and logical basis for investment, based on its contribution to agreed or desired outcomes, is critical in driving efficient and accountable source catchment investment and management (McInnes, de Groot, Plant, Chong, & Olszak, 2010)</p> <p>There are instances where water utilities have historically undertaken a range of source water protection activities or catchment/environmental management functions that do not strictly relate to particular regulatory objectives or requirements, and are not seen as directly related to core service delivery requirements by regulators and / or other decision makers. Further clarification of each utility's requirements and the methods to be used to verify the achievement of the objectives will be useful in such circumstances.</p> <p>In some cases regulatory requirements are specified as minimum standards, and a utility can provide a higher level of performance or service delivery if they can demonstrate that it is efficient to do so. This could first involve the utility determining whether providing a higher level of service in one respect could lead to overall cost savings. More generally, this process involves the utility demonstrating that customers are willing to pay for this higher level of service. Further application of economic willingness to pay studies (e.g. stated choice modelling) could contribute to the justification of such claims (McInnes, de Groot, Plant, Chong, & Olszak, 2010).</p>	<p>This activity is normally completed as part of long term strategic planning.</p>	<p>Level of Service Template Examples (Attachment D)</p> <p>Significant asset identification mapping tools (INFFER Stage 1)</p>

<p>makes it clear why this is the case.</p> <p>This SAMP includes (or references where appropriate) the core information that justifies the recommended source catchment asset management activities so that:</p> <ul style="list-style-type: none"> • each source catchment can meet its specific levels of service. • managers can manage asset risks for each source catchment to a reasonably practicable and acceptable level. • managers can endeavour to optimise investments in its source catchment assets. • managers can meet legislative, customer, and stakeholder requirements. 	<p>A SAMP is designed to:</p> <ul style="list-style-type: none"> • clearly demarcate regulatory compliance obligations and LOS from non-regulatory objectives (i.e. objectives set by the organisation, customer needs etc.) • clearly demarcate (regulatory) minimum LOS and desired LOS and evidence the rationale for the desired LOS • consolidate asset information and knowledge into one location. • facilitate asset management decision making processes by clearly identifying the processes undertaken in making investment decisions through the Service Lifecycle and then recording the outcomes of those processes. • facilitate the development of the capital and operational investment programs, in the short and medium terms • communicate with and provide guidance for asset stakeholders. • focus on identifying high value assets, with current or future high risk to their values. Asset values can be cultural, economic and environmental. • identify a minimum or base LOS and a target LOS. The minimum base LOS is the minimum standard service to be provided. • identify whether the minimum LOS is set by legislative, customer, organisational or other targets. 		
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Step 2: Clearly articulate the need (problem definition)

Outcome	Why are we doing this?	How we achieve this?	Toolbox
<p>Initial mapping of the issue from brainstorming. Answer and document 16 key questions that will rapidly provide decision-makers who we need to convince with confidence that:</p> <ul style="list-style-type: none"> • there is a real problem and it needs to be addressed at this time • there is a clear mandate for us addressing the problem (regulatory, customer or organisational targets) • there is evidence to confirm the cause and effect of the problem • there is evidence that the benefits that would be provided by successfully addressing the problem are of high value • the solution can't be delivered through existing programs • the solution is likely to be delivered within the time set and will be cost effective compared to other options. <p>The 16 questions address four areas – <i>problem, benefits, strategic response and solution</i></p>	<p>From the outset of a proposal, water utilities need to be able to articulate a clear vision of why the decision to fund a catchment management activity is being considered. The 16 questions set out in Attachment E are a useful way to be able to assess whether the vision is clearly defined.</p> <p>From the outset the water utility needs to be clear on what is required as a (regulatory) minimum versus targets set by customer, organisational or other things. The 16 questions help identify this.</p>	<p>An initial workshop of the core team – people who understand the problem(s) and can provide initial evidence that will validate that the identified problems are real.</p> <p>An internal investor / champion should attend this workshop. If you do not know the investor yet, have a person 'act' as the investor (for example the regulator) and get them to think about and ask the (hard) questions the investor would want answered.</p> <p>The number of people attending the workshop will probably be between 3-8, but could be up to 12.</p>	<p>Investment decisions maker's checklist - 16+ questions² (Attachment E)</p> <p>'Informed discussion' guidelines (Attachment G)</p>

² <http://www.dtf.vic.gov.au/Publications/Investment-planning-and-evaluation-publications/Lifecycle-guidance/Investment-decisions-makers-checklist-16-questions>

Step 3: Identify the funder(s) and stakeholders(s), develop a constituency and build partnerships

Outcome	Why are we doing this?	How we achieve this?	Toolbox
<p>Clear identification of the investor(s) who we need to engage for the catchment management proposal, and why, how and when we need to engage them.</p> <p>A stakeholder engagement matrix and management plan.</p> <ul style="list-style-type: none"> An investment concept brief targeted at the investor – a one page summary of the investment vision that captures investment story on a single page using language and concepts that are understandable to a layperson 	<p>Developing a constituency to champion the cause and provide resources and technical support is a key success factor.</p> <p>Partnering with those who have the authority to make change such as elected officials and agricultural and industry representatives is a critical success factor.</p> <p>Having early involvement of relevant stakeholders in planning and implementing the program is a key success factor.</p> <p>Developing trusted partnerships needed to implement catchment management activities takes time.</p> <p>All project team members should share the common vision and a unified voice – this makes the proposition more compelling to decision makers and investors. The investment concept brief is the one pager that does this.</p>	<p>Stakeholder mapping and communication planning.</p> <p>Step done internally and confirmed with the internal funder(s)</p>	<p>Stakeholder influence matrix (Attachment H)</p> <p>Worksheet 3 on page 3-7 of the US EPA Handbook³ provides a checklist of skills and resources that stakeholders can contribute to the planning process.⁴</p> <p>(Guice, Miller, & Deere, 2009) 5.1.1 Action 1. Assemble the team</p> <p>Investment Concept Brief⁵ (Attachment F)</p>

³ <http://www.dtf.vic.gov.au/Publications/Investment-planning-and-evaluation-publications/Investment-management/Investment-logic-map-example-Initiative>

⁴ http://water.epa.gov/polwaste/nps/upload/2008_04_18_NPS_watershed_handbook_handbook-2.pdf

⁵ <http://www.dtf.vic.gov.au/Publications/Investment-planning-and-evaluation-publications/Investment-management/Investment-concept-brief-template-Initiative>

Step 4: Agree level of evidence the funder wants to approve the investment

Outcome	Why are we doing this?	How we achieve this?	Toolbox
<p>Agree and document with the investor the level of evidence that needs to be established to support the investment case.</p>	<p>It is well understood that sources and their associated risk to value of assets vary greatly. Level of evidence required for the investment case should align with the value at risk.</p> <p>In short not all source catchment investment assessments need to be complex and resource intensive.</p> <p>Different stakeholders can have different views on what is required. The key requirement and need for agreement comes from the funder – i.e. the agent who holds the purse strings. We need to agree and document the level of evidence that will be developed with this funder.</p> <p>In the past, source catchment investments have not got up because evidence requirements and methods of verifying the achievement of regulatory objectives have not been fully defined and agreed at the outset (McInnes, de Groot, Plant, Chong, & Olszak, 2010)</p>	<p>Completed with the internal funder(s)</p>	<p>Risk-Based Level of Evidence Requirements Tools (Attachment I)</p>

Step 5: Build the evidence base (define and identify high value assets)

Outcome	Why are we doing this?	How we achieve this?	Toolbox
<ul style="list-style-type: none"> Describe and document the source water system, the asset's possible sources of contamination and the nature of barriers present. Construct and validate a schematic diagram for the source water system that defines catchment risk endpoints for water. For large catchments or groundwater areas, breaking the source down into sub-catchments may be advantageous. Clearly identify high value assets that you are aiming to maintain, protect or enhance (environmental, social, and economic). Understand community evidence and perception, and incorporate. 	<p>We need to describe and document the source water system to develop an understanding of the impacts seen in the catchment, identify possible causes and sources of the impacts, and subsequently quantify the pollutant loads</p> <p>Characterizing the watershed, its problems, and pollutant sources provides the basis for developing effective management strategies to meet catchment objectives as water quality treatment assets.</p> <p>Understanding what the community identifies as high valued assets, and the threats and risks to these assets is needed to start to frame solution identification and community consultation going forward</p>	<p>The approach depends on the Level of Evidence that you have agreed with the funder(s).</p> <p>At a minimum this will include a desktop study and one or more workshops of people who understand the problem(s) and can provide evidence that will validate that the identified problems are real.</p> <p>An internal funder / champion should attend the workshops.</p> <p>The number of people attending the workshop will probably be between 3-8, but could be up to 12.</p>	<p>Attachment J includes a raft of tools and resources that can be used to:</p> <ul style="list-style-type: none"> Characterise the watershed Construct a flow diagram Identify and characterise high value assets Identify existing management efforts in place that protect, maintain or enhance the assets Identify community assets, values, threats and drivers

Step 6: Show customer support and willingness to pay

Outcome	Why are we doing this?	How we achieve this?	Toolbox
Customer consultation that shows the customers support the investment case and are willing to pay for the benefits that are created by catchment investments.	This step is critical if the catchment investment is delivering LOS for drinking water and other asset objectives (for example other values of water may also be appropriate e.g. ecological needs, waterway condition) that go beyond regulatory / legislative minimum requirements. For these investments the catchment manager should demonstrate that there is evidence that the customer supports and is willing to pay for this higher level of service (see ESC 2004; IPART 2008).	Customer surveys Customer focus groups	Attachment N

Step 7: Prepare an Investment Logic Map

Outcome	Why are we doing this?	How we achieve this?	Toolbox
<p>An Investment Logic Map for the proposed catchment management activity. It shows the four primary elements of an investment proposal (problem, benefit, strategic response and solution) which are connected in a logic stream.</p> <p>The Investment Logic Map communicates the investment story in a single page using language and concepts that are understandable to funder(s). The one-pager is equivalent to the elevator pitch when you are asked to describe your investment.</p>	<p>By the time you have assembled the evidence base and identified the high value assets that are at risk, you should have a very clear idea of why you are proposing the investment and the benefits that it will generate.</p> <p>Catchment managers need to be able to communicate their ideas using language and concepts that are convincing to the layperson and funder. The Investment Logic Map helps you to do this.</p>	<p>Workshop of people who understand the problem(s) and can provide evidence that will validate that the identified problems are real.</p> <p>An internal funder / champion should attend this workshop.</p> <p>The number of people attending the workshop will probably be between 3-8, but could be up to 12.</p>	<p>Investment logic mapping tools⁶ (Attachment K)</p>

⁶ <http://www.dtf.vic.gov.au/Publications/Investment-planning-and-evaluation-publications/Investment-management/Fictional-initiative-investment-logic-maps>

Step 8: Identify strategic responses

Outcome	Why are we doing this?	How we achieve this?	Toolbox
<p>The strategic response produces a two-page Strategic Response Options Analysis, which documents the output of these steps and allows investment decision makers to confidently respond to the strategic response questions in the 16 questions checklist.</p> <p>This will involve identifying how water utility has considered:</p> <ul style="list-style-type: none"> existing asset options: i.e. using or improving existing Government assets to address the issues new assets: developing and investing in new assets / infrastructure to address the service need non-asset options: for example changing regulation or policies to deliver sought outcomes market based solutions: using market mechanisms such as pricing, property rights and competition to address the service need. 	<p>Most catchment management interventions are focussed on (hard or soft) infrastructure investment. Other interventions e.g. non-asset solutions can be used, and delivery mechanisms should be fully mapped out.</p> <p>Strategic response analysis needs to:</p> <ul style="list-style-type: none"> identify the range of interventions (existing asset options, new assets, non-asset options, market based solutions) that could deliver the benefits identified decide how the interventions can be packaged and sequenced into sensible strategic options identification of data gaps and resources needed to address them evaluate the strategic options to determine relative merit. Merit is based on benefits, costs, timelines, risks and dis-benefits. 	<p>The workshop will explore the range of potential options and decide which ones are preferred.</p> <p>The workshop should include:</p> <ul style="list-style-type: none"> the funder people who participated in the previous workshops who have most knowledge of the problem environment an experienced implementer who can test the breadth of proposed interventions and their feasibility a 'hard infrastructure' specialist, who can challenge and test the merits of soft infrastructure, and identify ways to maximise complementarities a benefit specialist who has expertise in KPI design and understands what is practically achievable. 	<p>Strategic response analysis tools and templates⁷ (Attachment L)</p> <p>Risk based assessment tools (Attachment I)⁸</p> <p>AS/NZS ISO31000:2009 Risk Management: Principles and Guidelines</p> <p>Table 13 Proposed microbial qualitative risk assessment categories under dry, normal and wet runoff conditions</p>

⁷ <http://www.dtf.vic.gov.au/Publications/Investment-planning-and-evaluation-publications/Investment-management/Strategic-options-analysis-template-Program>

⁸ https://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCMQFjAAahUKEwjYr--LjfrGAhVIF6YKHTjQAIY&url=http%3A%2F%2Fwww.watercorporation.com.au%2Fwater-supply-and-services%2Fongoing-works%2F-%2Fmedia%2Fe116ef2b8541495db43b77a831021a25.ashx&ei=pYG1VZjJD-WumAW4oluwBQ&usq=AFQjCNHsB_QKUil6r3EoT_vD9OJIQe4kJA&bvm=bv.98717601.d.dGY

Step 9: Do a first pass filtering of the long list of strategic responses and get funder sign-off on the short-list

Outcome	Why are we doing this?	How we achieve this?	Toolbox
<p>A shortlist of strategic options for detailed evaluation that has been agreed with the funder.</p>	<p>The number of ways that a catchment management issue can be addressed is potentially extremely large. Even limiting the focus to assets of high significance still leaves a long list of possibilities. This step could involve broader stakeholder consultation to discuss potential suite of options if required.</p> <p>The strategic options analysis tool can be used to document the options and assess their first pass feasibility using five basic criteria: benefits to high value assets, costs, timelines, capacity, risks, and dis-benefits.</p> <p>The step is useful to complete an early elimination of potential source catchment investments before going into a more detailed quantitative assessment. Typically, catchment managers are time constrained and can only do so many detailed assessments. The aim of this filtering step is to eliminate options that fall short on one or more of the key criteria.</p> <p>By the end of this step you should have a shortlist of significant assets that have significant value at risk and meet initial criteria for more detailed benefit-cost and risk assessment.</p>	<p>Agreement between the funder and project team on the options that will be progressed for more detailed investigation</p>	<p>Strategic response analysis tools and templates⁹ (Attachment L)</p> <p>Multi-criteria decision support freeware for catchment investments¹⁰</p>

9 <http://www.dtf.vic.gov.au/Publications/Investment-planning-and-evaluation-publications/Investment-management/Strategic-options-analysis-template-Program>
10 <http://www.toolkit.net.au/tools/MCAT>

Step 10: Prepare the compelling investment case

Outcome	Why are we doing this?	How we achieve this?	Toolbox
<p>A compelling investment case sets out the solution consistent with the strategic response, the benefits and costs of these, the delivery mechanisms, key stakeholders, risk management plan and the next steps. A timeline should be included.</p> <p>This step provides what is often a ‘missing link’ – an activity where policy and strategy are directly translated into a balanced set of actions and investments. This is then used to mobilise the preferred investments. It should answer the question: What set of initiatives will be most effective at implementing the strategic interventions and delivering the expected benefits?</p>	<p>The investment case is the final recommendation that is put forward to the funder. The investment case can be for a program of works or for individual projects.</p> <p>The main elements that the investment case must address are:</p> <ul style="list-style-type: none"> • there is a real problem and it needs to be addressed • the problem needs to be addressed by the funder because of: <ul style="list-style-type: none"> ○ regulatory or operating license drivers that are in place to meet minimum standards and obligations with respect to service provision (e.g. water quality standards) ○ broader environmental or social requirements or constraints associated with the delivery of minimum services (e.g. other catchment and river health obligations) and ○ services should be provided to a standard exceeding a minimum regulatory requirement because there is evidence that this is efficient / customers are willing to pay for this higher level of service • the benefits that would be provided by the investment successfully addressing the problem are of high value • the way the problem will be addressed is strategic, cost effective, and takes into account existing programs • the solution is likely to be delivered within the time and cost expectations. 	<p>Workshop. The number of people involved will probably be less than the previous discussions – maybe eight to 10. At a minimum it should include the investor, a strategist, an implementer and any other people who would be involved in the implementation of any solution and would benefit from understanding its intent.</p>	<p>Preparing the investment report (Attachment M)</p> <p>Catchment Investment Assessment Tool (CIAT)</p>

Step 11: Monitor, evaluate, adapt and optimise

Outcome	Why are we doing this?	How we achieve this?	Toolbox
Strategic asset register and associated asset management plan	<p>Typically, all 'hard' infrastructure assets of a water utility have been included in asset registers and associated asset management plans. Asset condition and risk assessment are frequently used to assist in managing assets and in investment planning and prioritisation and to guide the implementation of asset maintenance and replacement programs.</p> <p>Such robust asset management approaches should equally be applied to catchment assets such as land and water to help demonstrate that they are being comprehensively and consistently managed (McInnes, de Groot, Plant, Chong, & Olszak, 2010).</p> <p>Optimisation of the approach may include a need, based on the monitoring and evaluation, to readjust assumptions that have been made in the development of the business case.</p>	-	-

2. Key documents produced

2.1. Investment concept brief ([Attachment F](#))

A no more than three-page depiction of the logic that underpins a catchment investment. It represents an 'agreed investment story' that is created in an informed discussion between the investor and project team.

It is written in plain English in a way that will allow a layperson to understand the language and the concepts. It provides the core focus of an investment and is modified to reflect changes to the logic throughout its lifecycle.

2.2. Investment Logic Map ([Attachment K](#))

The Investment Logic Map (ILM) communicates the investment story in a single page using language and concepts that are understandable to investor(s). The one-pager is equivalent to the elevator pitch when you are asked to describe your investment. It builds on the investment concept brief and is written after the evidence base is assembled and solutions are better defined

The primary intent of the ILM is to get a clear understanding of the:

- problem or opportunity impacting the investor
- strength of available evidence to confirm both the cause and effect of the problem
- benefits that can be expected in successfully responding to the problem

2.3. Strategic options analysis ([Attachment L](#))

A document that explains the logic used to identify which strategic response would best address the identified problem and deliver the expected benefits. This will describe the strategic interventions that were considered, how these were grouped to form a range of strategic options and why the preferred option was selected.

2.4. The investment case ([Attachment M](#))

The document that is put forward to the investor recommending the investment. It should contain all the information that the investor needs to support your investment with confidence. It should contain all of the evidence that you agreed to include in the investment case with the investor (see 'Agree the level of evidence the investor wants to improve the investment').

The investment case builds on the structure and evidence assembled in the investment concept brief and the strategic options analysis.

The investment case is written in plain English in a way that will allow a layperson to understand the language and the concepts. It provides the rationale for the investment, a clear justification of the driver for the investment, a clear evidenced based accounting of the benefits and costs of the investment, and a clear assessment of contingencies, constraints, risks, and uncertainties.

3. Getting started

How you use the CMIS is up to you and your organisation – it has been deliberately developed as a toolbox that you can draw elements from as you need. The templates found in the Appendix are a guide only. You can adopt all of the CMIS or parts of it. In doing so it is important to note that the systematic development of content and the business justification for it will be critical to success.

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Attachment A: Critical success factors and barriers for source catchment investments

What is this	<p>A summary of critical success factors and barriers for source catchment investments.</p> <p>Several reports reviewed for this project have identified critical success factors for (source) catchment programs and investments. The table in this Attachment summarises the key success factors and commonalities across three main reports –</p> <ul style="list-style-type: none">• ‘Path to protection - ten strategies for successful source water protection’ (Ernst & Hart 2005)• Water Research Foundation report (Sklenner et al., 2012)• the ‘Inquiry into catchment management’ (DEH, 1999).
How can you use the information in this section	<p>You can use the summary table to:</p> <ul style="list-style-type: none">• Develop your thinking around critical success factors, drivers and risks for your project or program• Communicate with others around critical success factors, drivers and risk
Information source	<p>The three key resources used here are tools and techniques from:</p> <ul style="list-style-type: none">• ‘Path to protection - ten strategies for successful source water protection’ (Ernst & Hart 2005)• the Water Research Foundation Report (Sklenner et al., 2012)• the ‘Inquiry into catchment management’ (DEH, 1999).
Quick tips and things to consider	<ul style="list-style-type: none">• The factors identified in this table is not exhaustive

Table 1. Strategies for successful source water protection programs

Strategy	EH	WRF	DEH
1 Make source water protection a high priority. Articulate the benefits of source water protection, including financial benefits, and demonstrate how successful protection can cap or reduce treatment costs over time. Ensure that source water protection planning and action is important even in the absence of regulatory requirements to do so, and that water suppliers must become active leaders in their watersheds.	Y	Y	Y
2 Clearly identify the most critical threats to source water and share that information to involve and motivate a broad constituency (i.e. risk based approach). Adequately identify the threats to the water supply. Obtain and use technical data to show where the problems are (i.e. use 'sound science' for the source water assessment and prioritisation analysis) and what the risk to key assets (economic, social, environmental) are.	Y	Y	Y
3 Articulate a clear vision for source water protection, and support it with sufficient resources to accomplish the vision. Be sure to target the most important priorities and those program components which have the greatest chance for success.		Y	Y
4 Develop a constituency to champion the cause, and provide resources and technical support to ensure sustainability.	Y	Y	Y
5 Partner with those who have the authority to make change such as elected officials and agricultural and industry representatives. Have early involvement of the relevant stakeholders in developing the vision, goals, plan and implementation of the program.	Y	Y	Y
6 Understand that it takes time to get people to understand and want to address the problem. Understand that it takes people seeing progress and believing in the cause to keep things moving forward. Source water protection can be a long and continuous process, so maintain patience and perseverance.		Y	
7 Build on and integrate with existing issues and programs, integrating source water protection into high priority initiatives such as stormwater management and land conservation. Coordinate (in particular) with local, state (and where applicable) (US EPA) authorities who regulate potential sources of contamination within the source water protection area(s). Add source water protection goals into existing plans and criteria for Clean Water Act (US) and other state programs. Encourage drinking water and clean water program integration and partnering across state programs.	Y	Y	
8 Create a viable action plan that guides and motivates implementation. Continue to develop and implement partnerships, coordination and collaboration throughout the development and implementation of the program.	Y	Y	
9 Actively promote successful source water protection efforts to build momentum and encourage replication. Study other successful source water protection programs to learn from their successes and failures.	Y	Y	
10 Create financial and regulatory incentives to build commitment of local stakeholders, especially around multi-jurisdictional or resource-based planning efforts. Support or create public funding programs broad enough to include source water protection, and make funding easy to find with one stop shopping for water-related funding sources. Develop locally relevant incentives and removal of disincentives to achieve sustainable land management and adjust planning objectives.	Y	Y	Y
11 Develop a sustainable source of funding for protection efforts. This may be done through establishing a funding 'quilt' – a patchwork of available funding sources.		Y	
12 Use water quality monitoring and other measures of success to sustain implementation and manage state and local programs. Establish "SMART" goals (specific, measurable, attainable, realistic and timely). Facilitate community	Y	Y	Y

Strategy	EH	WRF	DEH
based ongoing monitoring and evaluation to ensure outcomes are identifiable and strategy is adjusted whenever necessary.			
13 Include an ongoing community education and involvement program.		Y	Y

Source: Ernst and Hart (2005).

Y = the report identified the corresponding strategy as a critical success factors for (source) catchment programs.

EH = Ernst and Hart (2005). WRF = Sklener et al. (2012). DEH = DEH (1999).

3. Critical barriers

The broader literature identifies that catchment management and water source protection programs face a range of barriers to implementation. These barriers include:

- Capital bias:** The Water Services Regulation Authority (OFWAT) (the regulatory body for water providers in England and Wales) have identified the existence of a Capex bias in funding decisions that is relevant to catchment management. *Capex* is defined as expenditure on productive capacity and usually refers to hard assets such as built infrastructure. Catchment programs are usually classified as *Opex* (operational) expenditure. Under many regulatory regimes, costing of water for resale and therefore company incomes are based on regulatory capital value and companies may be incentivised to expend more on hard capital assets rather than annual operational expenditures (OFWAT, 2012). Incentives to achieve financing efficiencies (decreasing Opex) and regulatory capital value growth (increasing Capex) are having an important influence on business planning and delivery.
- Off-balance sheet bias:** Catchments can be regarded as the most important asset in the water supply business yet in many instances are not included in the financial calculations of the business. Non-recognition of the catchment as a formal asset is a barrier in that there is a reluctance to invest in its protection and maintenance in a similar fashion to a hard asset such as a filtration plant. Often catchments have multiple owners, and expenditure on third party land to protect water quality further challenges the flexibility and utility of accounting and financial standards.
- The engineering culture:** Organisational structures in water utilities are dominated by engineers with limited exposure to and understanding of catchment management issues (OFWAT, 2012). Engineering solutions provide a well-recognised certainty of outcomes in terms of water quality, while the results of catchment management are by their nature uncertain and potentially difficult to quantify to the same extent.
- Knowledge and skill gaps:** Many utilities face knowledge gaps among key constituents and internal decision makers. There is a lack of financial resources or technical knowledge needed to advance catchment management programs (Gartner et al., 2013). In many instances, there is a lack of regularity clarity regarding water utilities involvement in catchment management and confusion over jurisdictional and leadership roles in catchments.
- Long and lagged timeframes:** The timeframes associated with catchment management are also a key barrier. Natural infrastructure tends to provide benefits over a very long time period (centuries or longer), whereas man-made capital provides benefits in the near term (years to decades). Natural infrastructure appreciates in value over a long period of time whereas built capital depreciates relatively rapidly (Gartner et al., 2013).

Attachment B: Water industry drivers for source catchment management

What is this	<p>A summary of drivers for source catchment management.</p> <p>We define the ‘drivers’ for water source catchment management as the main factors which cause source catchment management to happen. Table 2 summarises the main drivers of water source catchment management investment identified through the rapid stocktake review completed for this project.</p>
How can you use the information in this section	<p>You can use the summary table to:</p> <ul style="list-style-type: none">• Develop your thinking around critical success factors, drivers and risks for your project or program• Communicate with others around critical success factors, drivers and risks
Information source	<p>The three key resources used here are tools and techniques from:</p> <ul style="list-style-type: none">• (Mulligan, 2013)• ‘Path to protection - ten strategies for successful source water protection’ (Ernst & Hart 2005)• Water Research Foundation report (Sklenner et al., 2012)• ‘Inquiry into catchment management’ (DEH, 1999).
Quick tips and things to consider	<p>The factors identified in this table is not exhaustive</p>

Table 2. Drivers of water source catchment management investment

Driver	Description
Regulatory requirements	<p>This is a core driver requirement. Minimum regulatory requirement(s) that codify catchment management as a key driver for water source protection need to be in place. A significant difference between Australia and the US is the existence of the US Federal Clean Water Act and other heads of power to implement and enforce source protection.</p> <p>Source water protection regulations should be formulated in a way that ensures their effective implementation and enforcement. Regulations must clearly identify objectives of source water protection – drinking water protection, recreation, the maintenance of aquatic and land ecosystems, etc.</p> <p>Clear and applicable numeric and/or narrative water quality criteria should support the regulatory requirements.</p> <p>Note that the business case for source catchment investments beyond minimum regulatory requirements needs to prove additionality—that is, net beneficial impacts over and above the regulatory minimum requirement for source management protection (Mulligan, 2013).</p>
Multiple-barrier approach	<p>This is a core driver. Water management organisations have long recognised the importance of a multiple barrier, risk management approach to protecting drinking water quality from contaminants (Deere et al., 2008).</p> <p>The Australian Drinking Water Guidelines (2011) (ADWG) indicate that the most important barrier in water quality protection is the effective protection of the source or catchment. Effective source protection can mitigate significant cost and reliance on fallible downstream barriers such as water treatment and disinfection (Ford, 2008).</p> <p>The concept of water safety planning, i.e. greater emphasis on source catchment as the first step in ensuring safe drinking-water, is to select and protect reliable, high quality source water, and is a key driver supporting action.</p>
Comprehensive overarching strategy and management framework	<p>This is a supporting driver. There must be a clear, overarching, structured management framework.</p> <p>The strategy should confirm the importance of water source protection and clearly articulate management objectives, obligations and responsibilities of key parties managing and impacting on water sources.</p> <p>The strategy and management framework should be integrated and align the source water management framework into high priority initiatives such as stormwater management and land conservation. The strategy must be developed and supported across agencies, levels of Government (Federal, State, Local) and stakeholders involved in catchment management.</p> <p>Development of risk plans, catchment management plans and other more specific land management and maintenance plans in isolation is a driver, but is less effective as a driver.</p>
Evidence that built infrastructure is inadequate	<p>This is a core driver. There is evidence that technological solutions (water treatment) are inadequate, and need to be complemented by source catchment management.</p> <p>For example, management of the water supply catchments of Sydney changed significantly after the 1997 Royal Commission into the Cryptosporidium and Giardia crisis. The Commission found that Sydney’s drinking water catchments were seriously compromised, that a modern water treatment plant was not a substitute for proper catchment management, and that a strong and effective response was required (Warner, 2013).</p>
Critical landscape, development and property right pressures	<p>This is an enabling driver. There is clear evidence that development and land use pressures are placing water quality requirements at risk (and that built infrastructure is inadequate).</p> <p>Many water authorities face development pressures within their source areas (TPL, 2004). Rapid urbanisation and associated peri urban development add to the existing pressures on catchments and significantly increase risks to raw water quality. Open catchments are particularly exposed to this risk. For example, the open catchments servicing the cities of Geelong, Ballarat and Melton in Victoria include existing agricultural and urban areas and are under increasing pressure from further development.</p> <p>An assessment of catchment risks to potable water supplies found that the predominant hazards were found to be (Water Ecoscience 2002):</p>

Driver	Description
	<p>human habitation in the catchment – including towns and settlements</p> <p>agricultural runoff – due to poor streamside vegetation and lack of fencing to prevent stock access potential for chemical spills.</p> <p>Water authorities relying on open catchments are facing increasing treatment challenges that may be more effectively managed through catchment protection and risk mitigation programs. New contaminants are emerging that suppliers may not be prepared to test for or treat. Spikes in contaminant loads due to storms and flooding make treatment more challenging and constantly changing standards and regulations regarding new contaminants are being implemented even though those contaminants may have been present in the water long before they were identified as threats to public health (TPL, 2004). The risks of emerging pathogens such as Hepatitis E, which are resistant to chlorine and disinfection have no medical treatment and which are highly infectious, are being highlighted in the literature. Additionally, increasing detection technologies are highlighting risks to water supplies from chemicals, metals and pharmaceuticals (TPL, 2004).</p>
Cost effective	<p>This is an enabling driver. Clear evidence that the avoided water treatment costs of built infrastructure (variable and/or fixed) exceed the costs of catchment management actions needed to avoid the treatment costs is needed.</p>
Significant economic value at risk	<p>Evidence and a compelling case that there is substantial economic value at risk. For substantial investments to mobilise—and be worthwhile economically—there also needs to be real economic value tied to current or emerging water-related issues in a watershed.</p>
Certainty of catchment management outcomes	<p>This is an enabling driver. There is relatively high certainty about how catchment management actions will impact on source water quality – i.e. when cause-effect relationships exist.</p> <p>Proving this is easier if there is low spatial variability across the source catchment, or the implications of spatial variability on source water quality are well understood. Spatial variability in land use, development pressures, climate, soil, etc. can pose challenges for clearly demonstrating the case. There is variability across and within watersheds in the magnitude of water resources impact given land cover and/or land management practice (Freeman et al., 2013).</p>
Catchment management benefits are frontloaded	<p>This point is related to certainty. There is a stronger driver for catchment management investments if the benefits will occur within a shorter (say 5 year) timeframe. This is a key challenge as many catchment actions take years to become effective, and often become more effective over time (Warner, 2013).</p>
Alignment of costs incurred and benefits received	<p>This is an enabling driver. There is alignment of economic and/or financial benefits and costs of source catchment actions – i.e. where the benefits of source catchment management actions go back to the funding organisation in some form.</p> <p>For example, water utilities may struggle to justify catchment activities on private land because these activities don't get added to the implementing agency's regulated asset base (RAB)/balance sheet. Catchment organisations may compete for funds and recognition of the impacts and social benefits of their work.</p>
Social drivers	<p>This is an enabling driver. There is a strong community voice calling for improved source catchment management, and a clear understanding of the issues.</p>

Attachment C: Investment cases – approaches and issues

What is this	A summary of the main types of issues (roadblocks) that catchment managers encounter when they are putting together compelling investment cases for catchment management activities.
How can you use the information in this section	You can use the summary table to: <ul style="list-style-type: none">• Develop your thinking around critical success factors, drivers and risks for your project or program• Communicate with others around critical success factors, drivers and risks
Information source	The key resources used here are tools and techniques from: <ul style="list-style-type: none">• (Mulligan, 2013)• 'Path to protection - ten strategies for successful source water protection' (Ernst & Hart 2005)• Water Research Foundation report (Sklenner et al., 2012)• 'Inquiry into catchment management' (DEH, 1999)
Quick tips and things to consider	The factors identified in this table is not exhaustive

Challenges in preparing a business case

Challenges in preparing the business case include:

- uncertainty around relationships and lack of biophysical production relationships. Optimistically, even the best models often do not capture 20–40% of variation for annual prediction (Schmidt & Mulligan, 2013)
- difficulties in estimating the likelihood of occurrence of low probability events. There is limited understanding of the transport and fate mechanisms which determine the concentrations and duration of pollutants in the environment (Guice et al., 2009)
- substantial and cross-disciplinary resources needed in the form of both expertise and personnel hours are still required to rigorously apply the most useful modelling systems and investment tools
- methods for conducting uncertainty analyses are abundant and are well developed; however, there is no standardised set of analysis tools built into modelling systems or even applied in modelling studies across the board. This is especially the case in risk and multiple objective studies
- integration between source catchment biophysical and economic systems. Evaluations often operate at different spatial and temporal scales, use different units of measurement, and different performance metrics, therefore, alignment is challenging
- evaluation approaches use a number of different economic methods to assess natural infrastructure, including avoided cost, replacement cost, or project benefits. However, there is often low transferability of values between sites and issues
- risk aversion and regulations requiring redundancy (i.e. built infrastructure even if natural infrastructure should provide). Redundancy, or having two or more natural infrastructure elements included to achieve the same outcome, is one way to reduce risk and uncertainty in the design of natural infrastructure investment portfolios
- full range of benefits not quantified; full range of costs not quantified
- lack of a common framework and approach makes assembling a united front difficult.
-

Tools being used to make a business case

Decision makers in different catchments require different levels of decision-making support and certainty before acting. This is often due to variations in their underlying political or organisational context, and the timeframe over which decisions apply (Schmidt & Mulligan, 2013).

Investment decision tools need to manage uncertainty and maximise cost effectiveness. This should be done by:

- prioritising types of interventions (e.g. easements and best management practices) and the distribution of those interventions throughout the watershed
- carefully monitoring the response of water resources throughout implementation
- managing investments adaptively to maximise outcomes (Freeman et al., 2013)
- ensuring the full costs and benefits have been highlighted to the investor.

A range of tools are being used to make a business case (shown in **Table 3**).

Table 3. Tools in use to support a source catchment protection business case

Tool	What is it?	Examples (where applicable)
Risk based assessment	<p>The most important tool in determining where to implement preventative barriers within the source is through the application of a source water risk assessment. Source water risk assessments involve assessing the risks to drinking water quality that arise in a particular source recharge area, with the results determining the appropriate risk management actions and their prioritisation.</p> <p>Risk assessment evaluates the interactions between water quality values, the stressors to these, and management actions for protecting the values. This is used to assess the potential impacts of stressors to water quality values. This is done in a consistent, clear and structured way using a risk assessment framework.</p> <p>The outcomes of a source water risk assessment are:</p> <ul style="list-style-type: none"> • an estimation of the likelihood that values may be impacted, and how the impact changes given alternative scenarios • detailed information and tools that help to better understanding how systems work • targeted management actions and monitoring programs. 	<p>Guice et al. (2009)</p> <p>In Queensland, the Department of Energy and Water Supply requires each drinking water service provider to prepare a Drinking Water Quality Management Plan (DWQMP). The purpose of the DWQMPs is to implement a risk-management approach to maintaining drinking water¹¹</p>
Financial analysis	<p>Compares the financial costs and benefits of (natural or built) infrastructure investments.</p> <p>Financial analysis alone is typically insufficient for an economic appraisal as it examines a project only from the narrow perspective of the entity undertaking the project. A traditional financial analysis does not take account of effects on other enterprises or individuals nor does it consider the opportunity cost when the price of a good or service is not a good indicator of the real value. It also does not account for the ability to leverage catchment basing investment to obtain multiple benefits.</p>	
Cost-benefit analysis	<p>The most robust method for examining the economic viability of a source water scheme is to consider the marginal value of the scheme using a cost-benefit analysis (CBA) framework. CBA is the most comprehensive of the economic appraisal techniques and is the preferred method of analysis for most State and Commonwealth (AUS) and Federal (US) agencies responsible for economic management.</p> <p>CBA does not specifically address matters of equity or perception, including political sensitivity, moral obligations or cultural issues. Where applicable, these issues must be subjectively assessed by decision makers and weighed against the economic impacts.</p> <p>If all of the costs and benefits have not been quantified, then a subjective assessment of the unquantified factors may be required to make a final assessment. In these cases, a ‘threshold analysis’ can be useful. A threshold analysis does not seek to quantify the remaining costs and benefits, but involves a subjective comparison of the unquantified costs and benefits against the quantified net present value result. Threshold analysis generally seeks to answer the question ‘Is the unquantified benefit enough to outweigh the quantified cost?’</p>	
Cost effectiveness analysis	<p>Cost effectiveness analysis (CEA) compares the costs of different project options with the same or similar outputs.</p> <p>For example, if the primary purpose of a source water scheme was to</p>	

¹¹ Department of Energy and Water Supply, Queensland. 2014. “Water Supply and Regulation.” Available at www.dews.qld.gov.au/water-supply-regulations/drinking-water/forms-and-guidelines. Accessed on 20 June 2014.

Tool	What is it?	Examples (where applicable)
	<p>avoid discharges to an environmentally sensitive river, then the CEA technique would compare the cost of the natural infrastructure with the cost of alternative methods of disposal.</p> <p>CEA is a well-accepted alternative to CBA when the major benefits cannot (or will not) be quantified, however it is generally considered a 'second best' alternative if the benefits can be quantified and included in a CBA.</p>	
Economic impact analysis	<p>For example, input-output analysis, computable general equilibrium models, etc. An economic impact analysis attempts to estimate changes to economic activity associated with a development. However, all government expenditure has economic impacts and generates employment; therefore, an economic impact analysis of the positive impacts of one particular project does not help a government decide where it should allocate public funds. More importantly, an economic impact analysis does not relate the expected benefits to the costs involved – that is, the benefits the community might expect to flow on from the taxpayer-funded costs involved.</p> <p>Input-output (multiplier) analysis is one of the most common tools used to assess the regional impacts of a project. In the simplest form of input-output analysis, input-output multipliers are applied to measures of direct impact to determine estimates of flow-on impacts in terms of income and employment. The most important limitation is that input-output analysis is concerned with measuring economic activity, and is not a tool for the evaluation of projects. Input-output analysis does not take account of the alternative uses (opportunity costs) of resources. Input-output analysis may indicate positive impacts – activity – without providing guidance as to whether such impacts correspond with net benefits. Poor investments, perhaps in heavily subsidised fields of endeavor, could be associated with greater levels of activity than good investments.</p>	
Incidence analysis	<p>An incidence analysis disaggregates the overall impacts of options according to the impact on individual community groups. The disaggregation is commonly undertaken in terms of the income grouping of those affected by a specific development. As such, it provides valuable information to decision makers about the distribution of benefits and costs, but is not an alternative to CBA or CEA in its own right.</p>	
Multiple objective planning	<p>Uses techniques (such as multi-criteria analysis) to select projects based on multiple explicit objectives, particularly for options that have several objectives which cannot be quantified in monetary terms. The estimation of weights for each objective can be tenuous, however the technique can help evaluate complex applications of CEA.</p>	<p>Zhang and Barten (2009) Guice et al. (2009)</p>
Green-grey analysis (GGA)	<p>A type of investment analysis (cost-benefit analysis or cost-effectiveness analysis, depending on the situation) that provides a basis for considering both natural (green) and built (gray) infrastructure alternatives.</p>	<p>Sebago Lake Watershed, US</p>

Attachment D: Levels of service planning examples

What is this	A template that you can use to agree minimum and desired levels of service drinking water catchments
How can you use the information in this section	<p>You can use the summary table to:</p> <ul style="list-style-type: none">• Develop your thinking around critical success factors, drivers and risks for your project or program• Communicate with others around critical success factors, drivers and risks• Agree and document the minimum and desired levels of service for drinking water catchments
Information source	Melbourne Water, source catchment Strategic Asset Management Plan (SAMP)
Quick tips and things to consider	<p>Clear and agreed Levels of Service (LOS) provide the foundations for catchment investment. If you don't have agreed minimum and desired LOS you should develop these as a priority.</p> <p>Minimum LOS meet regulatory or legislative requirements. Often, the regulatory minimum is not clearly defined, which can lead to uncertainty about the objectives and levels that need to be met. As a rule, where it is possible to set clear regulatory minimum standards this should be done to avoid confusion and to support efficient investments.</p> <p>Desired LOS for drinking water catchments go beyond the minimum regulatory requirements. Where you are setting desired LOS you should clearly show how:</p> <ul style="list-style-type: none">• the service level directly supports achievement of one or more regulatory requirements• the investment proves additionality and that (1) customers are willing to pay for the additional services that are being delivered or (2) the works contribute towards achieving regulatory objectives more effectively than alternative mechanisms

Table 4: Example template for customer, planning, tactical and operational LOS for water supply

Customer	Reliability of safe water supply not to exceed an outage of more than 6 hours.
Planning	Water supply needs for current and 10 year future capacity of the township: This would be measured through performance metrics. For example, Yarra Glen requires a minimum of 4ML/day based on projected usage for a peak summer day.
Tactical	<p>For a water aqueduct</p> <ul style="list-style-type: none"> • Minimum hydraulic capacity 4ML/day for 99.8% of the time • Maximum duration of low flow not to exceed 6 hours. • Safe to operate and maintain. • Durability to be able to perform their required functions for at least their nominated design life. • Will not endanger the public or cause unnecessary disruption. • Minimise contamination risk. • Meet or better the water leakage loss target.
Operational	<p>Secured from unauthorised access and tampering.</p> <ul style="list-style-type: none"> • Maintained to remove debris and flow conveyance. • Performance condition greater than 3 requires intervention. • Safety assessed using HAZID process. • Outage for maintenance not to exceed 6 hours. • Leakage reported and rectified where practical.

Table 5 Melbourne Water tactical LOS for Source Catchments

Catchment Programs based on Assets/Threats	Minimum / Basic Level of Service
Bushfire	Identify, analyse, evaluate and treat bushfire risk to water resource assets Limit the spread of any bushfires in the catchments to less than ten hectares in the first 12 hour shift
Recovery	Recover from the impact of bushfires and severe weather events
Roads	All infrastructure roads functioning all year All essential roads open and functional during the fire season All important roads open and functional during the fire season
Access	Exclude unauthorised access within the fenced reservoir areas Limit and control authorized access to essential visits only
Pest Animals	Target pest animals to protect water quality in the catchments
Runoff	Improved quality of runoff from rural land in the Tarago Catchment

Attachment E: 16 questions

What is this

These 16 questions have been developed by Victorian Treasury as part of the investment management standard

The 16 questions can together provide decision-makers with confidence that:

- there is a real problem and it needs to be addressed at this time
- the benefits that would be provided by successfully addressing the problem are of high value to the organisation
- the way the problem will be addressed is strategic and cost effective
- the solution is likely to be delivered within the time and cost expectations.

The 16 questions address four areas – *problem, benefits, strategic response* and *solution*. These questions are relevant to any type of investment but the areas of focus and depth of information required for a decision-maker will vary based on the type of investment and the business environment.

How can you use the information in this section

These are initial screening questions for your project team to get you thinking about the investment you are proposing and the issues you should address.

If you can answer all of these questions clearly and with confidence then you have a strong case to put forward. Typically, there will be gaps. These gaps get you thinking about how you are going to address them.

Information source

Victorian Government Investment Management Standard

Quick tips and things to consider

- Use as a basis for discussion
 - Identify strong and weak spots
 - Use to develop your investment story and define next steps in your investment
-

Problem	Benefits	Strategic response	Solution
1. Is it clear what the problem is that needs to be addressed, both cause and effect? What are the key drivers? What are the assets at risk?	5. Have the benefits that will result from addressing the problem been clearly defined? When, where, how will they occur?	9. Have we fully identified the options that are on the table: regulatory controls, incentives (payments), works and measures (new or existing)?	13. What's the best way to deliver the solution? How do we leverage off our existing partnerships and programs?
Yes / Maybe / No	Yes / Maybe / No	Yes / Maybe / No	Yes / Maybe / No
2. Is there enough evidence to confirm both the cause and effect of the problem	6. Are the benefits of high value? To whom? Are the beneficiaries the investors?	10. Is there evidence to demonstrate that the strategic options are feasible? (technical, cost, ability to deliver)?	14. Is the recommended project solution the <i>best value for money solution</i> to deliver the <i>expected benefits</i> ?
Yes / Maybe / No	Yes / Maybe / No	Yes / Maybe / No	Yes / Maybe / No
3. Does the problem need to be addressed as part of a regulatory requirement? What are the explicit links between the problem and governing legislation and regulation?	7. What are the key performance measures we need to put in place that will show the problem has been addressed. Are these measures in place now? Are the measures in a standard format? Are they SMART? Will they provide clear evidence that the benefits are being delivered?	11. Were the strategic options evaluated to reflect their ability to deliver the benefits? What are the key delivery risks?	15. Is the solution flexible – can we adapt the solution so that it works better if conditions change for some reason? Or is our investment locked in and inflexible once made?
Yes / Maybe / No	Yes / Maybe / No	Yes / Maybe / No	Yes / Maybe / No
4. If the problem is not part of a regulatory requirement, is there a clear case why we are proposing the investment? Is there evidence that our customers want this investment to be made? Do we understand what the community thinks the issues are and their drivers?	8. Have key dependencies critical to benefit delivery been considered? Have inter-dependencies (with other investments, delivery, departments) been considered?	12. Is the preferred strategic options the most effective way to address the issue and deliver the benefits?	16. Are we confident the solution can really be delivered (cost, risk, timeframes etcetera)
Yes / Maybe / No	Yes / Maybe / No	Yes / Maybe / No	Yes / Maybe / No

Comments:

Attachment F: Investment concept brief

What is this	<p>A no more than three-page depiction of the logic that underpins a catchment investment. It represents an ‘agreed investment story’ that is created in an informed discussion between the funder and project team.</p> <p>It is written in plain English in a way that will allow a layperson to understand the language and the concepts. It provides the core focus of an investment and is modified to reflect changes to the logic throughout its lifecycle.</p> <p>Keep the brief to less than three pages – it’s an initial sketch of the investment, not the final investment case.</p>
How can you use the information in this section	<p>You can use the investment concept brief to:</p> <ul style="list-style-type: none">• communicate clearly and simply with stakeholders, decision makers and investors about why you are looking at the investment.• get your project team to agree on the ‘investment story that you will communicate’.• Capture cost, benefit, delivery and risk information about initial options you are considering• Track how the investment logic changes over time
Information source	Victorian Government Investment Management Standard
Quick tips and things to consider	<ul style="list-style-type: none">• Use to clearly communicate the message• Don’t worry if you don’t know costs, benefits and risks with high confidence. Get your initial ballpark ideas down, the idea is to get screening for what may be to high cost, too high risk, too few benefits• Make sure you are aligning to SAMP• Make sure you align to what is a regulatory requirement versus not• Use the investment concept brief to discuss evidencing requirements with the investor, getting initial feedback on issues

Investment Name (Title)

Subtitle

Catchline	What is the one most compelling reason this investment should be considered further?	
	Description of context	
Why us, why now	Why does the problem need to be addressed now and by this organisation?	
	Description. Why it can't wait. Why we need to own the problem, or take leadership	
Regulatory driver	What is the legislative / regulatory requirement that this investment will contribute towards?	
	Description of legislative and regulatory alignment. Is the investment mandatory (driven by a legislative requirement) or discretionary (driven by organisational objectives / customer expectations).	
Strategic objectives	What is the primary policy / strategic objective of the investor to which this investment will contribute?	
	How does delivering the investment support key source water policies or strategy objectives of the investor	
Multiple barrier approach	How does the investment build redundancy and resilience in the multiple-barrier approach to drinking water quality management?	
	How do we justify the investment if there are existing barriers in place that are already performing at or above the minimum required standard?	
Benefits	What are the benefits? Are the benefits of high value? To whom? Are the beneficiaries the investors? How does the investor benefit? How long will it take for the benefits to become evident?	
	Description	
Cost	What are our initial ball-park indicative (+/-50%) costs of this investment to the investor?	Cost (range)
	Capital cost estimate total	\$n mil - \$n mil
	Operational cost total	\$n mil - \$n mil pa
Time	What are the indicative (+/-50%) timeframes for the key deliverables?	Time from funding
	Description of deliverable/milestone	mm-mm
	Description of deliverable/milestone	mm-mm

Risks	What are the primary risks to the investor (financial, reputation, delivery) to the success of this investment delivering the benefits?	Likelihood	Criticality
H: High	Description of risk	H,M,L	H,M,L
M: Medium	Description of risk	H,M,L	H,M,L
L: Low	Description of risk	H,M,L	H,M,L
Dis-benefits	What negative impacts (if any) are likely to occur by successfully addressing the problem?	Likelihood	Impact
H: High	Description of dis-benefit	H,M,L	H,M,L
M: Medium	Description of dis-benefit	H,M,L	H,M,L
L: Low	Description of dis-benefit	H,M,L	H,M,L
	Description of dis-benefit	H,M,L	H,M,L
Critical Dependencies	What external conditions are critical to the success of this investment? Description of critical dependency Description of critical dependency Description of critical dependency		
Uncertainties	What are the key uncertainties and knowledge gaps we need to fill before we can put forward a robust and evidence based investment case? What's our plan to fill these gaps Description of key uncertainties		
Investor	Who is the senior person who will ultimately be responsible for delivering the identified benefits?		
	Name	Position	

Attachment G: Informed discussion principles

What is this

A summary set of ‘rules’ on how to harness the knowledge available within the organisation to make effective catchment management investment decisions.

Many organisations have introduced complex and compliant processes that aim to standardise the way they work and increase their rigour in shaping new investments. These processes have often failed to properly harness the knowledge available to the organisation

How can you use the information in this section

You can use the informed discussion principles to:

- Identify the investor and when how they are involved in discussions
- Structure discussions to ensure the investor is getting maximum benefit to help them decide when to invest
- Keep meetings targeted

Information source

Victorian Government Investment Management Standard

Informed discussion principles

Informed discussions have the following characteristics:

- Informed – they require funder participation (the person(s) who will be responsible for the passage of approval of the investment) and people with most knowledge of the subject
- Decision making – practices are structured to address a sequence of decisions that are central to potential investment
- Plain English – the source catchment investment is told in simple language and concepts that can be understood by a layperson
- Evidence-based – each statement of the story must be supported by best available evidence
- Two-hour limit – discussions do not go over 2-hours. This is short enough for commitment of senior people (and Treasury) and long enough to get an agreed investment story developed
- 48 hours following – the 48 hours following informed discussions are used to conclude them. During this time the key outcomes of the discussion and decisions are circulated and outstanding matters resolved
- Facilitated – the facilitator should be independent of the source catchment project team and is responsible for:
 - extracting, challenging and identifying gaps in the source catchment investment story and underpinning logic
 - shaping the source catchment investment story in a way that will maximize the value to the organization and expresses the need for the project and its benefits in a clear plain English way
- Obtaining agreement from all participants about the investment story
- Ensuring that each statement is supported by factual evidence.
- The funder needs to only commit a maximum of eight hours (four two-hour informed discussions spread over a period of six weeks) to shape a major investment.
- The informed discussions are structured to address the issues of most importance (and interest) to a funder. This allows them to hear all arguments and confidently take ownership of the investment.
- The discussion participants are those people with the most knowledge of the business problems and the stakeholders who will be important to the success of the investment.

Attachment H: Source catchment stakeholder influence map

What is this	<p>A common theme throughout the literature and in the interviews undertaken was the importance of influencing key decision makers and communities of practice to engender support for water source catchment protection and management.</p> <p>The stakeholder influence matrix below can be used to identify who needs to be influenced, how they can be influenced, and what role they place in the decision making process.</p>
How can you use the information in this section	<p>You can use the stakeholder influence matrix to:</p> <ul style="list-style-type: none">• Brainstorm, identify and document who the key stakeholders are• Identify who the investors are – i.e. who are the people who will make the decision about whether the project gets funded• Identify what information the investor needs to make their decision• Document how stakeholders will be involved in the process
Information source	Source catchment project team, based on previous projects
Quick tips and things to consider	<ul style="list-style-type: none">• Investments often fail when the key person (the funder) is not actively engaged in its management. Additionally, many potentially good investments are never funded because the funder just doesn't understand what they are all about.• The CIMS addresses both of these issues by engaging the funder early and retaining their involvement over the entire investment lifecycle.• If you do one thing with the stakeholder influence matrix make sure it clearly identifies who the funders are and how you are going to engage with them

The stakeholder influence matrix

	Influence level		Why influence?
Politico economic context	Policy makers	–	Successful programs have had a policy champion and high-level policy support to achieve their aims. Establishment of roles, responsibilities and lead agencies vital.
	Legislators	Federal	Significant difference between the US and Australia is the existence of the Federal Clean Water Act and other heads of power to implement and enforce source protection in the US. Australia does not have an equivalent.
		State	Each State in the Australian context has differing legislative approach to source protection. Most planning in some areas focused on quantity not quality. Limited regulatory support for source protection in some states. Reliance on guidelines with limited statutory impact.
		Local	Local Government identified as a key land use regulator. Wide variety of engagement identified however it is mostly reactive. Several areas identify limited influence over planning schemes and development patterns.
	Regulators	Financial	Financial regulators need to be influenced to provide appropriate financial signals. Currently a RAB and CAPEX bias against source protection exists.
		Health	Identified support for multi barrier approach. Establishment of guidelines needs to be supplemented by risk reduction requirements.
Organisational context	Board	–	High level Board support and resourcing required. Most Boards dominated by financial/legal considerations with few source protection subject experts at high level.
	Executive	–	Executive must be fully engaged and supportive for program to succeed. Strong leadership required particularly in relation to expenditure on third party land or assets.
	Middle management	–	In some organisations there is an opportunity to improve the level of understanding within middle management of the potential

	Influence level		Why influence?
			benefits of source water protection programs. These programs challenge business as usual approaches – many decisions needed for successful catchment management programs will not progress beyond this level in organisations unless this is addressed.
	Staff	–	Staff across all elements of water businesses need to understand source protection importance and long term importance across all spheres of operation.
Catchment context	Catchment organisations	–	In many catchments, numerous organisations identified with no clear leader and competition for funds and recognition.
	Catchment industries	–	Industries operating within water supply catchments can have tremendous influence over producers. Need to engage industry to promote source protection goals.
	Landholders	–	In open catchments, the majority of on ground works need to occur on private land.
Community context	Catchment community	–	Influencing catchment communities to be supportive of source protection programs is vital. Top down approach of water industry identified as barrier to successful engagement.
	Drinking Water Customers	–	Drinking Water Customers of source catchments need to understand role of catchments, source protection and long term program benefits if long term success and support is to occur.

Attachment I: Risk-based level of evidence requirements

What is this	<p>Tools and techniques to help identify and agree with the funder(s) the level of evidence that is needed to support the source catchment investment case.</p> <p>Discussions with water utilities show that successful investment cases are based around a clear understanding of the level of evidence that the investor needs to make the decision to back the investment with confidence.</p> <p>The level of evidence being called for is largely driven by assessments of risk and threats to assets (Miller, Guice, & Deere, 2009). For some assessments simple desktop studies are sufficient, others call for more rigorous evaluation. The tools in this attachment provide different ways of assessing risks, and agreeing the level of evidence needed for an investment case.</p>
How can you use the information in this section	<p>You can use the risk-based level of evidence requirements tools to:</p> <ul style="list-style-type: none">• Brainstorm, identify and document what the assets at risk are and what evidence you already have about them• Agree with the funders the level of evidence you are going to need for your investment• Identify any other 'off-the-table' / informal information the investor wants to make their decision• Document the agreed level of evidence requirements
Information source	<p>Source catchment project team, based on previous projects</p>
Quick tips and things to consider	<p>In some cases the level of risk to assets might not be known and will only become known through the process of gathering evidence. If this is the case, discuss with the investor what the minimum and maximum level of evidence requirements are</p>

Table 6. Tiered process of assessment

Description source features	Level of risk	Other factors – political, social, economic	Resources	Stakeholders	Recommended evaluation tier level	Evaluation level
Small isolated source, population served 1-500	<p>Not well understood; or minimal water quality trends of concern (none microbiological)</p> <p>Rare reportable issues</p> <p>Land uses or activities present that pose minimal water quality risk</p> <p>Some barriers in place, but never validated</p> <p>Source storage time exceeds 30 days</p>	<p>No known historical or current issues</p>	<p>Compliance water quality monitoring data</p> <p>Basic land uses surveyed and listed, on-ground practices not well understood</p> <p>Limited understanding of hydrological characteristics</p>	<p>Limited, land is almost entirely under utility/Crown ownership</p>	<p>1</p>	<p>Desktop study with project team coming together only for review and issue resolution</p>
	<p>Not well understood; or some water quality trends of concern (including microbiological)</p> <p>Rare reportable issues</p> <p>Land uses or activities present that pose water quality risk with the potential for increased risk</p> <p>Some barriers in place, but never validated</p> <p>Source storage time is less than 30 days</p>	<p>Potential future land use issues</p>	<p>Compliance water quality monitoring data, limited investigative data</p> <p>Basic land uses surveyed and listed, on-ground practices not well understood</p> <p>Limited understanding of hydrological characteristics</p>	<p>Land ownership is a mixture of private and Crown</p>	<p>2 (or 3 if source storage time is less than 30 days at times of highest risk)</p>	<p>Desktop study for data collation, regular workshops for project team</p>

Description source features	Level of risk	Other factors – political, social, economic	Resources	Stakeholders	Recommended evaluation tier level	Evaluation level
Medium – large source, regional population served 500-100 000	Rare reportable events Less than 5 water quality trends of concern (non-microbiological) Barriers in place have some limitations validated Past risk assessments indicate some land uses/activities of risk to water quality	Some local; community or stakeholder concern	Compliance water quality monitoring data Some limited investigative monitoring data Land uses surveyed, practices reasonably well understood and possibly mapped simply Very few licensed premises Good understanding of hydrological characteristics	Numerous, as land within source area is under mixed ownership– LGAs, state government authorities, industry, private land owners	2	
	1–3 reportable events per year (including microbiological) Barrier failure suspected but not confirmed Less than 5 water quality trends of concern Barriers in place have some limitations validated Past risk assessment indicates several land uses/activities of risk to water quality	Some local; community or stakeholder concern in past, and increased potential for the future	Compliance water quality monitoring data Some limited investigative monitoring data Land uses surveyed, practices reasonably well understood and possibly mapped Some licensed premises Good understanding of hydrological characteristics	Numerous, as land within source area is under mixed ownership– LGAs, state government authorities, industry, private land owners	3	Workshop for all key stages in assessment process

Description source features	Level of risk	Other factors – political, social, economic	Resources	Stakeholders	Recommended evaluation tier level	Evaluation level
Large Metropolitan source population servicing 100 000 +	1–5 reportable events per year (including microbiological)	Highly political, community very interested in water quality and public health, several social issues	Extensive investigative and compliance monitoring Land uses and practices very well understood and documented. GIS mapping Licensed premises High level understanding of hydrological characteristics	LGAs, state government authorities, industry, private land owners, community as a whole	3	Workshop for all key stages in assessment process
	Any water quality issues/trends of concern Most barriers in place effective but some have limitations Barrier failure confirmed for very occasional events Past risk assessment indicates minimal land uses/activities of risk to water quality					
	1–5 reportable events per year Any water quality issues/trends of concern Barriers in place have some limitations Barrier failure confirmed for some events Past risk assessment indicates land uses/activities of risk to water quality	Highly political, community very interested in water quality and public health, numerous social issues	Extensive investigative and compliance monitoring Land uses and practices very well understood and documented. GIS mapping Numerous licensed premises High level understanding of hydrological characteristics	LGAs, state government authorities, industry, private land owners, community as a whole	3	Workshop for all key stages in assessment process

Source: (Guice, Miller, & Deere, 2009)

Table 8 Explanations of risk tier level

Risk Tier Level	Source vulnerability	Water quality risk microbial	Water quality risk chemical	Political or social issues	Downstream barriers present	Resourcing requirements
1	Source recharge area is well protected; source itself has good dilution and detention barriers.	Risk of raw water contamination by microbial parameters is low	Risk of raw water contamination by chemical parameters is low	Limited to none, few stakeholders	Source has robust downstream barriers that address all known raw water risks	Desktop study with supervisory support from project team
2	Source recharge area having some protection, source itself has good dilution and detention barriers, but they can fail during high risk events.	Risk of raw water contamination by microbial parameters is moderate	Risk of raw water contamination by chemical parameters is moderate	Some local issues in past and predicted occasionally for the future	Source has robust downstream barriers that address most raw water risks, except under event conditions	Preliminary desktop study and then verification through workshop- based process
3	Source recharge area having only limited effective protection, source itself having good dilution and detention barriers, but they can fail during high risk events.	Risk of raw water contamination by microbial parameters is high	Risk of raw water contamination by chemical parameters is high	Local and/or state based political and social issues in the past and anticipated for the future	Source has robust downstream barriers that address most raw water risks, except under event conditions	Preliminary desktop study and then verification Workshop- based process – including external stakeholders (if required)

Table 7: Guidance on deciding whether a risk assessment should be conducted and the level of assessment required

Water body values ¹²	Potential impacts ¹³ to water body values (value at risk)	Knowledge ¹⁴ and understanding of water body values and risks	Is a risk assessment required?	What level of assessment should be conducted?
High	Moderate to high	Substantial	<p>If the values and risks are well understood, a risk assessment may not initially be required. Instead, the impacts can be directly managed using the available information.</p> <p>Monitoring should be conducted to assess the effectiveness of management actions and whether the prior assumptions of risk are correct.</p>	<p>If monitoring shows that management actions are not effective or the prior assumptions of risk are incorrect, then a semi-quantitative or quantitative risk assessment should be conducted.</p>
High	Moderate to high	Minimal	A risk assessment should be conducted.	A semi-quantitative or quantitative risk assessment should be conducted.
High	Minor	Substantial	<p>If the values and risks are well understood, a risk assessment may not initially be required.</p> <p>Monitoring should be conducted to assess whether the impact to values remains minor.</p>	<p>If monitoring shows that the prior assumption of a low impact is incorrect (i.e., there is the potential for a moderate to high impact to values), then a semi-quantitative to quantitative risk assessment should be conducted.</p>

¹² Values: These include environmental, social and economic aspects of the beneficial uses and values of a water body. High-value waterbodies can be identified through state, national and international designations; regional processes such as regional river health strategies and coastal plans; and local community processes

¹³ Impacts: Examples of scenarios that might be considered to have a high impact are: an impact that may alter the ecosystem (i.e., from which there isn't recovery but which results in a change in the system); an impact from which recovery would be very slow; a continuous downward trend in biota health; an impact that prohibits any identified beneficial use (such as primary or secondary recreational activities) from being protected in the water body. Examples of scenarios that might be considered a minor impact are: occasional small impact from which biota can recover quickly back to previous levels; where all beneficial uses are still protected continuously (i.e., all SEPP (WoV) objectives still met).

¹⁴ Knowledge and understanding: Substantial knowledge and understanding would be considered as having:

- clearly and objectively identified all the key values of the water body
- conducted extensive monitoring and assessment of the biota and water quality to evaluate potential impacts to values
- assessed the level of impact to beneficial uses from water body risks

Minimal knowledge and understanding would exist where none of the above evaluations had been undertaken

Water body values ¹²	Potential impacts ¹³ to water body values (value at risk)	Knowledge ¹⁴ and understanding of water body values and risks	Is a risk assessment required?	What level of assessment should be conducted?
High	Minor	Minimal	A risk assessment should be conducted.	<p>Initially, a qualitative risk assessment may be conducted to assess the prior assumption of a low impact to values.</p> <p>If the qualitative risk assessment indicates the prior assumption of minor impact to values is correct, then monitoring should be conducted to assess whether the impact to values remains minor.</p> <p>If the qualitative risk assessment, or monitoring, indicates the potential for a moderate to high impact, then a further semi-quantitative to quantitative risk assessment should</p>
Low	Moderate to high	Substantial	<p>If the values and risks are well understood, a risk assessment may not initially be required. Instead, the impacts can be directly managed using the available information.</p> <p>Monitoring should be conducted to assess the effectiveness of management actions and whether the prior assumptions of risk are correct.</p>	<p>If monitoring shows that management actions are not effective or the prior assumptions of risk are incorrect, then a qualitative risk assessment may be conducted initially.</p> <p>If this level of assessment is insufficient to fully understand the risks for management, then a further, semi-quantitative risk assessment may be required.</p>
Low	Moderate to high	Minimal	A risk assessment should be conducted.	<p>A qualitative risk assessment may be conducted initially.</p> <p>If this level of assessment is insufficient to fully understand the risks for management, then a further semi-quantitative to quantitative risk assessment may be required.</p>
Low	Minor	Substantial	A risk assessment may not initially be required. Monitoring should be conducted to assess whether the impact to values remains minor	<p>If monitoring shows that the prior assumption of a low impact is incorrect (i.e., there is the potential for a moderate to high impact to values), then a qualitative risk assessment should be conducted initially.</p> <p>If this level of assessment is insufficient to fully understand the risks for management, then a further semi-quantitative risk assessment may be required.</p>

Water body values ¹²	Potential impacts ¹³ to water body values (value at risk)	Knowledge ¹⁴ and understanding of water body values and risks	Is a risk assessment required?	What level of assessment should be conducted?
Low	Minor	Minimal	A preliminary qualitative desktop risk assessment should be conducted to better understand the potential risks.	<p>If the desktop risk assessment indicates the potential for moderate to high impacts to values, then a further, more detailed qualitative assessment or semi-quantitative risk assessment should be conducted.</p> <p>If the desktop risk assessment indicates the prior assumption of minor impact to values is correct, then monitoring should be conducted to assess that the impact to values remains minor.</p> <p>If monitoring shows that there is potential for moderate to high impact to values in the future, then a qualitative risk assessment should be conducted initially. If this level of assessment is insufficient to fully understand the risks for management, then a further, semi-quantitative risk assessment may be required.</p>

Source: based on (EPA, 2009)

Attachment J: Building the evidence base

What is this	<p>A toolkit of resources, links and tools that can be used to build the evidence base for the catchment investment by identifying catchment processes, high value assets, risks to the high value assets, and barriers in place to protect, maintain and / or enhance the high value assets.</p> <p>We have separated these tools into stages of evaluation and country of origin to help users navigate through this large evidence base. You can complete some or all of the stages as needed. Remember, the level of evidence you need (and therefore the amount of work you have to do in this stage) should be agreed with the investor. The aim is for this evidence base to be developed and refreshed over time with the help of practitioners.</p>
How can you use the information in this section	<p>You can use the evidence base to:</p> <ul style="list-style-type: none">• Develop a program that builds a clear and compelling evidence base of high value assets at risk• Develop resources that can be used for communicating with stakeholders
Information source	<p>The three key resources used here are tools and techniques from:</p> <ul style="list-style-type: none">• (EPA, 2009)• (Guice, Miller, & Deere, 2009)• (Park, et al., 2009)
Quick tips and things to consider	<ul style="list-style-type: none">• Don't rely solely on spatial data and/or modelled layers – issues with accuracy and appropriate use of this data can mean that the outputs fail to match on-ground reality• Be clear about what is meant by a significant asset for the purposes of this process (see definition in this section).• Be clear about how you are going to use the list of assets once you have collected the information. It is important to explain to people involved how their information will be used in subsequent steps in the CMIS investment process. For example it is crucial to make it clear that just because an asset gets on the list, this does not mean that it will be a priority for public investment (Park, et al., 2009)

Step	Resource	What does it contain?	Country of origin
Gather catchment information and construct a flow diagram of water supply system from catchment to consumers and describe the nature of barriers	(Guice, Miller, & Deere, 2009)	5.1.3 Action 3. Contains detailed steps on gathering catchment information and constructing a flow diagram of the water supply Appendix 3 – Catchment Information Collation Contains checklists of information that can be gathered for the assessment and to construct a flow diagram	AUS
	(United States Environmental Protection Agency, Office of Water, 2008)	Chapter 5: Gather Existing Data and Create an Inventory discusses the first step in watershed characterization— gathering existing information and creating a data inventory. Table 5-1 on page 5-8 of the US EPA Handbook, includes a checklist of data typically collected for watershed characterization and the data's potential uses and risks	US
Identify high value assets that are impacted by changes in catchment condition. The CMIS is an asset based approach that prioritizes management actions around protecting, maintaining and / or enhancing the performance of high value assets. An asset is the thing we hope to protect or enhance through a proposed project. It is an endpoint. It could be large or small, localised or dispersed. An asset could be a single localised thing (for example, a particular reservoir or stretch of river), or it could be a collection of smaller assets, such as remnant vegetation on farms in a region.	(Park, et al., 2009)	Significant Asset Identification Guide (INFFER Step 1). Investment Framework For Environmental Resources (INFFER) is a tool for planning and prioritising public investments in natural resources and the environment. It focuses on achieving outcomes cost effectively. The Significant Asset Identification Guide provides a step-by-step guide on how to: define assets define asset categories determine appropriate asset scale assess asset significance document assets and their economic, social and environmental significance	AUS
Identify existing barriers and management actions protecting high value assets. Using the information gathered in the previous stages you should be able to clearly identify how the multiple barriers operate to protect high value assets that you have identified in the earlier stages	(United States Environmental Protection Agency, Office of Water, 2008)	<ul style="list-style-type: none"> • Worksheet 10-1 Identifying Existing Management Efforts • Worksheet 10-2 Documenting Management Measure Opportunities and Constraints • Table 10-4. Example Management Practice Screening Matrix 	US
	(Guice, Miller, & Deere, 2009)	5.7 Step 7. Select Catchment-Based Critical Control Points (CCPs)	AUS

Step	Resource	What does it contain?	Country of origin
Identify Data Gaps and Collect Additional Data if Necessary	(United States Environmental Protection Agency, Office of Water, 2008)	Chapter 6. Identify Data Gaps and Collect Additional Data If Needed	US
Identify Main Threats / Causes of Risk to High Value Assets. By the end of this step you should be able to identify the key sources of risk to high value assets that you will quantify in the next step of the evaluation.	(Guice, Miller, & Deere, 2009)	5.3 Step 3. Identify Hazards, Hazardous Events and Sources 5.3.1 Action 1. Identify water quality hazards 5.3.2 Action 2. Identifying hazardous events 5.3.3 Action 3. Identifying sources of hazards	AUS
You should identify the source type, locations, and timing for load estimation. It might be helpful to identify the areas for evaluation on a watershed map to determine the key locations for conducting the loading analysis and which sources will be included in the analysis. You should also develop a brief report summarizing your data analyses and their results and describing the watershed sources, including their location, associated pollutants, timing, and impact on the waterbody	(United States Environmental Protection Agency, Office of Water, 2008)	Chapter 7. Analyze Data to Characterize the Pollutant Sources Appendix Worksheet 4-3 Building a Conceptual Model (sources, stressors, impacts and impairments)	US
Evaluate risk of threats to High Value Assets. By the end of this step you should understand how point and non-point sources impact on the condition of significant assets. This gives the basis to determine priorities managing hazards and hazardous events that impact on the high value assets.	(Guice, Miller, & Deere, 2009)	5.4 Step 4. Assessment of Water Quality Data for Hazard Identification 5.5 Step 5. Uncertainty Scoring 6. Risk Assessment – Determine the Likelihood, Consequence of each Risk and then Prioritise	AUS
	(United States Environmental Protection Agency, Office of Water, 2008)	8. Estimate Pollutant Loads 8.2 Using Monitoring Data or Literature Values to Estimate Pollutant Loads 8.3 Watershed Modeling 8.4.5 Estimation of Existing Conditions and Baseline Scenarios	US
Identify community key assets, threats and risks. By the end of this step you should be able to identify your key stakeholders in the community, know their key assets, the condition they want	(United States Environmental Protection Agency,	3.3 Identify and Engage Stakeholders	US

Step	Resource	What does it contain?	Country of origin
these assets to be in, and what they think the key threats to these assets are.	Office of Water, 2008)		
Assess uncertainty. Review the basis of the knowledge behind the hazards, hazardous events and sources to define the level of confidence in the information	(Guice, Miller, & Deere, 2009)		AUS

Attachment K: Investment logic map

What is this

The Investment Logic Map (ILM) communicates the investment story in a single page using language and concepts that are understandable to investor(s). The one-pager is equivalent to the elevator pitch when you are asked to describe your investment.

An ILM is a type of program logic model. A program logic model (also known as outcome model, logic model, or outcome hierarchy) sets out what a project will do and how it will do it. In other words, it represents a project's theory of change. The program logic model does this by visually representing a linear sequence of steps that need to occur for a project to meet its desired outcomes. This generally consists of identifying the inputs, activities, outputs, and outcomes (from immediate, to long term).

The primary intent of the ILM is to get a clear understanding of the:

- problem or opportunity impacting the investor
- strength of available evidence to confirm both the cause and effect of the problem
- benefits that can expect in successfully responding to the problem.

How can you use the information in this section

You can use the ILM to:

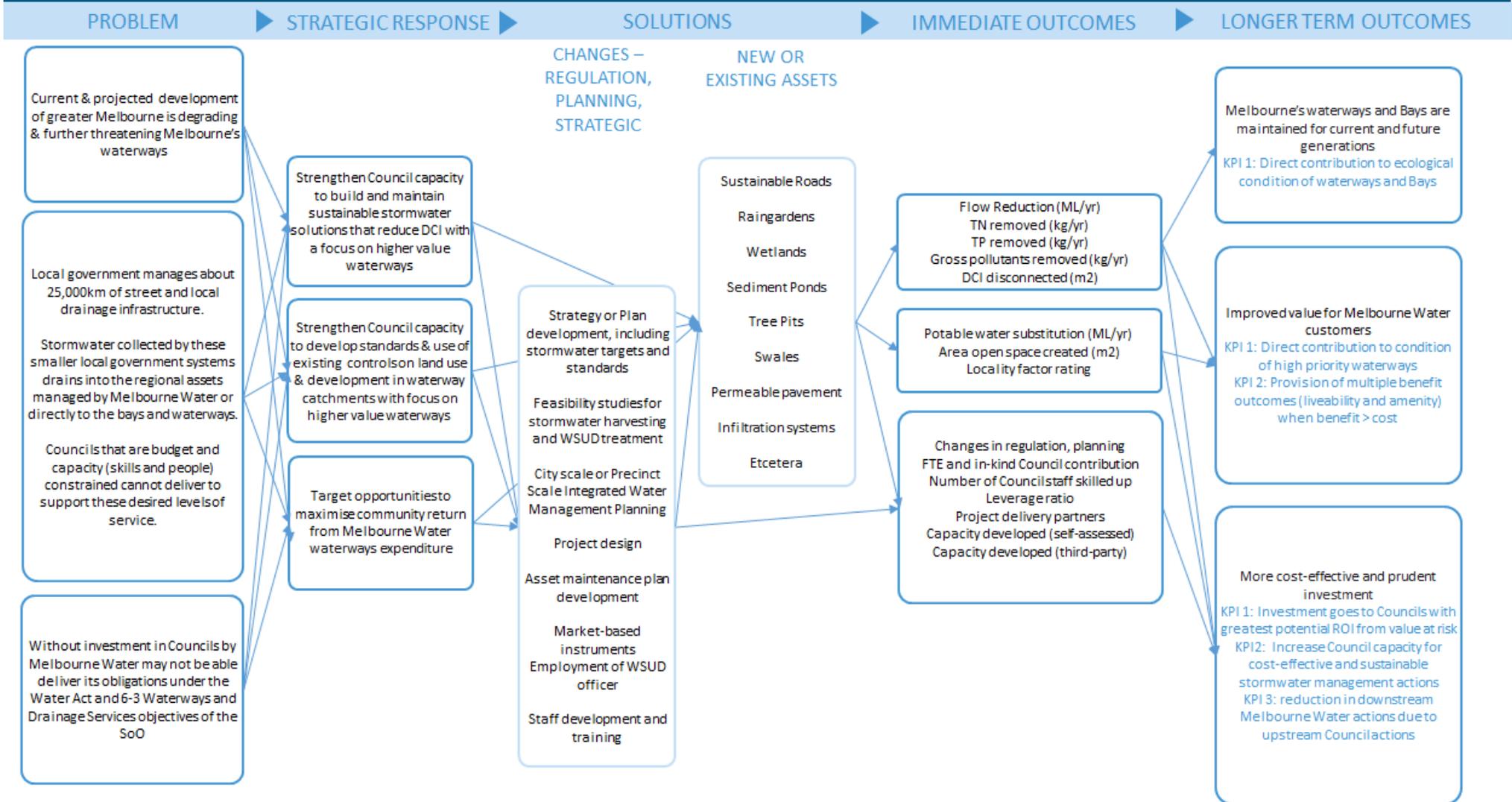
- Make sure that the evidence base you have developed is complete and there are clear linkages between the problem, the benefit and the strategic response
- Communicate with stakeholders and investors in a clear and simple way

Information source

The ILM is a tool drawn from the Victorian Treasury Investment Management Standard.

- The IMS can be accessed at [here](#)
- Investment Logic Map templates, examples and help are [here](#)
- Guidance on how to run a workshop to prepare and ILM is [here](#)

INVESTMENT LOGIC MAP
Initiative



Investment Logic Maps have three parts to them: Problems, Benefits, and Strategic Response

Element	What is this	Quick tip
Problem	<p>The problem(s) is/are recorded in the first column of the ILM. A problem is the reason action needs to be considered at this time. Generally, it is couched in negative terms and is made up of two parts – cause and effect. The problem(s) statements are critical to understanding the need for this investment and should enable the reader to get a sense of the level and significance of the investment.</p> <p>For example :</p> <p>Cause: High levels of toxicity Effect: Threaten water quality</p>	<p>A problem statement should be:</p> <ul style="list-style-type: none"> • expressed in plain English and have a clearly defined cause and effect • supported by evidence to verify both the problem and the ‘cause and effect’ • the effect is focussed on high value assets, so that the problem is compelling
Strategic Response and solutions	<p>The <i>Strategic response</i> and <i>Solutions</i> are the second and third column of the ILM.</p> <p>The strategic response is the broad set of strategic options recommended as the preferred response to an identified problem(s). It is made up of one or more strategic interventions.</p> <p><i>Solutions</i> are high-level actions that could be taken as a response to an identified problem. A valid solution intervention must have the potential to deliver some or all of the identified KPIs and their target measures. To ensure it is sufficiently high level, its implementation must also allow more than one possible solution.</p> <p>Therefore a strategic response and solution intervention needs to pass three tests; it needs to:</p> <ul style="list-style-type: none"> • deliver some of the identified KPIs, their measures and targets; • allow more than one possible solution; and • be a valid response to the problem(s) 	<p>Key questions to ask here include:</p> <ul style="list-style-type: none"> • Have we thought of all the solutions including: <ul style="list-style-type: none"> ○ Existing asset options: i.e. using or improving existing Government assets to address the issues ○ New assets: developing and investing in new assets / infrastructure to address the service need ○ Non-asset options: for example changing regulation or policies to deliver sought outcomes ○ Market based solutions: using market mechanisms (pricing, property rights and competition) to address the need. • What strategic interventions will best respond to the problems and deliver the benefits? • Is it in our power/influence to respond to this? Have we got the right people here to answer this? Do we need to invite others into this conversation if we are genuinely going to deliver on the proposed KPIs? • Does this align with the purpose of our organisation(s)? Have we got the right people here to answer this? • Do we need to involve another organisation and develop a joint response? • Will this deliver on the KPIs, their measures and targets?

Element	What is this	Quick tip
Solutions	<p>Benefits are the impacts of the investment. The <i>Benefit</i> column articulates the value proposition or successful outcomes that are expected from addressing the negative consequences identified in the problem statements.</p> <p>The benefit statement is made up of an overarching statement that provides line-of-sight to the outcomes the organisation is seeking and is supported by two high-quality KPIs.</p> <p>A benefit needs to pass three tests:</p> <ul style="list-style-type: none"> • the benefits remove or mitigate the defined problems • it is supported by two KPIs that are meaningful, measurable, time-bound and attributable to the investment • it is cost-effective – the effort required to track the benefit and the KPIs are commensurate with the value created 	<p>It is critical at this stage that any benefits claimed are supported by reasonable KPIs – ones that are meaningful, attributable, measurable and time-bound.</p> <p>The KPIs should be outcome rather than output or activity focused. The emphasis should be on the results or impact of the work that is done to deliver the benefit and remediate the problem. Aim for a maximum of four benefits and a maximum of two KPIs for each benefit.</p>
Immediate outcomes	<p>Immediate outcomes are the things that follow logically from the strategic actions. They are high-quality key performance indicators (KPI) that show that the strategic actions are delivering on their intent. They clearly link the strategic actions to the longer term outcomes.</p> <p>Immediate outcome KPIs need to be SMART:</p> <ul style="list-style-type: none"> • Specific – they target a specific area for improvement • Measurable – they are a quantifiable indicator of progress • Assignable – they specify who will be responsible for the action • Realistic – they are realistically achievable, given available resources. • Time-bound – they specify when the result(s) will be achieved. 	<p>It is critical at this stage that any benefits claimed are supported by reasonable KPIs – ones that are meaningful, attributable, measurable and time-bound.</p> <p>The KPIs should be outcome rather than output or activity focused. The emphasis should be on the results or impact of the work that is done to deliver the benefit and remediate the problem. Aim for a maximum of four benefits and a maximum of two KPIs for each benefit.</p>
Long term outcomes	<p>Long term outcomes are the beneficial impacts of the investment. The <i>Benefit</i> column articulates the value proposition or successful outcomes that are expected from addressing the negative consequences identified in the problem statements.</p> <p>The benefit statement is made up of an overarching statement that provides</p>	

Element	What is this	Quick tip
	line-of-sight to the outcomes the organisation is seeking and is supported by two high-quality KPIs.	
	A benefit needs to pass three tests:	
	<ul style="list-style-type: none"> • the benefits remove or mitigate the defined problems • it is supported by two KPIs that are meaningful, measurable, time-bound and attributable to the investment • it is cost-effective – the effort required to track the benefit and the KPIs are commensurate with the value created 	

It is often useful to rank and then allocate weightings in the ILM. It ensures only the most compelling problems continue to be discussed.

In an ILM a total of 100 per cent is distributed within each of the *Problem*, *Benefit* and *Strategic response* columns. This is distributed to indicate the relative importance of the various elements within each column. To ensure clarity and ease of prioritisation, no items should have the same weighting within each column.

Problems rated less than 10 per cent should be questioned regarding the need to mention them at all. The aim is to capture those things that really matter and eliminate the rest.

Attachment L: Strategic options analysis tool

What is this

A two-page strategic options analysis summary.

The number of ways that a catchment management issue can be addressed is potentially extremely large. Even limiting the focus to assets of high significance still leaves a long list of possibilities. The strategic options analysis tool is rapid assessment methodology that allows you to document the options and assess their first pass feasibility using five basic criteria: benefits to high value assets, costs, timelines, capacity, risks, and dis-benefits.

How can you use the information in this section

You can use the SOA to:

- Make sure that you have identified all the potential strategic options – existing assets, new assets, and non-asset solutions
- Develop uniform criteria to do a first pass assessment of strategic options for more detailed analysis
- Communicate with stakeholders and investors in a clear and simple way about potential solutions

Information source

The SOA is a tool drawn from the Victorian Treasury Investment Management Standard

- The IMS can be accessed at [here](#)
 - Strategic templates, examples and help are [here](#)
 - Guidance on how to run a workshop to prepare an SOA is [here](#)
-

Strategic options

			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Description of option			<Insert description>					
Benefits to high valued assets								
Percentage of full benefit to high value assets to be delivered			0%	0%	0%	0%	0%	0%
Benefit 1	<Insert description here>	%						
Benefit 2	<Insert description here>	%						
Benefit 3	<Insert description here>	%						
Benefit 4	<Insert description here>	%						
Cost								
Investment cost (Indicative Range)			\$n mil - \$n mil					
Operational costs if significant (Range)			\$n mil - \$n mil pa					
Timelines for delivery								
(Range)			mm-mm	mm-mm	mm-mm	mm-mm	mm-mm	mm-mm
Constraints (capacity)								
Constructability			H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L
Land availability			H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L
Other site constraints (define)			H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L
Delivery parties (capacity)								
Delivery party 1			<Insert description>					
Delivery party 2			<Insert description>					
Delivery party 3			<Insert description>					
Risks								
Construction			H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L
Maintenance			H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L
Timing of delivery			H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L
Certainty that benefits will be realised			H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L

Complexity of delivery arrangements	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L
Performance at climate extremes	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L
Community acceptability	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L
Political and institutional acceptability	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L

Transferability

Transferability to other sites	<Insert description>					
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Dis-benefits

Dis-benefit 1	<Insert description>					
Dis-benefit 2	<Insert description>					

Monitoring and evaluation and adaptation

Ability to monitor and evaluate delivery	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L
Ability to adapt investment to changing circumstances	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L	H / M / L

Ranking

1-3		1	2			
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Attachment M: Investment case template

What is this

A simple example investment case template suitable for making investment proposals within your organisation. The investment case is written for the investor. It should contain all the information that the investor needs to support your investment with confidence. It should contain all of the evidence that you agreed to include in the investment case with the investor (see 'Agree the level of evidence the investor wants to improve the investment').

The investment case builds on the structure and evidence assembled in the investment concept brief and the strategic options analysis.

The investment case is written in plain English in a way that will allow a layperson to understand the language and the concepts. It provides the rationale for the investment, a clear justification of the driver for the investment, a clear evidenced based accounting of the benefits and costs of the investment, and a clear assessment of contingencies, constraints, risks, and uncertainties

How can you use the information in this section

You can use the investment case to:

- communicate clearly and simply with stakeholders, decision makers and investors about why you are recommending the investment

Information source

- Victorian Government Investment Management Standard
-

Catchline	What is the one most compelling reason this investment should be considered further?
	Description of context
Problem statement	What is the problem we are addressing with the investment? What is the problem that needs to be addressed, both cause and effect? What are the key drivers? What are the assets at risk? What is the evidence that confirm both the cause and effect of the problem? How strong is the evidence?
Why us, why now	Why does the problem need to be addressed now and by this organisation? Description. Why it can't wait. Why we need to own the problem, or take leadership
	What is the legislative / regulatory requirement / strategic objective that this investment will contribute towards? You should clearly state the strategic objective that the investment will contribute towards. If the investment contributes towards level of service, you should state the targets and how the investment case contributes towards this.
Strategic objective	The regulator is often a key investor or operates in the background of decision makers minds when deciding what to invest in. You should clearly state whether the proposed investment: <ul style="list-style-type: none"> • Directly addresses one or more regulatory requirements. • If there is not a regulatory requirement, you need to clearly state how the investment proves additionality and that (1) customers are willing to pay for the additional services that are being delivered or (2) the works contribute towards achieving regulatory objectives more effectively than alternative mechanisms
Multiple barrier approach	How does the investment build redundancy and resilience in the multiple-barrier approach to drinking water quality management? You should clearly state how the proposed investment sits within the multiple barrier approach, and how it is justified with other barriers that are in place. How do we justify the investment if there are existing barriers in place that are already performing at or above the minimum required standard?
Customer support and willingness to pay	What is the evidence that customers / community support the investment and are willing to pay for it? Explaining this step is critical if the catchment investment is delivering levels of service for drinking water and other asset objectives (for example other values of water may also be appropriate e.g. ecological needs, waterway condition) that go beyond regulatory / legislative minimum requirements. For these investments you should clearly demonstrate that there is evidence that the community supports and willing to pay for this higher level of service.
Delivery	Who are the delivery parties? Summary of delivery parties and roles
Benefits	What are the benefits? Are the benefits of high value? To whom? Are the beneficiaries the investors? How does the investor benefit? How long will it take for the benefits to become evident? Description

	What are the estimated net-present value of benefits?	NPV benefits (range)
Benefits	Water supply regulation	\$n mil - \$n mil
	Water quality	\$n mil - \$n mil
	Erosion control	\$n mil - \$n mil
	Flood control	\$n mil - \$n mil
	Carbon storage	\$n mil - \$n mil
	Air quality	\$n mil - \$n mil
	Amenity, liveability and recreation	\$n mil - \$n mil
	Other benefits	\$n mil - \$n mil

	What are the estimated net-present value of costs of this investment to the investor?	Cost (range)
Cost	Capital cost estimate total	\$n mil - \$n mil
	Operating and maintenance cost total	\$n mil - \$n mil
	Monitoring, reporting and evaluation cost total	\$n mil - \$n mil
	Program administration cost total	\$n mil - \$n mil

	What are the indicative (+/-50%) timeframes for the key deliverables?	Time from funding
Time	Description of deliverable/milestone	mm-mm
	Description of deliverable/milestone	mm-mm

Risks	What are the primary risks to the investor (financial, reputation, delivery) to the success of this investment delivering the benefits?	Likelihood	Criticality
H: High	Construction	H,M,L	H,M,L
M: Medium	Maintenance	H,M,L	H,M,L
L: Low	Timing of delivery	H,M,L	H,M,L
	Certainty that benefits will be realised	H,M,L	H,M,L
	Complexity of delivery arrangements	H,M,L	H,M,L

Performance at climate extremes		H,M,L	H,M,L
Community acceptability		H,M,L	H,M,L
Political and institutional acceptability		H,M,L	H,M,L
Other		H,M,L	H,M,L

Dis-benefits	What negative impacts (if any) are likely to occur by successfully addressing the problem?	Likelihood	Impact
H: High	Description of dis-benefit	H,M,L	H,M,L
M: Medium	Description of dis-benefit	H,M,L	H,M,L
L: Low	Description of dis-benefit	H,M,L	H,M,L
	Description of dis-benefit	H,M,L	H,M,L

Critical Dependencies	What external conditions are critical to the success of this investment?		
	Description of critical dependency		
	Description of critical dependency		
	Description of critical dependency		

Uncertainties and assumptions	What are the key uncertainties and knowledge gaps we need to fill before we can put forward a robust and evidence based investment case? What's our plan to fill these gaps? What are the key assumptions underpinning the evaluation		
	Description of key uncertainties and assumptions		

Investor	Who is the senior person who will ultimately be responsible for delivering the identified benefits?		
	Name	Position	

Attachment N: Community Consultation

Community consultation can play an important role in developing and evaluating options. Effective consultation can lead to better project outcomes, better relationships with community, increased understanding of community issues, and better partnerships and networks.

The community consultation guidelines in the table below are based on [International Association of Public Participation](#) IAP2 framework. The IAP2 framework uses a spectrum to determine the scope, tools and techniques for conducting community engagement depending on whether the aim of consultation is to inform, consult, involve, collaborate, or empower. The IAP2 Toolkit available at the IAPP site includes example tools that you can use to develop your community consultation plan.

The Victorian Department of Primary Industries Effective Engagement web pages¹⁵ include community consultation tools developed for Victorian communities based on the IAP2 framework.

The worked example below is the consultation framework for water quality offsets investments in Victoria. It highlights how project risks and target outcomes drive the level of community involvement.

Offset type	Same 'Currency', Same Beneficial Use	Different 'Currency', Same beneficial use	Different 'Currency', Different beneficial use
Example	Example: Nitrogen discharge from a treatment plant is contributing to excess nitrogen loads (and increased risks of algal blooms) in a coastal embayment	Example: Nutrients from a treatment plant are increasing the risk of algal blooms in a creek which threaten drought refuge for fish. Opportunity exists however to purchase temporary water rights for environmental flows which would reduce this risk and provide water for spring flushes to promote fish migration	Example: An ERS is considered low overall risk but still has social and some difficult to define environmental impacts on the local creek. The local community are in favour of building some wetlands that will provide some water quality benefit but also will provide habitat and amenity functions
Socially acceptable			
Summary	Results are equivalent or better at the site and the nature of the impact, so consultation with community can be	Level of consultation required will be guided by assessment of offset options. Likely that community	Level of consultation required will be guided by assessment of offset options. Likely that community preference will provide weight for particular options.

¹⁵ <http://www.dse.vic.gov.au/effective-engagement>

	<p>quite simple compared to other approaches.</p> <p>Consultation is likely to be focussed on informing rather than gathering data to decide on result.</p> <p>The exception to this will be if there are several feasible offset options and there are multiple benefits of each. In this case community preferences should provide extra weight</p>	<p>preference will provide weight for particular options.</p>	<p>Because the offset delivers different beneficial outcomes community acceptance and values will generally have more weight than a different currency, same beneficial use (outcome) offset evaluation.</p>
<p>Suggested IAP2 Spectrum Participation Level</p>	<p>Inform – provide balanced and objective information to assist the community to understand the problems, alternatives and actions the proponent is taking</p> <p>Consult – obtain feedback on analysis, alternatives and or decisions</p>	<p>Consult – obtain feedback on analysis, alternatives and or decisions</p>	<p>Involve – work directly with the public throughout the process to ensure that public issues, values and concerns are understood and considered when choosing the offset</p>
<p>Promise to the public</p>	<p>Inform - ‘We will keep you informed’</p> <p>Consult – ‘We will keep you informed, listen and understand your preferences, and provide feedback on how your input influenced our decision’.</p>	<p>Consult – ‘We will keep you informed, listen and understand your preferences, and provide feedback on how your input influenced our decision’.</p>	<p>Involve – ‘We will work with you to ensure that your issues, values and concerns are understood and reflected in the offsets developed, and we will provide feedback on how your input influenced the decision’.</p>
<p>When to consult and objective</p>	<p>Phase 1 – Preliminary assessment</p> <ul style="list-style-type: none"> inform / identify beneficial values of high priority to the community <p>Phase 2 – Offset evaluation</p> <ul style="list-style-type: none"> obtain community feedback on analysis, alternatives around the proposed offset measures 	<p>Phase 1 – Preliminary assessment</p> <ul style="list-style-type: none"> inform / identify beneficial values of high priority to the community <p>Phase 2 – Offset evaluation</p> <ul style="list-style-type: none"> obtain community feedback on analysis, alternatives around the proposed offset measures 	<p>Phase 1 – Preliminary assessment</p> <ul style="list-style-type: none"> identify beneficial values of high priority to the community understand community acceptance, issues, concerns of non-like-for-like trade offs understand how community concerns and issues may be addressed within the offset framework <p>Phase 2 – Offset evaluation</p> <ul style="list-style-type: none"> obtain community input on the offset

			alternatives, identify, quantify and document acceptance, concerns, issues
Example community consultation tools	<p>Inform – fact sheets, websites, presentations to special interest groups</p> <p>Consult – public comment, open forums, focus groups, surveys, public meetings</p>	Consult – public comment, open forums, focus groups, surveys, public meetings	Involve – deliberative polling, beneficial value and offset option surveys, public meetings, workshops, sentiment monitoring
General guidelines	<p>Inform</p> <ul style="list-style-type: none"> • Know who you are trying to reach and how they are most likely to access and understand the information. • Ensure information provided is high quality, consistent, timely, appropriately targeted and easily understood by your target audience(s) <p>Consult</p> <ul style="list-style-type: none"> • Ensure the purpose of consultation is clear, including what is being consulted on and what is non-negotiable. • Know who you are trying to consult, the most effective way to reach them and get a response. • Allow enough time for a response to consultation requests. • Coordinate requests so that, where possible and appropriate, you ask for views once, not several times. • Provide feedback on the results of consultation. • Ensure and demonstrate that the views of those consulted are taken into account in the outcome. • Present all information simply and clearly. • Ensure adequate resources are allocated to the process 	<p>Consult</p> <ul style="list-style-type: none"> • Ensure the purpose of consultation is clear, including what is being consulted on and what is non-negotiable. • Know who you are trying to consult, the most effective way to reach them and get a response. • Allow enough time for a response to consultation requests. • Coordinate requests so that, where possible and appropriate, you ask for views once, not several times. • Provide feedback on the results of consultation. • Ensure and demonstrate that the views of those consulted are taken into account in the outcome. • Present all information simply and clearly. <p>Ensure adequate resources are allocated to the process</p>	<p>Involve</p> <ul style="list-style-type: none"> • Ensure all relevant people are given the opportunity to be involved. • Ensure you maintain a commitment to enabling their involvement in the process (have equity/access issues been considered that ensure that individuals are not unknowingly disadvantaged?). • Consider carefully what processes and/or structures are appropriate for the purpose and who is to be engaged. • Avoid misunderstanding and ambiguity by clearly establishing the basis for membership of bodies such as boards or committees (e.g. skills vs representation), the decision-making processes (e.g. voting vs consensus) and roles and responsibilities at the outset.

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