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**COLIBAN
WATER**

**IDENTIFICATION OF OPTIONS, ISSUES
AND PRELIMINARY ASSESSMENT —
SOURCE SECURITY FOR THE COLIBAN
SYSTEM OF WATERWORKS**

**PHASE 1
SUMMARY REPORT**

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BACKGROUND

Impetus for Study

Significant and sustained interest in the security of the supply for the Coliban System, arising out of the recent dry conditions and the subsequent imposition of restrictions, has reinforced the need to develop a detailed strategy to secure the water resource for customers serviced by the Coliban System. The last major review of the security of the Coliban System was undertaken some eight years ago, leading to the recently completed enlargement of the Upper Coliban Reservoir, introduction of demand management practices and works to increase system efficiency.

A REALM model — a computer simulation model of the Coliban system — recently completed in conjunction with the Office of Water Reform as part of the Bulk Water Entitlement process, provides the first opportunity for a comprehensive assessment of the long term security of the Coliban System.

Study Objectives

The primary objective of the study is:

“to develop a long term strategy to achieve the appropriate level of security for the water resource supplying the Coliban Water Supply System that will enable Coliban Water to meet customer service contracts under operating licence conditions and to provide an appropriate commercial return on any investment in water resource security.”

The study comprises two phases:

- **Phase 1** entails a progress report on the options and issues and preliminary assessment to the Board of Coliban Water to support subsequent discussions with the Minister for Natural Resources;
- **Phase 2** is likely to comprise clarification and refinement of underlying data and assumptions, detailed costing and analysis of a short list of preferred options, and extensive community and stakeholder consultation leading to the development of a long term (Year 2015) water security strategy.

WATER SUPPLY SYSTEM

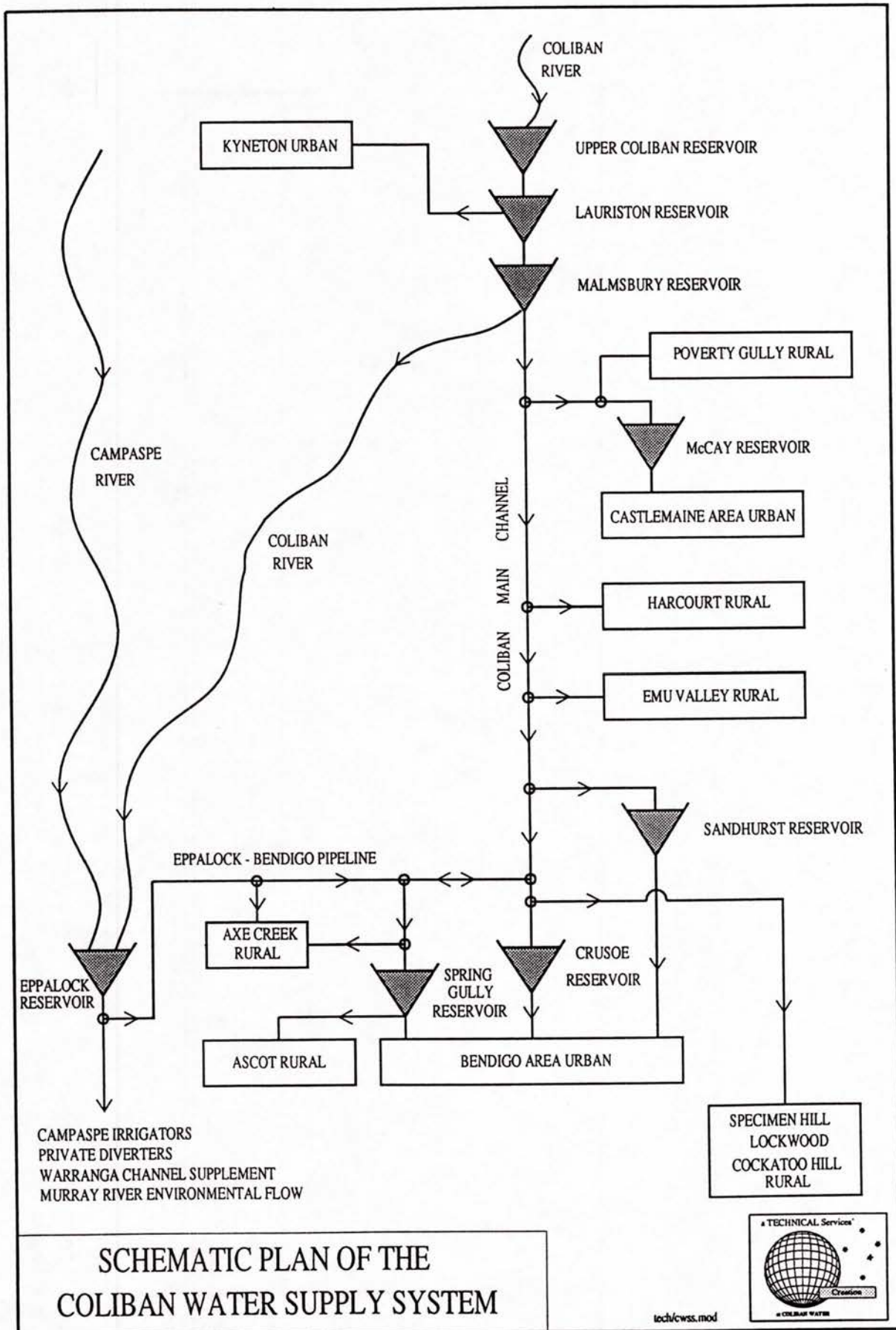
The primary sources of water for the Coliban System are the Coliban River storages near Kyneton and Lake Eppalock, 30 kilometres east of Bendigo on the Campaspe River. The Coliban storages — Upper Coliban, Lauriston and Malmsbury Reservoirs — have a combined capacity of 75,000 ML with an average yield in the order of 30,000 ML annually. These storages currently provide 70% of the water needs of the Coliban System. Water from Malmsbury Reservoir — the lowest of the reservoirs — is released along the Coliban Main Channel and feeds into a number of internal storages, supplying individual urban and rural demand centres.

Lake Eppalock provides 30% of the water needs of the Coliban System. It is operated by Goulburn Murray Rural Water Authority serving numerous water user groups. The reservoir has a capacity of 312,000 ML which provides an average annual yield of approximately 90,000 ML. The annual entitlement to the Coliban System from Lake Eppalock is 14,800 ML, representing around 17% of the reservoir's average annual yield. Three hydro-powered pumps at Lake Eppalock utilise the energy of downstream water releases to pump water into the Coliban System. These pumps can be supplemented by electric pumps during periods of low releases.

The Coliban system supplies water to a population of 97,000, with 70% of consumers residing in the Bendigo Urban Supply area. Other urban areas supplied include Castlemaine, Maldon, Kyneton, Malmsbury, Taradale-Elphinstone, Harcourt, Fryerstown, Newstead, Strathfieldsaye, Sebastian, Raywood and Tylden. Axedale and Goornong are supplied from the Campaspe system, and Trentham by groundwater.

The rural sector of the Coliban System provides water for some 2,200 permits supplying, on average over the last 6 years, 10,500 ML from the extensive channel network between Malmsbury and Raywood. Rural system deliveries are limited by the permit allocation, although historically excess sales, usually up to 50% of the permit volume, have been available in most years.

Figure 1 shows the schematic layout of the Coliban water supply system.



SCHEMATIC PLAN OF THE COLIBAN WATER SUPPLY SYSTEM

CURRENT SITUATION

The current level of service to urban customers in the Coliban system is that they can, on average, expect to have:

- up to Level 3 restrictions occurring at a frequency of 1 year in every 12; and
- a Level 6 or higher restriction imposed 1 year in every 100.

Rural customers can expect to receive only 75% of their average annual usage (around 11,000 ML) when Level 3 restrictions are imposed on urban customers.

These levels of service can be maintained for a further six years, following which the system would need to be augmented to preserve the existing levels of service. Alternatively, lower levels of service, ie. more frequent and possibly severe restrictions, would be incurred.

PRELIMINARY EVALUATION OF OPTIONS

For the purpose of the preliminary economic assessment, options are assessed in terms of their economic cost per ML per year. This approach facilitates comparison of options on a consistent basis, especially between options that have differing economic lives.

The economic cost derived in this preliminary assessment is consistent with the concept of full economic cost recovery endorsed by the Council of Australian Governments (COAG) at its April 1995 meeting.

Twelve structural options (ie. options involving construction of works) were examined and subjected to a preliminary economic analysis with a further eight options identified but discounted on the basis of their high cost and environmental concerns. Additionally, two non-structural options — demand management and water trading within the Coliban rural system — were assessed.

The results of the preliminary economic assessment of the options, assuming the costs of acquiring and holding additional entitlement are included, are presented in Table 1 and show the incremental yield achieved, the total annual cost per ML of average annual incremental

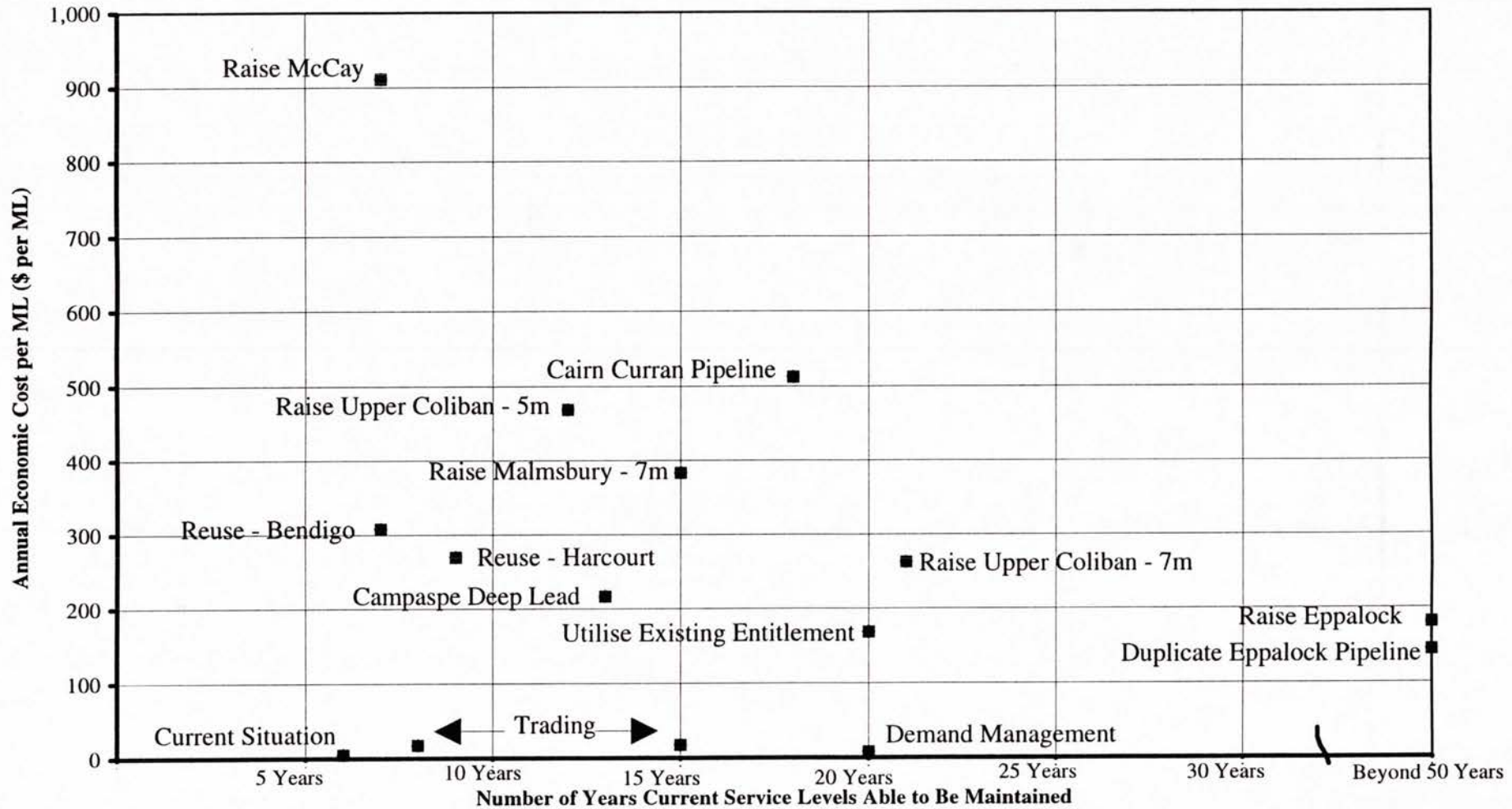
yield and the number of years for which the particular option is able to meet the current specified standards of service.

Figure 2 illustrates where each of the assessed options lie in relation to its annual economic cost per ML and the number of years at which the current levels of service can be maintained. The most cost effective options are those in the lower right hand corner, ie. low economic cost per ML and longer period over which the current levels of service can be maintained before further augmentation is required.

**TABLE 1 : RESULTS OF PRELIMINARY ECONOMIC EVALUATION
ASSUMING THE COSTS OF ADDITIONAL ENTITLEMENT ARE INCLUDED.**

| | OPTION | INCREASED YIELD (ML/YEAR) | COST PER ML (\$/ML/YEAR) | YEARS AT CURRENT SERVICE LEVELS (YEARS) |
|-------------------------------|------------------------------|---------------------------------|--------------------------------|---|
| STRUCTURAL OPTIONS | | | | |
| 1a | Raise Upper Coliban — 5m | 2,766 | 469 | 12 |
| 1b | Raise Upper Coliban — 7m | 6,244 | 263 | 21 |
| 2 | Raise Malmsbury — 7m | 3,906 | 383 | 15 |
| 3 | Raise McCay | 43 | 911 | 7 |
| 4 | Campaspe Tunnel | 40 | 7,947 | 7 |
| 5 | Ashbourne Tunnel | 40 | 3,042 | 7 |
| 6 | Utilise Eppalock Entitlement | 4,707 | 152 | 20 |
| 7 | Duplicate Eppalock Pipeline | 25,241 | 144 | 50+ |
| 8 | Raising Eppalock | 24,921 | 181 | 50+ |
| 9 | Cairn Curran Pipeline | 4,357 | 513 | 18 |
| 10 | Campaspe Deep Lead | 3,000 | 217 | 13 |
| 11 | Water Reuse - Bendigo | 475 | 308 | 7 |
| 12 | Water Reuse - Harcourt | 1,060 | 270 | 9 |
| NON STRUCTURAL OPTIONS | | | | |
| 1 | Demand Management | 6,364 | 8 | 20 |
| 2 | Water Trading | | | |
| | — Lower Bound | 575 | 18 | 8 |
| | — Upper Bound | 4,025 | 18 | 15 |

Figure 2 : Summary of Cost and Number of Years Service Levels Able to be Maintained at Current Levels



Note: Campaspe Tunnel and Ashbourne Channel options are excluded from the chart because of their high cost.

FINDINGS

The preliminary evaluation indicates that:

- continued implementation and enhancement of demand management strategies;
- purchasing of permits from rural users on an open market; and
- the undertaking of works to utilise Coliban Water's current entitlement to water in Lake Eppalock;

are low cost options for securing the long term (20 years) security of Coliban water resource.

The three options are also likely to be preferred on other non-economic evaluation criteria such as environmental impact, social, cultural and heritage impacts and technical and engineering risk. This is because they do not involve major or complicated works, do not require major entitlement purchases from outside the Coliban system and do not have major environmental impacts. However, it must be recognised that any option placing further reliance on water from Lake Eppalock may advance the need for water treatment of the Bendigo urban supply.

Under a strategy combining these three options, the current levels of service (ie. magnitude and frequency of restrictions) are estimated to be able to be maintained for a period at least 40 years before further augmentation of the system is required.

Higher cost options involving augmentation of existing storages are not warranted at this stage and, if implemented, would most likely result in increased charges to customers.

Further, options involving augmentation of storages are likely to be difficult to implement because of increasing concern over the impact on flows to the environment. The bulk entitlement process currently underway throughout Victoria is aimed at converting existing rights to users and maintaining flows to the environment levels at least equal to those currently applying. Increased usage which impacts on flows to the environment will therefore have to come from the purchase of entitlements from existing users. The recent policy to cap diversions from rivers within the Murray-Darling Basin announced by the Ministerial Council only acts to reinforce this approach towards a market solution as

opposed to an engineering solution. In summary, therefore, there is no reason for augmenting storages such as Eppalock since it is more cost effective to purchase existing entitlements as such entitlements will have to be purchased in any case. Moreover, additional entitlements may be required to be purchased in order to maintain environmental flows.

Figure 5.1 illustrates where each of the assessed options lie in relation to their annual economic cost per ML and the number of years at which the current levels of service can be maintained. The more cost effective options are those in the lower right hand corner, ie. low economic cost per ML and longer period over which the current levels of service can be maintained before further augmentation is required.

NEXT STEPS

A number of important issues were highlighted in the Phase 1 study that need to be resolved before a detailed water resource strategy can be completed. These issues include:

- the need to reconcile and fill deficiencies in data and assumptions on water deliveries, existing and future demands, assumptions underlying parts of the REALM model and engineering costs of a short list of options;
- the need to assess the impact of key water policies, especially relating to the specification of bulk entitlements in the Campaspe Basin, the capping on diversions recently announced by the Murray Darling Ministerial Council and the development of policies to foster an efficient and open water market within the Coliban system;
- appropriate evaluation of the options against the non-economic criteria will require additional work, particularly in the areas of environmental impacts, and social and heritage impacts; and
- the undertaking of more extensive community consultation, particularly in the area of levels of service, feedback on options and their costs and risks and the balance between economic and non-economic evaluation criteria.

The immediate task is to develop an implementation plan for the Phase 2 study.

TABLE 5.1 : PRELIMINARY ECONOMIC ASSESSMENT OF STRUCTURAL OPTIONS INCLUDING ENTITLEMENT COSTS

| Option | Description | Yield (ML/Year) | Infrastructure Capital Cost (\$M) | Entitlement Capital Cost (\$M) | Total Capital Cost (\$M) | Direct Operating Cost (\$M) | Entitlement Holding Cost (\$M) | Total Recurrent Cost (\$M) | Economic Life (Years) | RROR 4% Annual Cost (\$M) | Cost per ML (\$ per ML) | Years to Exceedance |
|--------|--|--------------------|---|--------------------------------------|-----------------------------|-----------------------------------|--------------------------------------|----------------------------------|--------------------------|---------------------------------|----------------------------|------------------------|
| 1 | Raise Upper Culiban Reservoir above current level | 2,766 | 28.10 | 3.69 | 31.78 | 0.00 | 0.00 | 0.00 | 100 | 1.30 | 469 | 12 |
| | (i) by 5 m | 6,244 | 33.72 | 6.55 | 40.26 | 0.00 | 0.00 | 0.00 | 100 | 1.64 | 263 | 21 |
| 2 | Raise Malmsbury Reservoir by 7 m | 3,906 | 30.70 | 5.99 | 36.69 | 0.00 | 0.00 | 0.00 | 100 | 1.50 | 383 | 15 |
| 3 | Raise McCay Reservoir | 43 | 0.96 | 0.00 | 0.96 | 0.00 | 0.00 | 0.00 | 100 | 0.04 | 911 | 7 |
| 4 | Campaspe Tunnel | 40 | 7.30 | 0.00 | 7.30 | 0.02 | 0.00 | 0.02 | 100 | 0.32 | 7,947 | 7 |
| 5 | Ashbourne Channel | 40 | 2.00 | 0.00 | 2.00 | 0.04 | 0.00 | 0.04 | 100 | 0.12 | 3,042 | 7 |
| 6 | Utilisation of Eppalock Entitlement | 4,707 | 3.85 | 2.89 | 6.74 | 0.22 | 0.18 | 0.40 | 50 | 0.71 | 152 | 20 |
| 7 | Duplication of Bendigo Pipeline | 25,241 | 29.07 | 14.87 | 43.94 | 0.59 | 0.90 | 1.49 | 50 | 3.54 | 140 | Beyond 50 |
| 8 | Raise Eppalock | 24,921 | 35.33 | 29.08 | 64.41 | 0.79 | 0.88 | 1.67 | 60 | 4.52 | 181 | Beyond 50 |
| 9 | Cairn Curran to Sandhurst | 4,357 | 27.63 | 7.12 | 34.74 | 0.40 | 0.21 | 0.62 | 50 | 2.23 | 513 | 18 |
| 10 | Campaspe Deep Lead | 4,707 | 5.01 | 1.39 | 6.40 | 0.54 | 0.18 | 0.71 | 45 | 1.02 | 217 | 13 |
| 11 | Wastewater Reuse - Bendigo (1) | 475 | 2.50 | 0.00 | 2.50 | 0.03 | 0.00 | 0.03 | 50 | 0.15 | 308 | 7 |
| 12 | Wastewater Reuse - Harcourt (1) | 1,060 | 4.00 | 0.00 | 4.00 | 0.10 | 0.00 | 0.10 | 50 | 0.29 | 270 | 9 |

Note : 1. The period to exceedance is an estimate not based on REALM modelling.