Sugarloaf Pipeline
South-North Transfer
Preliminary Business Case Summary
Sugarloaf Pipeline South-North Transfer
Introduction
During the Millennium Drought, Victoria made large investments in the state’s water security. The Victorian Desalination Project was commissioned, $1 billion dollars was invested in upgrading the Goulburn-Murray Irrigation District, and the water grid was expanded, including building the Sugarloaf Pipeline.

As a consequence of these investments, the Victorian Government has determined that up to an additional 75 gigalitres (GL) per year be available for use in northern Victoria. This will support industry and farmers, particularly during dry conditions.

The government made a commitment to consider the feasibility of using the Sugarloaf Pipeline to provide water security to towns and communities in both directions. The work has shown that it is technically feasible to pump water north with additional works to existing infrastructure. It would require additional capital investment and it is an option that government will continue to explore.

The primary benefits available by sending water north through the Sugarloaf Pipeline include:
• supplying water to irrigators and private diverters to improve agricultural productivity;
• improving water security for rural towns and urban centres connected to the water grid;
• making water available to be traded to its highest value use; and
• enhancing the flexibility of the Victorian Water Grid.

The key questions asked in the preliminary business case were:
• What infrastructure is required for bi-directional pumping and is it technically feasible?
• How much water can be pumped from the Melbourne system to the Goulburn River?
• When can water be transferred and where can it be used?
• Is the infrastructure financially viable?

This document summarises the key findings of the preliminary business case.
Existing systems and infrastructure

Melbourne System

The Melbourne water system is able to deliver water to homes, businesses, irrigators and public spaces across metropolitan Melbourne and the surrounding centres including Geelong, Melton and Sunbury and the South Gippsland and Westernport regions. The system also provides environmental flows to priority waterways such as the Yarra, Thomson, Tarago and Werribee rivers.

Water is delivered to households, irrigators and businesses by water corporations including South East Water, City West Water, Barwon Water, Western Water, Gippsland Water, Westernport Water, South Gippsland Water, Southern Rural Water and Yarra Valley Water.

The Melbourne system has 10 storages with a combined total storage capacity of more than 1,812 GL. Average annual inflows to Melbourne’s four major harvesting storages (Thomson, Upper Yarra, Maroondah and O’Shannassy reservoirs) are approximately 500 GL per year, although they were much lower during the Millennium Drought period 1997–2009 when average annual inflows declined to approximately 380 GL per year. The system is also able to receive water from the Victorian Desalination Plant (VDP), which can supply up to 150 GL per year of high quality drinking water, and from the Goulburn System via the Sugarloaf Pipeline. In 2015–16 approximately 432 GL was used within the Melbourne system by households, industry and other water users. As Melbourne’s population increases into the future, the volume of water used is expected to increase.

Goulburn System

The Goulburn system delivers water to towns, irrigators and domestic and stock schemes across northern Victoria including communities near Shepparton, Bendigo, Rochester, Echuca and Boort. The system also provides environmental flows to priority waterways such as the Goulburn and Murray rivers. Water can be transferred from the Goulburn system to Melbourne via the Sugarloaf Pipeline.

The Goulburn system main storage is Lake Eildon, which has a storage capacity of 3,334 GL. The other significant storage is the Waranga Basin, a 432 GL off-river storage from water diverted from the Goulburn River at Goulburn Weir. Average annual inflows to storages are approximately 3,287 GL per year and vary depending on seasonal conditions. Average annual water diversions in the Goulburn system is approximately 1,638 GL.

Sugarloaf Pipeline

The 72km long Sugarloaf Pipeline runs from the Goulburn River near Yea, south over the Great Dividing Range near the Melba Highway to Sugarloaf Reservoir. It includes an offtake from the Goulburn River with a 300 megalitres (ML) per day pump station at Goulburn River, an additional 300 ML per day high-lift pump station to pump water over the Great Dividing Range, a Balance Tank on the Great Dividing Range and a discharge chute into the Sugarloaf Reservoir. The pipeline system was designed to convey water from north to south to supply water from the Goulburn River to metropolitan Melbourne.

The pipeline was constructed during a time when Melbourne was facing the potential of entering into stage 4 water restrictions. It was the only viable option able to deliver a substantial volume of water to Melbourne in the relatively short timeframe required.

Once the VDP was on line it was envisaged that the pipeline would provide added flexibility for water distribution across Victoria. This included retaining the water allocated to Melbourne in Lake Eildon and redirecting it to other parts of Victoria.
Figure 1: Water Grid
Key Findings and Benefits

1. What infrastructure is required for bi-directional pumping and is it technically feasible?

The preliminary business case considered two options. The first was to take water from Sugarloaf Reservoir and pump it to the Goulburn River. The second was to take water from Olinda Reservoir, downstream of Silvan Reservoir, and pump it to the Goulburn River. The merits of taking water from Olinda Reservoir were considered superior due to the higher water availability of the storage. Melbourne Water advised that approximately 100 GL per annum could be reliably sourced from Olinda Reservoir compared to approximately 12 GL per annum from Sugarloaf Reservoir. Taking water from Sugarloaf Reservoir would also require the construction of an additional two pump stations and installation of 6 km of new pipeline.

The volume of water available from Sugarloaf Reservoir is limited by existing demand from the Melbourne system and the ability to transfer water to it from other reservoirs within the Melbourne system. Olinda Reservoir has greater connectivity to the Melbourne system.

This assessment found that bi-directional flows through the Sugarloaf Pipeline from Olinda Reservoir are technically feasible and would require the following new infrastructure:

- new 12.5 megawatt pump station;
- a power upgrade at Yarra Glen;
- 14.75km of new pipeline;
- a high pressure divide valve station at the connection to the existing Sugarloaf Pipeline;
- a new pipe over the Yarra River or under the Yarra River to connect Olinda Reservoir to the existing Sugarloaf Pipeline;
- modifications to the pipe and valves at the existing Sugarloaf high-lift pump station near Yea; and
- a pressure reduction device or station installed at the Goulburn River.

This new infrastructure is shown in Figure 2 (right).
In addition, the assessment identified a number of ecological, social and technical constraints that would need to be addressed. The constraints include (but may not be limited to):

- general technical issues including site access, positioning of the outlet to the Goulburn River and discharge pressure at the outlet;
- planning approvals from local government and the Victorian Government;
- alignment of new infrastructure impacting on native flora and fauna and ability to offset any impacts;
- cultural heritage;
- geological suitability of identified sites for the outtake at Olinda Reservoir, outfall to the Goulburn River, 14.75km pipeline and other new infrastructure;
- ability to access the power grid for the proposed new pump station near Yarra Glen;
- mechanical issues associated with the integration and operation of both the existing and new infrastructure;
- need for Commonwealth approvals (e.g. Environmental Protection and Biodiversity Conservation Act 1999); and
- operational issues including commercial arrangements and water accounting.

The estimated capital cost of the infrastructure is $277 million based on recent market costs and a notional P50 cost estimate, which has 50 per cent certainty the price will not be exceeded based on available information. This includes cost allowances for community consultation, detailed design, approvals, project management and contingencies. A full business case would be required to determine the final estimated cost following consideration of all constraining issues and detailed design.

Further analysis is required to assess the full costs, constraint mitigation and benefits of the proposed south-north water transfer via the Sugarloaf Pipeline.

2. How much water can be pumped from the Melbourne system to the Goulburn River?

The Sugarloaf Pipeline has a north to south transfer capacity of 300 ML per day. The south to north transfer of water through the Sugarloaf Pipeline would be able to match the 300 ML transfer capacity without exceeding the pipeline pressure rating, provided the new pipeline and pump station are appropriately sized and designed. It is technically possible for a maximum of 109.5 GL to be pumped from Olinda Reservoir to the Goulburn River (assuming 365 days of pumping and no outfall constraints in the Goulburn River). Total losses for water transferred from the Melbourne system to a northern customer (including evaporation, seepage and spills) are estimated to be approximately 15 per cent. If water is transferred to the Murray River system, further losses could be expected.

The Goulburn Simulation Model (GSM) is used in northern Victoria to simulate operational scenarios. The GSM was used to assess how much water the Goulburn system can receive from the Sugarloaf Pipeline. The range of potential water volumes that could be transferred and used in the Goulburn system is between 72.1 GL per year and 94.5 GL per year for historical climate and return to dry climate scenarios respectively. Under wetter scenarios the volume is less than 72 GL per year. The model takes into account natural streamflows and the release of water from Lake Eildon to meet downstream water use demands, but does not take into account the water availability in the Melbourne system.

Further modelling, using a combination of water availability in the Melbourne system and the GSM, has shown that the volume of water that could be transferred north is more likely to be around 57 GL per year on average. Transferring larger volumes would be difficult given water availability and delivery constraints in both systems.

The current pipeline configuration would see water discharged directly into the Goulburn River near Yea. This discharge would need to be timed to ensure that it did not affect the health of the Goulburn River.

Furthermore, there will be a limited period of time where the water will be available before Melbourne’s growth and potentially decreased rainfall and water supply reduces the volume of water available to be transferred to the north without further augmentation of the Melbourne System.

Sugarloaf Pipeline South-North Transfer
3. When can water be transferred and where can it be used?

Water transferred from south to north would flow into the Goulburn River. Water would be re-regulated and stored until needed by northern water users. Water from the Sugarloaf Pipeline could be:

- used to substitute water released from Lake Eildon when water demand is higher than natural inflows. This would typically be in late Spring and early Autumn;
- diverted into the East Goulburn Main Channel;
- diverted to the Waranga Basin via Stuart Murray and Cattanach canals in years the basin does not fill from natural inflows and used during the irrigation season;
- transferred from the Goulburn system to the Murray system, when it is not able to be used in the Goulburn system; and/or
- transferred from the Goulburn system to the Murray system regardless of the Goulburn system demands.

The above options have potential to benefit water users in the Goulburn and/or Murray systems. Operational and water accounting rules would need to be prepared during the development of a full business case to further assess each option.

Using the GSM, a time series of results from 1990 to 2014 for the historical climate scenario was prepared (Figure 3). It shows months in which water from the south could be used in the Goulburn system when demand is sufficient (shown in the green columns) and months in which there is potential for transfer and storage in Waranga Basin (shown in the blue columns). White columns indicate periods water could not be transferred. The simulated Lake Eildon storage is presented to highlight that in a number of the drought years from 1998 to 2009, storage in Waranga Basin may have been possible.

![Figure 3: Time series results of Historical Climate Model](image)

Department of Environment, Land, Water and Planning
4. Is the infrastructure financially viable?

The current estimated capital cost of the infrastructure is $277 million. The financial analysis undertaken to date shows that the cost of Goulburn allocation water would need to be well above historic levels for it to be economically viable. These conditions are only likely to be met with significantly reduced water availability and only likely to be viable for non-interruptible, high value crops. For example, allocation water prices in the Goulburn system would have to be consistently above $1,350 per ML for water transferred to provide a net benefit assuming the supply of desalinated water. While some individual trades have exceeded this threshold, average monthly prices have not.

The costs and value of externalities (environmental and social) have not been estimated or included in the financial analysis of the scheme. The externalities would need to have a net positive value of approximately $1,100 per ML of water transferred south to north and discharged into the Goulburn River in order for the scheme to produce a (median) economically positive result.

The extent of the potential external benefits is limited by the volume of water that could be transferred to and accepted by the Goulburn system. The preliminary business case considers what additional benefits could be generated and noted the following:

a) Augmented capacity in the water sector

The bi-directional feature of the pipeline would enable water to be transferred to where it is valued most and promote the efficient and effective use of the Victorian water market.

b) Strengthened viability of local industry

Water is a primary input for economic activity. This project may enhance the effective water availability, which is critical to irrigators and farmers. This project represents an opportunity to facilitate the continued growth of irrigated agriculture and regional employment.

c) Environmental benefits

Water transfers from south to north may increase quantities available for environmental flows. The potential benefits are dependent on the timing of when water would be delivered to the north:

- There is no benefit of pumping water north in summer, as the Goulburn River already has high flows due to existing releases from Lake Eildon (and tributary inflows) to meet irrigation requirements. In fact, additional flows are likely to contribute to further negative environmental impacts on the Goulburn River.
- If water is pumped north during winter, there may be some environmental benefit, however in consideration of the volume of water which the south-north scheme could deliver, in comparison to the total water volumes already available in the Goulburn River, the benefits will not be significant.

Overall, the preliminary assessment determined there are currently no substantial environmental benefits arising from the south to north transfers.

d) Improved amenities

Improved waterway health will boost the aesthetic and recreational values of northern Victorian. The liveability and tourist potential of the region could therefore be improved.

Given the high value of externalities that would be required in order to make the scheme positive on an economic basis, it is possible that other water security projects may be more favourable.
Next steps

The preliminary business case recommends that pumping water from Olinda Reservoir to the Goulburn system be assessed against other potential strategic responses to improve water security. This is in line with the Government’s commitment to planning for a future that is likely to have reduced water availability due to climate change and increased water needs due to population growth. At present, the preliminary business case has identified a number of gaps and constraints that require further analysis and investigation as outlined above.

The Victorian Government remains committed to improving water security in northern Victoria and the broader water grid. The government will continue to work with water authorities and communities through the implementation of Water for Victoria, which may include further consideration of other bi-directional flow concepts or modifications to the Sugarloaf Pipeline.
Photo credit
Photos courtesy of Craig Moodie, Goulburn Broken Catchment Management Authority, GWMWater, Melbourne Water and Department of Environment, Land, Water and Planning.