



## eNews September 2013

### News from Victoria

<b>TITLE</b>	<b>: Westernport Water - Candowie Reservoir Upgrade Project (CUP) – The Story So Far</b>
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### 1. PROJECT SUMMARY

Westernport Water (WPW) is one of 19 water corporations in Victoria. Located within the Bass Coast Shire, some 100km southeast of Melbourne on the Eastern side of Western Port. Our region of operations covers 300 square kilometres, servicing a customer base of 17,300 which swells to peak population of over 100,000 during major events, and summer peak holiday periods.

The Candowie Reservoir is the sole water storage for our region. Built in 1963 and with a capacity of 2,263ML the supply vulnerability of the annual fill/empty cycle was exposed in 2006/2007. During a two-year drought period the reservoir capacity fell to 7% and Stage 4 water restrictions were imposed.

The Candowie Upgrade Project (CUP) was the key component in Westernport Water's Water Supply Demand Strategy (WSDS). The WSDS provides the planning framework for the reliable supply of water through to 2055.

The CUP involved embankment and other associated infrastructure works to raise the Full Supply Level (FSL) of Candowie Reservoir by three metres, doubling the water storage capacity to 4,463ML. The preferred design option to upgrade the existing reservoir maximised the opportunity to collect and store the most economic water from locally available sources.

After a rigorous multi-year review process the business case for the CUP was approved in March 2012. The construction phase of the project commenced in September 2012 and is on schedule to be completed by the end of June 2013.



*Figure 1. Aerial view of construction showing the water treatment plant at the top of the picture (1), the main construction compound at the right(2), red building in foreground is pump station to reticulation(3), red building just above is a treatment chemical building(4), red building to left of chemical building is pump station to the treatment plant(5), spillway is immediately on left abutment below treatment plant(6), outlet tower is lower left side (7) and photo is taken from right abutment. The only road to site is in middle to right (8) that is to be shared by the treatment site and all construction traffic.*

## **2. DEVELOPMENT OF THE BUSINESS CASE**

A complete business case was undertaken to demonstrate that the upgrade to Candowie Reservoir was the best way to ensure security of supply in the face of increased climate risk and variability and support continued development associated with a growing population in a key Australian tourism destination. A gateway investment program was submitted to the Victorian State Government to gain endorsement for this project, the program included the following:

- i. Development of Water Supply Demand Strategy
- ii. Identification and analysis of options
- iii. Project scope, designs, and costing
- iv. Recommendation and implementing the preferred solution

The project was endorsed by the Victorian Government and approved by Westernport Water's Board.

### **3. DESIGN ISSUES AND SOLUTIONS**

The key design issues identified included:

- i. Upgrade of Candowie Reservoir to current ANCOLD standards for flood and earthquake protection including;
  - a. Embankment stability requirements



*Figure 2. Finalisation of compaction on the downstream earth embankment including raising the chimney filter to full height and width of the new embankment.*

- b. Use of pre-cast concrete panels to form new parapet wall



*Figure 3. Installation of precast concrete parapet wall panels that were manufactured off site, craned into position and sealed to the existing parapet wall.*

c. Post-tensioning of existing Outlet tower for dynamic loads

*Figure 4. (below) Inside the inlet tower showing new pipework and platforms being installed.*



*Figure 5. New walkway and extended outlet tower before installing ground anchors*

d. Spillway design for 1:100,000 year flood



Figure 6. (Top) Right side of spillway wall showing reinforcement being prepared for concrete pour, Figure 7. (Bottom) Preparation of existing spillway, starter bars, to increase height of ogee crest by 3 metres.

- ii. Difficulties created by incomplete records on existing structures as plans were old and incomplete or did not show some details. The photo below shows the parapet wall, the right hand side of the spillway wall and the excavation to determine what was originally built in this location. This was required as there was a persistent leak in this area through the

spillway wall joint. The concrete block supporting the slab panel was not shown on the original plan and did not extend to the original parapet wall upstream of this position. The joints were resealed and the hole filled with concrete.



*Figure 8. Excavation of filter and existing parapet wall to determine leakage path*

- iii. Extensive geotechnical investigations required during design phase to support design assumptions and confirm details not recorded on the existing plans or originally known.
- iv. Requirement to undertake works on a “live” reservoir and co-ordinate the construction program with the needs of a 24/7 operational water treatment plant as the only source of water to 17,300 permanent customers.
- v. Restricted construction period to align with annual storage drawdown/refill cycle to ensure the minimum quantity of water is lost and that, as the only reservoir, that there is enough water to satisfy demand during the peak holiday season December 2013 to January 2014.
- vi. Protection of spillway works from possibility of floods by construction of a temporary coffer dam.

#### **4. CONSTRUCTION CHALLENGES and LEARNINGS**

The construction challenges and learning's from the project included;

- i. Importance of design and tender selection process. Correct contractor selection has ensured project will finish on-time and with variations less than 3% of a \$9,000,000 contract.

- ii. Importance of co-operation between contractor and operational staff to understand each other's needs and delineate areas of responsibility for access, works control, and safety inductions. Sharing of one access road to site including chemical deliveries to treatment plant to ensure plant could operate throughout the construction.
  
- iii. Integration of new and old parapet walls and ensuring a watertight structure that required careful preparation of the joints and sealing of the joints between the old parapet walls and the new parapet walls. Photo below shows the joint between the old parapet wall and the newly constructed wall on the upstream face.



*Figure 9. Construction of precast parapet wall*

- iv. Undertaking ground anchoring and post-tensioning of a “live” Outlet Tower. This involved core drilling to confirm geotechnical conditions, precision placement to clear fittings around the tower, control of spoil to avoid interruption of water draw-off to allow the treatment plant to operate supplying water to customers. The steel anchors are currently being drilled and fitted to the new raised outlook tower and will provide an upgrade to the dam safety ensuring the outlet tower can survive an earthquake event.
  
- v. Separate concurrent contracting of works to raise a public road and saddle dams on the boundary of WPW and privately owned property. New level of dam would have flooded a main rural road upstream of the dam and surrounding paddocks. The road works and the saddle dams on the creeks running into the reservoir were completed by another contractor to ensure the works were completed on time. These works have been completed in July 2013 with minimal disruption to the neighbouring properties and main road users.

## **5. OUTCOMES**

The contract has not yet been completed with the final pour for the spillway to the new level programmed in the next few days and the outlet tower yet to be ground anchored and completed. The recent wet weather has provided challenges to balance the need for water in the dam and the need to keep the water level low to provide a safe platform for construction. A final report will be provided when the project has been finished and finalised.

The project so far has gone to plan through the relentless work of a number of people especially Charminda Jayasena the Onsite Manager, Stephen Cannon Project Supervisor, Steven Porter General Manager, Westernport Water Board and the rest of the staff of Westernport Water.

The project will deliver a safe larger reservoir that will be used by the current and future customers and the thousands of tourists that flock to the surrounding beaches and countryside throughout Phillip Island and the surrounding mainland.

Larger water storage will provide greater opportunities for water management, optimise the use of all available local water sources and deliver safe, affordable water services to the communities serviced by Westernport Water. Furthermore, it will provide water security for a liveable and productive future for generations to come.

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