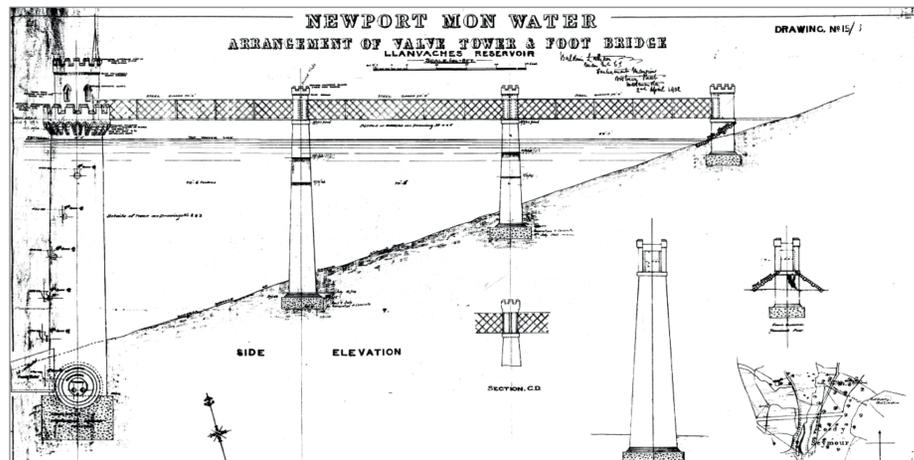


Wentwood Tower and Valve Refurbishment

Drivers: Flows out of the Wentwood Reservoir are controlled by valves located in a 9-storey high circular masonry tower within the reservoir dating from 1904. Following maintenance challenges and after exceeding their design life, the valves are now not operable and the reservoir is at risk due to the lack of control. The tower is showing signs of distress and structural cracking. Reservoir Safety requires this work to be completed at the first opportunity although no regulatory date is applicable.

Evolving scope: The project objective is to refurbish the tower and replace the valves to allow the reservoir to be operated safely. The scope has had to evolve to include a broad range of works associated with the reservoir basin and downstream such that tower and valve design is ~10% of spend to date.



Challenges

Alliance partners working collaboratively to address significant challenges:

- **Records are incomplete** and conflicting. Surveys required to scope design.
- **Tower is a wet tower.** Surveys required the reservoir to be drained. **Valve positions were unknown.**
- DCWW able to finalise design scope Dec-17, 15 months into project due to survey access challenges.
- Draining reservoir basin required **5,000 fish to be rescued.** NRW's consented **discharge turbidity limit of 50mg/l** required 24hr silt management system, re-energising former treatment works, and cleaning downstream sink holes. **Almost 500,000m³ of flows treated.**
- **Exact location of critical scour inlet unknown,** buried beneath ferrous debris and 2m of silt.
- Work in the **tower is restricted to a single entry point** – a pedestrian footbridge. Access to **the confined shaft requires six man mines rescue** standby safety cover.

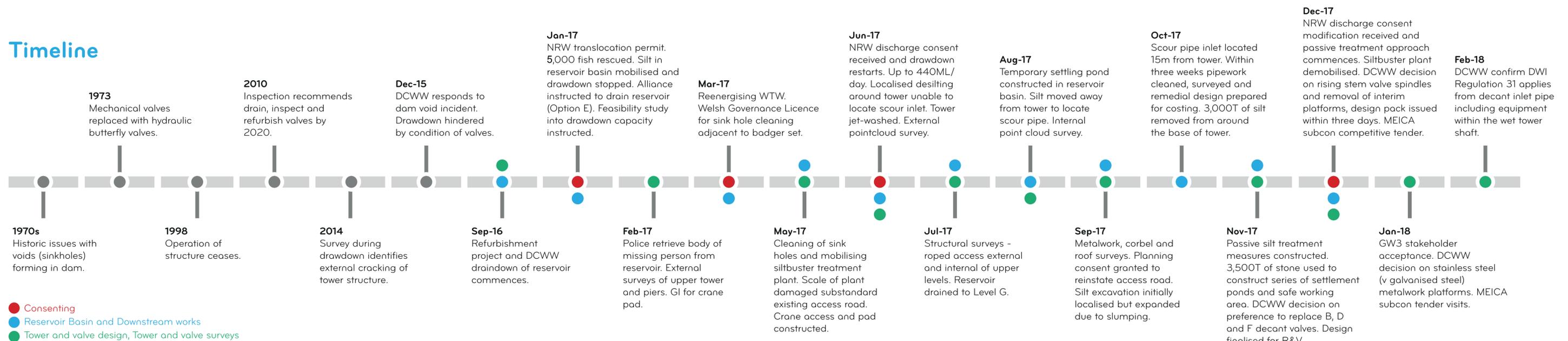


- Protracted consenting negotiations with NRW and silt management delayed programme by nine months, despite early engagement. **Phased survey and design has minimised programme delay.** A point cloud survey and **innovative BIM 3D model** used for clash detection and operative testing whilst rapidly accommodating design scope changes.
- The remote location and reservoir basin orientation limits plant access. Careful planning and communication with stakeholders has been necessary with correspondence and meetings. **Material loads are restricted to <1.5 tonnes** due to the size of crane that can access site. Materials will be lifted through a <1m diameter central opening down the tower shaft.
- External repairs to tower, corbels and to replace roof require a **34m-high access scaffold** sited on a concrete slab foundation, taking a month to erect.
- Linear programme due to access and crane restrictions limiting activities within tower to a single workforce.
- All design and site works require supervision from [Reservoirs Panel] Qualified Civil Engineer.

Stakeholder Management

- Weekly meetings with DCWW Dam Safety Team and Operations.
- External engagement with Natural Resources Wales, Newport City Council, Wentwood Fishing Club, local residents / customers.

Timeline



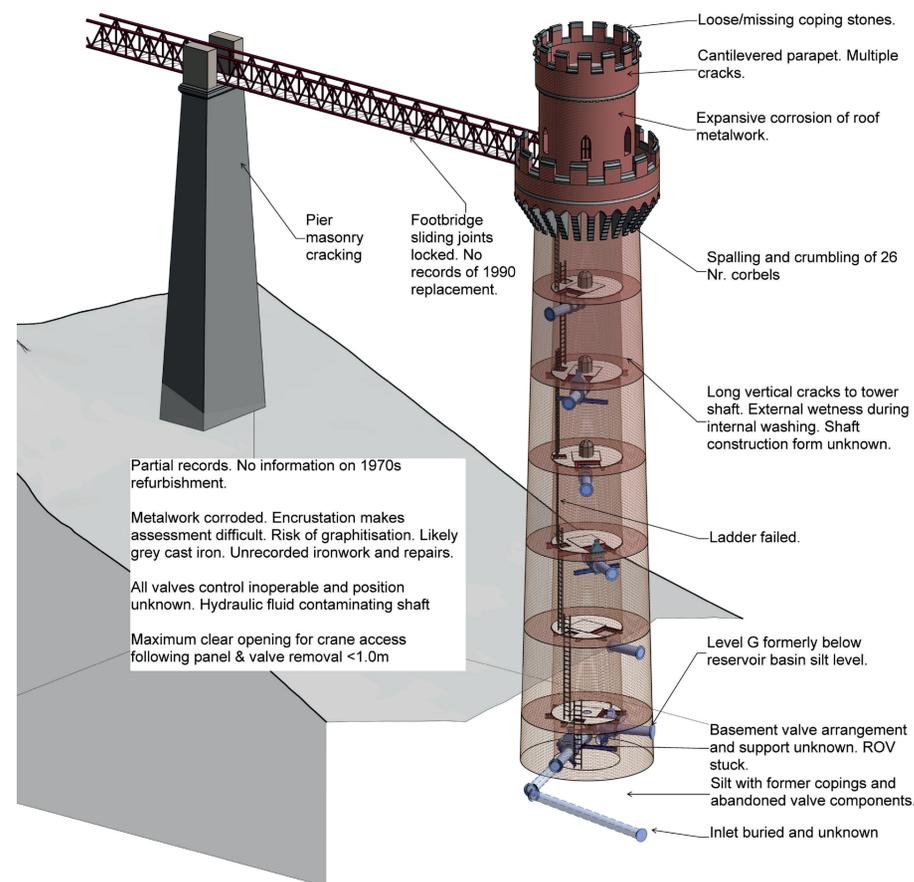
Wentwood Tower and Valve Refurbishment

Residual Risks

- Prolonged period of drawdown. Tower exposed to greater weathering. Clay dam subject to monitoring, especially during staged refilling.
- **Pipework has insufficient capacity to meet emergency drain down requirements.** An options feasibility study proposed a new downstream stilling chamber and up-sizing the 450mm scour pipe's 20m 300mm dia pipe restriction **located at the head of a restricted tunnel.**
- The maximum storage in the reservoir will be constrained until the deficiency in drawdown capacity has been addressed. The level will be based on the level of previously observed sinkholes; i.e. half-full (level D).
- Reservoir discharges to sink holes. Capacity varies due to antecedent and artesian conditions. Risk inundation of properties.
- Tower seepage observed during internal jet-washing. Risk ingress requires reservoir drawdown in order to access and maintain valves in shaft.

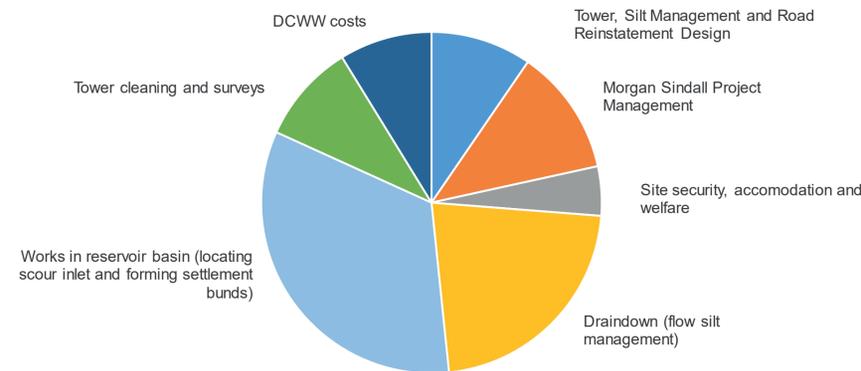


Summary of tower and valve issues

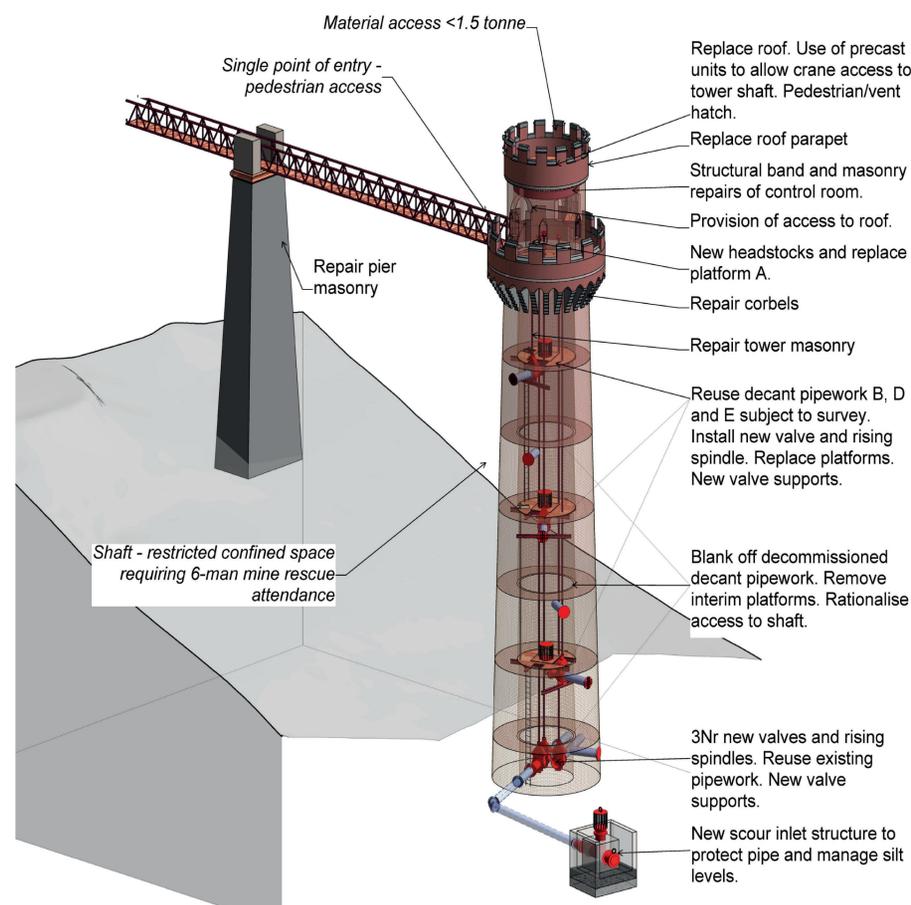


Costs

- Spend to date: £2,134k (see breakdown below)
- Forecasted (total) cost: £6,510k



Proposed summary of tower and valve works



Forward Look

- **Detailed design required for setting the financial target of the project, hence combined GW3 and 4 approval.**
- CPB Apr-18
- **Draft construction programme - May 2018 to July 2019.**
 - Mobilise. Overpumping, drain reservoir, install internal scaffold and construct external scaffold foundation (5 weeks)
 - Install external and internal scaffold (5 weeks)
 - Replace roof and roof parapet (5 weeks)
 - Sequentially remove and replace metalwork platforms from control room down. Test exposed pipework. Repairs to external tower and corbels. Works to scour inlet. (29 weeks)
 - Sequentially replace platforms and valves from basement up. Install rising stems and control room headstocks. Complete roof. Demobilise (13 weeks).

Location Plan

