



The British Dam Society

BRITISH DAM SOCIETY CONFERENCE – KEELE UNIVERISTY

Conference Tour – Thursday 12th September 2024

Environment Agency – Forge Mill Flood Storage Reservoir

Background

Forge Mill Reservoir is a new flood storage area built as part of the Perry Barr & Witton Flood Risk Management Scheme. The scheme reduces flood risk from the River Tame, providing a 1 in 100 standard of protection to over 1400 residential and commercial property in Birmingham.

The site is located approximately 5 km north-east of West Bromwich, where the River Tame passes through Sandwell Valley Country Park.



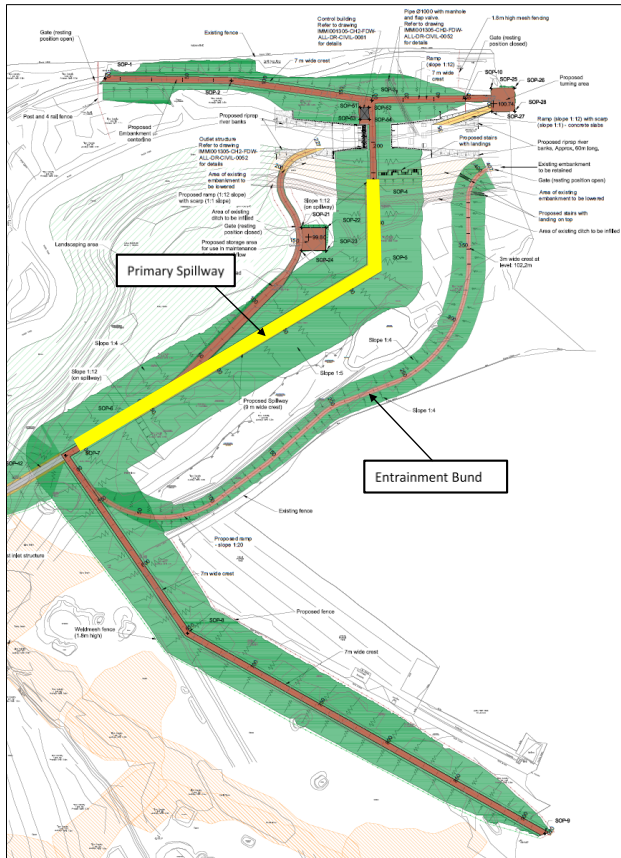
Figure 1 Drone view of completed dam

Design

The Reservoir was under construction between 2018 and 2022 and is now operational, with the preliminary certificate issued in September 2022. The dam spans the floodplain in a 'Z' shape configuration and is designed to store approximately 1,770,000m³ of flood water at TWL. It consists of a homogenous earth embankment that is circa 920m long and 7.8 m high.

The online control structure comprises a reinforced concrete inlet headwall, outlet headwall, wing walls and culverts through the centre of the dam with an energy dissipating outlet area.

The dam forming the reservoir is categorised as Category A under Floods and Reservoirs Safety (ICE, 2015).



For events exceeding the 1 in 100 year standard of protection, water is designed to overflow and spill down the primary spillway, located at the middle section of the main embankment. It has a length of 276 m, a 9m crest width and slopes of 1 in 5 on the downstream face.

An entrainment bund then diverts flows back into the River Tame, downstream of the dam.

The design level of the secondary spillway is 0.35 m higher than the primary spillway and will begin to overflow in events exceeding the 1 in 500 year flood.

The downstream face of the dam is protected by reinforced grass comprising Salix Vmax C350 within the topsoil layer.

Managing flood risk

Four automated penstock gates are attached to the upstream face of the inlet headwall. They close, based on operational rules, to reduce the outflow from the reservoir and to reduce flood risk to the Perry Barr & Witton areas of Birmingham. The position of the penstock gates and rate of discharge is based on water levels at two downstream monitoring stations. The intention is to maximise the capacity of the downstream channel, only storing water that could cause property flooding.

As the flood defence system is reliant on the successful automatic operation of the penstock gate controls, multiple redundancy measures are included to provide resilience against failure.



A trash screen is mounted on the headwall/intermediate walls to protect the culverts from blockage and penstock gates from damage. The bars are installed at a 45 degree angle and 2.4m spacing, to prevent large debris affecting the operation of the penstocks.

The scheme successfully operated during Storm Babet on 20th October, temporarily storing flood water and reducing flood risk to downstream communities.



Construction Challenges

- Sourcing suitable embankment fill

Identifying embankment fill was a challenge considering the competitive market with HS2 and limited supply of suitable material. It was initially intended that some fill would be sourced on site, but following detailed ground investigations it was decided most of the fill would need to be sourced off site. This significantly increased the number of HGV movements, requiring a change in planning permissions and programme.

- Debris screen clearance

A significant issue for the project was resolving an issue where water depth in the channel at the control structure was deeper than expected. This rendered the proposed maintenance approach unsuitable. An added complication was that the quantity of debris encountered was greater than expected. A specialist spider excavator is currently used to clear the screen and a mechanical grab option is being considered.

- Site constraints

The site has several constraints that had to be considered as part of the reservoirs design. These include a railway line, A RSPB nature reserve and a strategic multifuel pipeline.

The multifuel pipeline passes underneath the foundation of the embankment and therefore significant engagement with the utility owner was required to agree appropriate mitigation measures.

Further information is provided in a paper written by Ciara Gill in Dams and Reservoirs titled: Perry Barr & Witton FRMS: Forge Mill flood storage area – Lessons learned 28 June 2022.