

Welcome to the Milngavie Reservoirs civil engineering trail

This is a popular walk for many people, but do you realise the amazing civil engineering that's all around you? The reservoirs here are part of a scheme that had a huge public health benefit for Glasgow and still provides clean water to the city today.

Firstly, a little bit of history...

By the 1840s Glasgow was a rapidly growing city. It had certainly outgrown its water supply which mainly came from an 1807 scheme using the river Clyde as a source. But the quality of water from the Clyde was declining and outbreaks of diseases like cholera were common.

Glasgow City Council turned to water engineer John Frederick Bateman for a solution. Bateman was already famous for designing Manchester's water supply system. He suggested raising the level of Loch Katrine, an 8 mile long freshwater loch in the Scottish Highlands, to provide an abundant supply of water to the city.

Although there was some opposition – there were fears that damming Loch Katrine could reduce water levels in the nearby river Forth – Bateman's plan was backed by renowned engineers Robert Stephenson and Isambard Kingdom Brunel.

Glasgow Council approved the scheme and construction began in 1855. The ambitious project included Mugdock reservoir, nearly 26 miles of aqueduct, 13 miles of hard rock tunnels and almost 4 miles of iron pipes.

Today, Bateman's scheme including extensions and modernisations still provides Glasgow with water.

THE TRAIL

The reservoirs are a 15-20 minute walk from Milngavie Railway Station and town centre bus stops. The path around the reservoirs is generally flat and level but there are steep embankments in some places so care should be taken.

Access is via the Commissioners' Walk, off Strathblane Road/Moor Road. Please note the original main entrance gates off Strathblane Road are closed to the public but there is a pedestrian access further up Moor Road. This trail starts at the James Gale Memorial fountain at the top of the Commissioners' Walk and follows a circular route around both Mugdock and Craigmaddie reservoirs. It should take approximately one hour. The trail ends back where it starts, at the end of the embankment between the two reservoirs.

If you're interested in finding out more about the Loch Katrine scheme, we have another civil engineering trail along the line of Loch Katrine aqueducts.

This leaflet has been produced by the Institution of Civil Engineers in partnership with Scottish Water.

An engineer led guided walk is available for groups on request.

Please remember that reservoirs contain deep, cold water. This water will ultimately become drinking water so don't let people or pets swim in it. Please read the Scottish Water Bylaws for more details.

Find out more:

ice.org.uk/what-is-civil-engineering

ice.org.uk/scotland

 @ICEScotland

 ICE Scotland

 scotland@ice.org.uk

Registered charity number 210252

Registered in Scotland SC038629

INSTITUTION OF CIVIL ENGINEERS



Milngavie Reservoirs Trail



GLOSSARY

Dam – a barrier constructed to hold back water and raise its level, forming a reservoir used to generate electricity or as a water supply.

Draw-off tower – Draw-off towers are vertical tubular structures with one or more openings used for capturing water from reservoirs and transporting it on, usually for hydroelectric power or to a water treatment plant. They have multiple openings at various depths, typically equipped with valves.

Embankment (dam) – a wall or bank of earth or stone built to hold water.

Puddle clay – puddle clay is a naturally impervious material which is used to prevent water seeping through the dam. It can also be used as a waterproof lining, in canals for example.

Reservoir – a reservoir is a body of water, natural or man made, used for storing water for drinking or hydroelectric power or to manage flood risk. Most manmade reservoirs are stored behind dams.

Scour Valve – a scour valve is an ordinary valve used for scouring or emptying water. This can be in a reservoir or storage tank.

Sluice – an artificial passage for water fitted with a valve or gate for stopping or regulating flow.

Spillway – A spillway or overflow channel is a structure used to provide the controlled release of water from a dam.

Weir – a fixed barrier across a river or stream to control or measure the flow of the water.

Modern construction in the 1800's

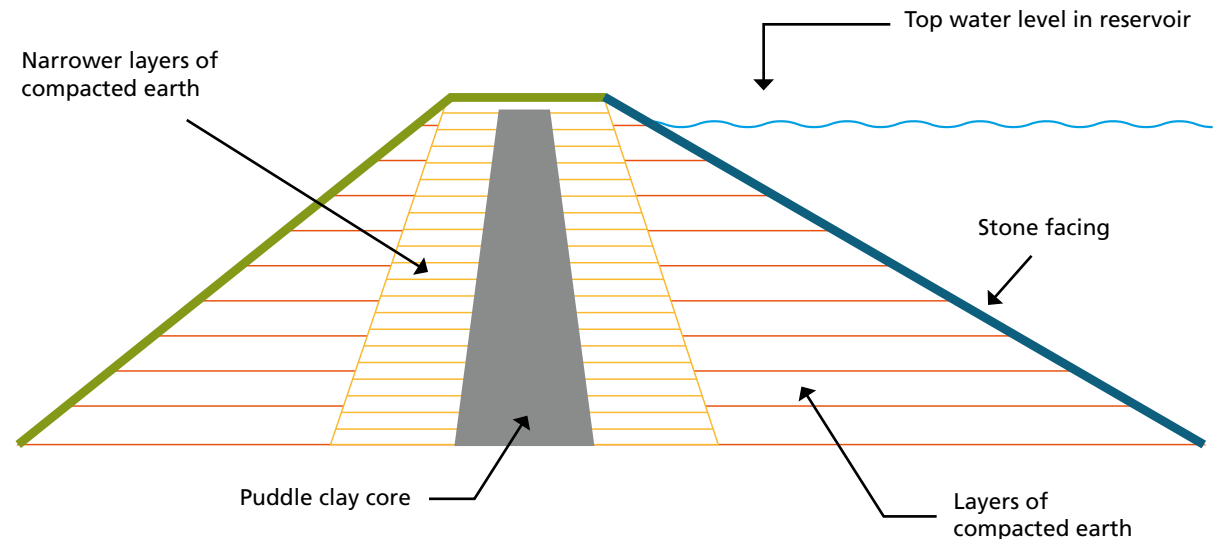
The Loch Katrine scheme was designed with very modern principles at its heart. When John Frederick Bateman designed the original scheme in 1855, he left room for expansion, anticipating the growth of the city of Glasgow and future increased need for clean water for drinking and powering industry.

The Milngavie Reservoirs were designed with both physical and mental wellbeing in mind with specially designed landscaping to enhance their scenic and recreational value. The advent of the railway from Glasgow to Milngavie in 1863 made the reservoirs a popular destination for day outings by Glaswegians, which is still true today.

How does a reservoir work?

There are three types of reservoir; impounding, non-impounding and service reservoirs. Impounding reservoirs gather rainfall from a catchment area and usually store it behind a dam. Non-impounding reservoirs have water transferred into them, either by gravity or pumping. Service reservoirs are generally concrete or masonry box structures, used for storing treated water for the public water supply. Both Mugdock and Craigmaddie are non-impounding reservoirs, getting their water from Loch Katrine via two aqueducts.

The dams at Milngavie are embankment dams, the most common type in the UK. Both Mugdock and Craigmaddie have earth embankments which rely on their weight and shape to hold back the pressure of the water in the reservoir. They are made of compacted earth with an impermeable core of puddle clay to stop the water going through.



Starting our trail at the James Gale Memorial Fountain (built 1904) you can actually see two reservoirs. The one to your left is Mugdock Reservoir built by water engineer John Frederick Bateman in 1856 and the one to your right is Craigmaddie Reservoir, built by James Gale in 1886 when the scheme was expanded.



1. STRAINING WELLS

To one side of the fountain you'll see a large circular grey tank. There is another one on the opposite side of the Commissioners Cottage. These are the original straining wells which were in use until 2007. They filtered the water before it was piped to Glasgow. The actual wells are below ground and what we can see are the cast-iron covers.



2. EMBANKMENT BETWEEN MUGDOCK & CRAIGMADDIE RESERVOIRS

The road in front of you runs along the top of the embankment dam. Although the two reservoirs abut each other they are completely separate.



3. DRAW-OFF TOWERS

At the near end of the embankment you can see two towers, one in each reservoir. These are the original draw-off towers where water was taken out of the reservoirs through a series of valves under the water but are no longer in use.

4. MUGDOCK RESERVOIR EMBANKMENT

Walking to the left and around Mugdock reservoir first, we pass the building known as the Commissioners Cottage and on along the top of the Mugdock reservoir embankment. This is a large earth embankment with a puddle clay core.

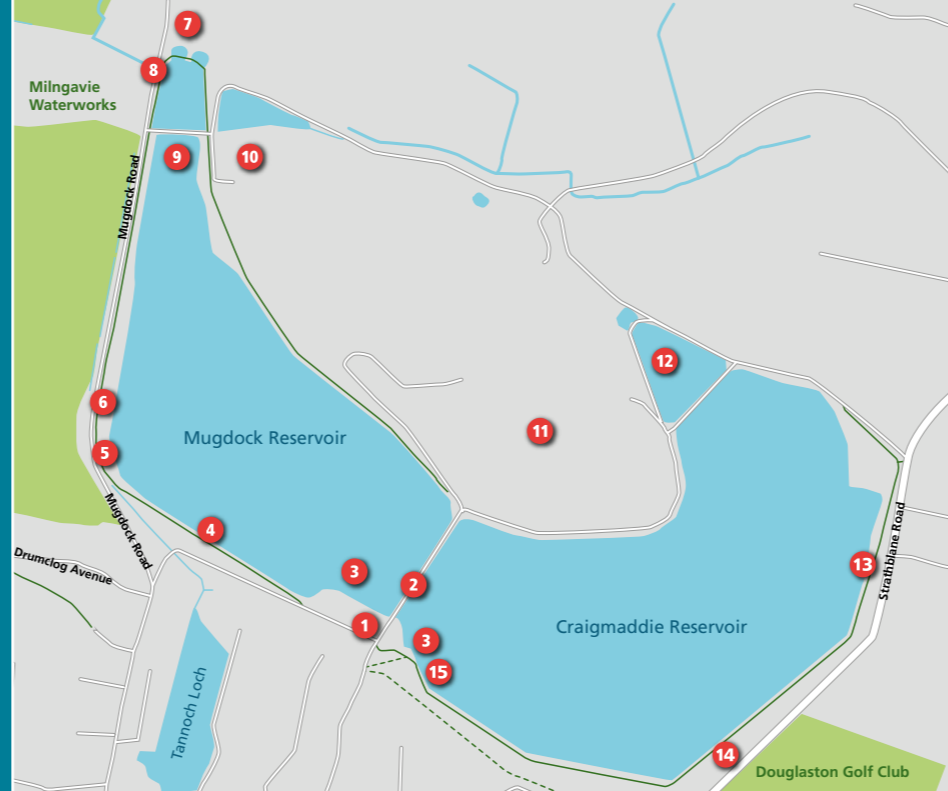


5. MUGDOCK RESERVOIR SPILLWAY

Walking round Mugdock reservoir, you'll pass the overflow spillway channel with a metal footbridge over it. This ensures the level of water in the reservoir doesn't get too high (a bit like the overflow in your sink).

6. THE WHITE WELL

This circular structure houses another former draw-off for the reservoir, that's no longer used.



7. MUGDOCK RESERVOIR INLETS

Walking right round Mugdock Reservoir, you'll come to another small embankment and the semi-circular gauge basins. The one on the left (to the West) is the original basin built in 1856. The one next to it (to the East) was added around 1865 when a second pipeline was laid. The water travels 26 miles along the aqueduct from Loch Katrine and enters the gauge basins through the elegantly arched stone inlets.



8. MUGDOCK RESERVOIR GAUGE BASINS AND WEIRS

The water flows into the gauge basins and under the baffle walls into each compartment. This slows the flow down before it goes over the basin weirs and on over the embankment weir into Mugdock reservoir itself. The gauge basins were originally used to measure the flow of water into the reservoir. This is now done with modern equipment at Loch Katrine.

9. BRIDGE

This lovely three arch masonry bridge carries the road over the embankment and weir.



10. DIRTY DAM

Walking back from the gauge basins towards Mugdock Reservoir itself, you may not notice it but you're actually walking along another embankment, known as the Dirty Dam. Through the trees to your left you might see another body of water. This gathers rain water run-off from the agricultural land to the North East, stopping it flowing into Mugdock Reservoir.



Walking around Mugdock reservoir, you can look across and see the stone paving that covers the embankment on the other side. When you reach the end of the embankment between the reservoirs, you've almost completed a circuit of Mugdock Reservoir. Our trail takes you on around Craigmaddie Reservoir.

11. MILNGAVIE WATER TREATMENT WORKS

As you walk round Craigmaddie Reservoir, hidden behind the trees to your left is Milngavie Water Treatment Works. This was built in 2007 to treat the water from Mugdock and Craigmaddie before it is piped to the people of Glasgow and surrounding area. In keeping with the surrounding environment, is partially below ground and screened by trees and landscaping.



12. CRAIGMADDIE RESERVOIR GAUGE BASIN, MEASURING POND, AND VALVE TOWER

Craigmaddie also has a gauge basin at its inlet, with an impressive masonry structure and inscription panel. The baffle walls here do the same job as in Mugdock, slowing the flow of the water into the large measuring pond. This pond was originally used to measure the flow of water into the reservoir. The water then flows out of the pond through the valve tower and via a pipe under the embankment, into Craigmaddie Reservoir itself.

13. CRAIGMADDIE RESERVOIR EMBANKMENT

Craigmaddie Reservoir was built by James M Gale from 1886-96 when a second aqueduct was built from Loch Katrine to increase capacity. The earth embankment is nearly 1.5km long and also has a puddle clay core like Mugdock, though it was much harder to construct due to the difficult ground conditions.



14. CRAIGMADDIE RESERVOIR SCOUR VALVE TOWER

Walking further around Craigmaddie Reservoir, you'll see the embankment increase in height. The masonry tower you can see on the left is the scour valve tower. This can be used to lower the level of water in the reservoir.

15. CRAIGMADDIE OVERFLOW SPILLWAY

Walking back towards the Commissioners Cottage, just before the draw-off tower you can see the overflow spillway for Craigmaddie Reservoir. This is rarely needed as the water level in the reservoirs is controlled from Loch Katrine.

