

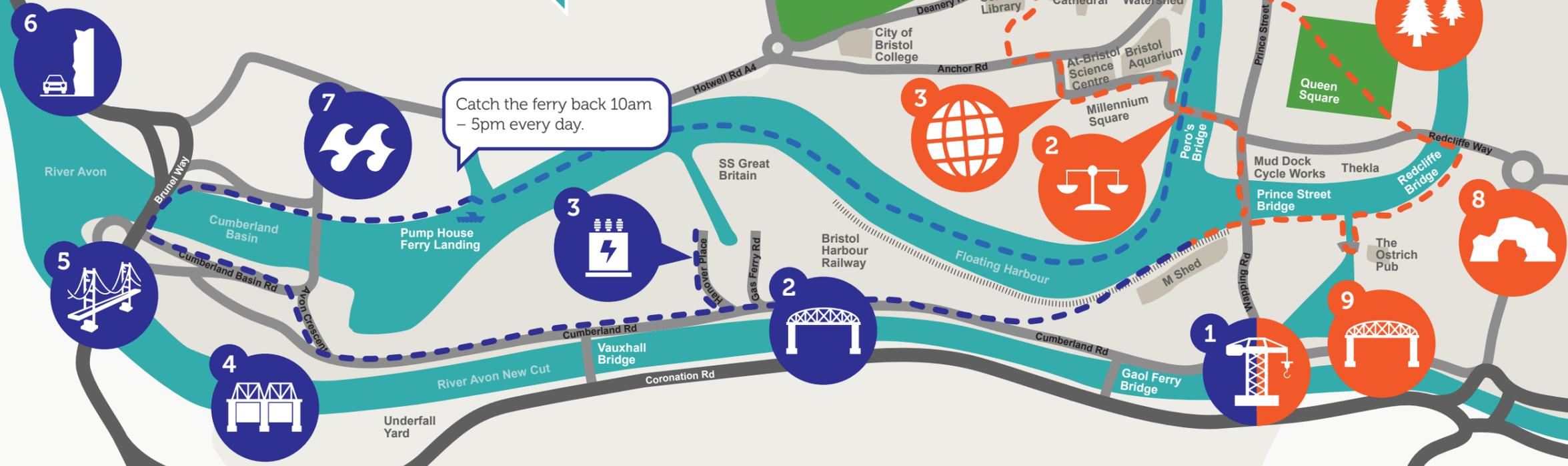
Who Built Bristol?

Welcome to our map which will reveal the building blocks of Bristol and open your eyes to the amazing engineering that has shaped our city, from bonkers bridges to weird water features.

- City Centre Route (Approx 1hr)
- Harbour Route (Approx 45mins plus ferry)



Cabot Tower
Brandon Hill Park



Share your photos and find answers to all the questions:
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1. M Shed and the Floating Harbour

For almost a millennium Bristol has been continuously reshaping its waterways. The river realignment of the 1200s was the largest civil engineering project in Europe at the time. Find out more at M shed museum!

As you leave the M Shed (facing the harbour), turn left and walk until you get to where the train lines meet and there is a footpath that crosses from the left. Join this and follow until you come out on Cumberland Road.

2. The 42 Bridges of Bristol

How many bridges have you seen on your walk? Try to identify what they are made from, and how they move (if at all) to let ships pass.

3. Underground Bristol

This small grey post is a vent for an underground electrical substation, which converts high voltage electricity into low voltage for use in homes and offices; feel the warm air escaping!

Along the river, look out for pipes with water coming out, called 'outfalls'. Some of these are from underground rivers which run under the city, and help prevent flooding.

4. Sluice Valves

A small hut and wall in the River Avon New Cut are the only evidence of tunnels that stop the Floating Harbour from filling up with silt – see the information board in Underfall Yard. The hydraulic system that operated the gates and valves around the harbour were only upgraded in 2005, before that all the locks, cranes and warehouses were operated using a 200-year-old pressurised water main!

Turn right off Cumberland Road onto Avon Crescent and follow until the bridge and road junction. Please be careful of the multiple roads here. Cross the road and turn left onto the footpath and follow the river under the next bridge.

5. Brunel's tubular bridge

Brunel's novel idea for this type of bridge structure went on to be a popular design used on bridges such as the Tamar bridge in Plymouth. This old swing bridge which now sits disused was replaced by one that stuck open in December 2013 causing havoc for commuters. They haven't yet dared to open it again...

6. Clifton Rocks Railway

If you have time, why not walk further along Hotwell road to the lower entrance of this funicular railway. Constructed in 1893, it extends through the rocks from the Clifton Gorge Hotel at the top to the Portway at the bottom.

7. Underwater Bristol

The only thing that stops the river from flooding Bristol is this single lock gate (even this doesn't always work! – see below) at Cumberland Basin, the end of the Floating Harbour. Using a series of locks and valves, water levels in the harbour are controlled to within 10mm.

Walk along the harbour to get back to M Shed, or catch the ferry (from the Pump House Ferry Landing). Make sure you've answered all the questions on the back!



1. M Shed and the Floating Harbour

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2. Pero's Bridge

By using the principle of leverage, the 'horns' act as counterweights to reduce the force needed when lifting the bridge to allow ships to pass through, combining art with engineering necessity. Can you spot the hydraulic rams underneath the bridge?

3. Millennium Square Planetarium

This beautiful mirrored globe that forms a centrepiece to the square required complex engineering to make it stand up and have such a striking mirrored surface. Architects imagined it, engineers designed it!

Turn right at the planetarium, cross the road and go up the slope to Deanery Road by College Green.

4. Building the Future

Have a look at the Environment Agency office on Deanery Road. The building has won many awards for its high environmental standards. Its sustainable features include a ground source heat pump and rainwater harvesting used to flush the toilets.

The office became carbon neutral in 2012, meaning that the carbon used in building it was offset by what it has generated, for example through the solar panels on the roof.

Head back to College Green.

5. Arches

You can see many arches on the old buildings here. Arches can withstand high compression ('pushing' forces), but not tension ('pulling'). They are difficult to build as they need to be supported fully during construction (historically using wood).

Go down the hill from College Green until you reach the fountains in the City Centre.

6. The River Frome

The river was artificially routed through here to provide additional ship docking space, before being covered over in the 20th century to provide space for cars. The river runs beneath your feet! These days the air quality in the centre is monitored by a green kiosk. The pollution regularly exceeds EU limits – a challenge for future engineers to solve.

7. Queen Square

From 1936 until 1999 there was a main road running through the middle of the square – notice the smaller trees and newer buildings in the gaps. When the city council decided to restore the park, there was huge opposition due to fear of impact on businesses. Redcliffe Way links the square to Temple Meads, and many people would like to see this converted into an inviting entrance to the city, part of the "Brunel Mile" running from Temple Meads to the SS Great Britain.

8. Redcliffe Caves

Redcliffe got its name from this red rock formation now known as 'Redcliffe Sandstone'. The full extent of the caves beneath the hill in the area of St Mary Redcliffe is not known. They were dug by French and Spanish prisoners of war in the 1740s to obtain quartz sand for the thriving glass industry. At present the caves are not used for any purpose, but the shafts pose a potential problem to structures above them.

9. Another Bridge!

Do you think this green pedestrian bridge can move? Have a go at designing your own bridge on the back of this map.

Cross the pedestrian bridge, turn right and walk along the harbour until you are back at M Shed. Now make sure you've answered all the questions on the back!

Can you answer these engineering questions about what you see on your walk?

Where do the railway tracks outside M Shed go to?

How many different arches have you seen? Draw the different types.

Could you build a straight bridge from stone? Why?

Which of Brunel's famous bridges spans the gorge?

What features could you have in the city centre to improve air quality and create a better environment?

How could you improve the city for pedestrians and cyclists?

The water level in the River Avon at Bristol can vary by 12 metres a day! What can engineers do to protect Bristol from flooding?

Can you spot signs of water pipes along your walk? The numbers on the hydrant posts are the pipe diameter and the distance away so you know where to look for the access cover. Though that the distance can be in feet or metres depending on how old it is! Give the numbers of one you find.

What other pipes and services are underground beneath your feet?



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ATKINS

A British Science Association project



Design your own bridge

You have identified many different types of bridges on your walk and seen how they let ships pass by lifting or swinging.

Imagine Bristol City Council wants to build a new bridge across the Floating Harbour. The council wants this to integrate into the cycle and walking network. Try drawing your own iconic bridge for pedestrians and cyclists that can still allow large ships through.

WHO BUILT BRISTOL?

Discovery Walk!

NATIONAL SCIENCE & ENGINEERING WEEK
14-23 MARCH 2014