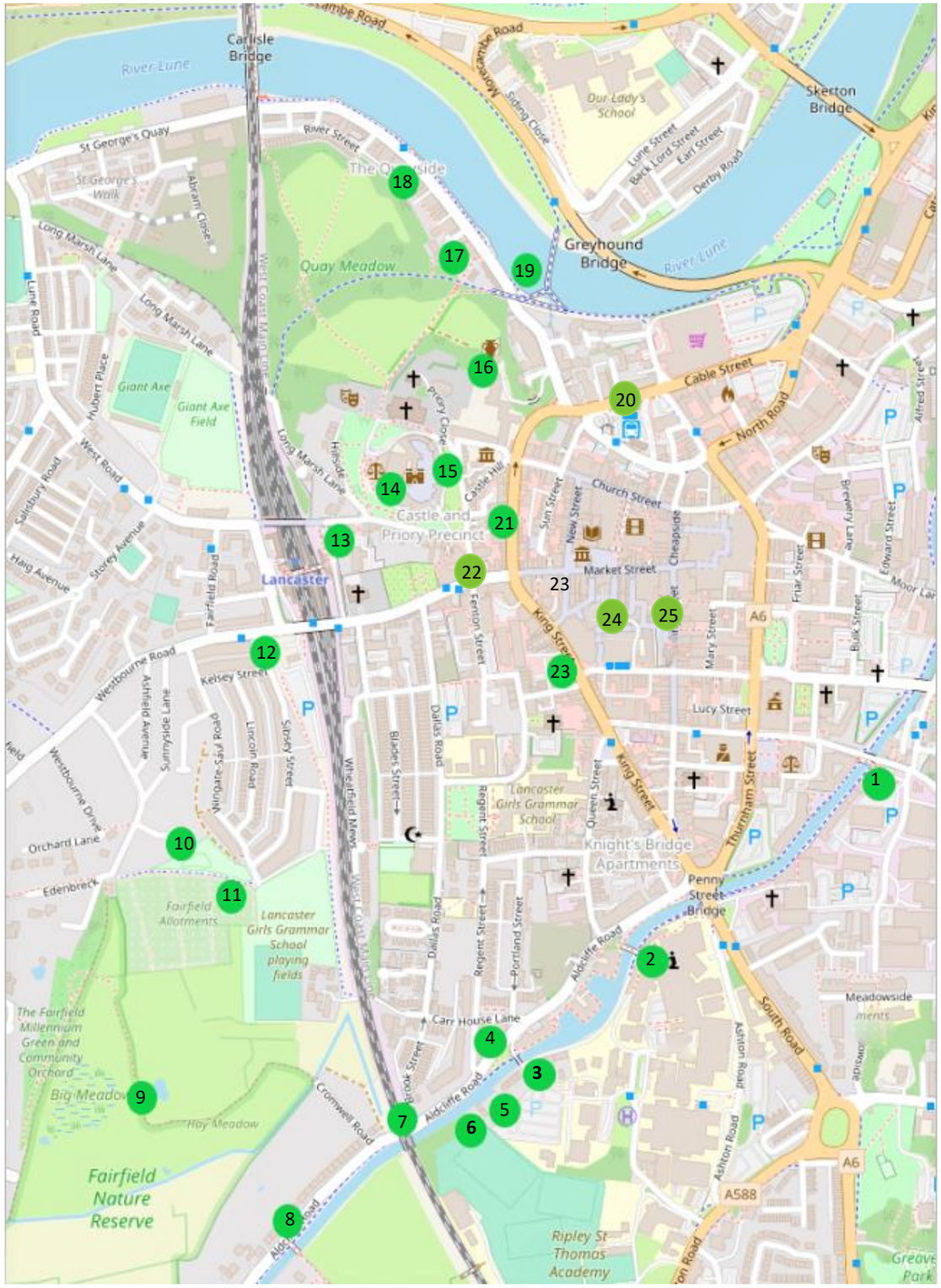


START at White Cross Bridge on Quarry Road

1. White Cross was the first cotton mill in Lancaster. Children worked here 200 years ago. Imagine the noise of the machines! You might have worked on the barges that stopped here, unloading bags of soft white cotton to make fabric, heavy stone for building black sooty coal for fires to heat houses and to power the mill machines.
Engineers are designing cleaner more environmentally friendly ways of creating electricity.
Can you spot any along the trail?

2. Water Witch Pub is named after a luxury superfast boat. It was pulled by two horses galloping along the tow path at 10 miles per hour, twice the speed of other boats taking just 7 hours to travel to Preston! You are probably walking at 3 miles per hour. In 1823, this was the fastest way of transporting goods. You might have been the child riding the horses and blowing a horn to warn everyone to get out of the way! This pub was one of the stables where you swap your tired horses for some new ones.
Engineers design transport to move people and things around safely. Are there any barges on the canal?
How would you change a barge design so it could get to Preston faster than the Water Witch?

3. Canal Bridge Number 98 is a point where you would have led your horses to the towpath on the opposite side of the canal.
Engineers designed this bridge to solve the problems horses getting into knots and snapping ropes.
Engineers need to imaging to solve problems. Imagine you are a horse pulling a barge crossing the bridge.
Where does your imaginary rope go?

4. Aldcliffe Road Triangle was a boat building yard belonging to David Vause. He made flat bottom boats called punts that were pushed along the canal using long poles to push along the bottom of the canal. He loved boat building so much, he called his yard Paradise Gardens.
Engineers chose the right materials for their designs. They even make new materials.
Can you spot any natural materials that can be used to create boats?

5. Across the canal, there is a simple machine used 200 years ago, to make it easier to lift heavy things off the barges. What is it?
Engineers have been using 6 simple machines for centuries to make it easier to move, lift, push and pull things. You use them too. Do you know what they are?

6. Lancaster Canal Company boat house, as it used to be, was where the Water Witch was repaired. Engineers used a simple machine called a pulley to help them lift the boats out of the water to repair them.
Why do you think the building was designed with a wide doorway where the windows are now?

7. Engineers designed bridges to allow every form of transport to cross the canal and the River Lune.

8. Continue along the towpath until you reach the white metal footbridge. Leave the tow path and turn right onto Aldcliffe Road and walk back towards the city and the rail bridge. Look both ways before crossing the road.
Look up to see what engineers have designed to use something that will never run out to make electricity.
Turn left onto Cromwell Road.
At the end of the road you will reach a gate to enter the Fauna area of Fairfield Nature Reserve.

9. Fairfield Nature Reserve
Engineers sometimes get ideas from living things. Can you spot an insect flying near water that may have inspired the invention of the helicopter?
Engineers find ways to use materials carefully and look after the Earth. Can you spot some recycling under your feet?

When you reach the end of the path, turn right away from Fairfield orchard and behind the old farmhouse.
Turn right to follow the path alongside Fairfield allotments.

10. Have a bounce in the playground!

Can you spot something engineers use to stop buildings shaking during earthquakes?

11. Fairfield allotments grow lots of different fruit and vegetables.
What would you like for your tea?
The number of people on Earth is nearly 8 billion, that's 8,000,000,000.
Engineers are designing new vertical farms to grow more food in less space. Can you see how fruit or vegetables are being vertically here?

Cross onto Sibsey Street and follow the road up to Westbourne Road.

12. Can you spot a material holding all the buildings together?

Turn right and cross the railway bridge. Cross Meeting House Lane at the zebra crossing.
Turn left and walk to Lancaster Railway Station, past the entrance, following the footpath up the slope towards Lancaster Castle.

13. Railway footbridge to the left

Can you spot the many simple machines that hold it together?

14. Lancaster Castle was built by lots of castle building engineers who would have used 6 simple machines. They didn't have diggers and cranes. Can you name the 6 simple machines?

15. St Mary's Parade street lighting

Walk up the steps to the Priory. Can you find the strange statue of a lady. Don't lose your head!
Walk past the Priory, with the castle and lady behind you, down through the narrow opening in the wall and down the hill towards the River Lune. Before you get to the bottom, you'll see a sign pointing to the right off the path, to a Roman Bath House.

16. Lancaster's Roman Bath House

Did you spot the material that is holding up all the buildings? It's called cement.
It is a material brought by the Romans who built this bath house in AD71, on the orders of the boss, Quintus Petillius Cerialis.

17. Back to the main path. Choose the steps or the ramp. They are both examples of the same simple machine which makes it easier to go up or down. Do you know the name of this simple machine?

Continue across the cycle path, past the three houses, down the narrow steps to St George's Quay.

18. Lancaster Maritime Museum is on your left.
You can visit, free, if you live in Lancaster. Here you can see a model of the superfast barge, the Water Witch.

Along the Quayside you can see some more of those simple machines used to lift heavy weights more easily. You might even spot some amazing bird engineers, building a home high up under the rooves.

19. Millenium Bridge.

How is it different to other bridges you have seen?
Follow St George's Quay Road under the cycle path bridge, past the old Three Mariners pub. Turn left and cross the Cable Street at the zebra crossing to reach Lancaster Bus Station.

20. Lancaster Bus Station

Engineers make sure you know when your bus will arrive. How?
Real-time displays work by accessing a device on the bus that reports their position to a central system. The system then estimates how long the bus will take to reach all bus stops along the route. These screens show the arrival times of the next bus by counting down the minutes until the bus arrives at the stop.

Walk towards town with the bus station on your left, past the taxi rank towards the YMCA. Walk up *New Street to reach Market Street.*
Turn right past the Sun Hotel to China Street. Cross the road at the crossing. Turn left along China Street and follow your nose.

21 Atkinson's coffee, where you can smell engineering!

Chemical engineers turn raw materials into something useful. That coffee smell is the result of chemical engineering processes. Chemical engineers at Lancaster University are experimenting with creating energy from used coffee grounds.

22. Use the crossing over Meeting House Lane. Along King Street and follow your nose again to Filbert's bakery where more chemical engineering is happening.

23. Leonardini's Gelato

Making ice cream is another example of chemical engineering.
After all that curiosity, looking and thinking, do you think you deserve an ice cream?
Across King Street at the crossing onto Common Garden Street.

24. Car park

How does the car park know your car is there?
Engineers have designed cameras using light sensors, that whatever the angle, day or night, they can scan the car number plates, as they enter and exit the car park.

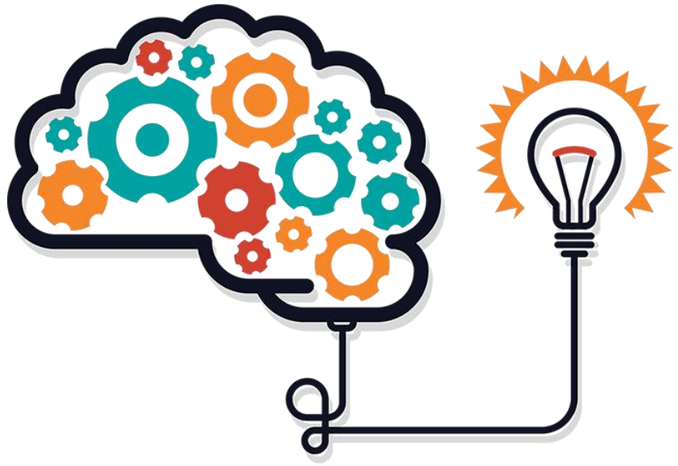
25. Penny Street

Engineers have designed contactless payment in shops.
Contactless credit cards have a chip inside them that emits radio waves. An antenna is built into the plastic to secure the connection with a contactless reader. This is known as radio frequency identification (RFID) technology. Mobile phones and other electronic devices use something called near-field communication (NFC) to transmit data – which is based on the technology used in RFID.

Engineering | Lancaster University

A Discovery Trail around Lancaster, exploring everyday and hidden engineering.

Follow the trail and use your curiosity and creativity in the engineering challenge.



Follow the trail (approximately 2 miles) and discover some of the everyday, and sometimes hidden engineering, around Lancaster. Use your discoveries to inspire your problem solving in the engineering challenge.

Don't go alone. Take at least one adult you know. You can teach them something they never knew before.

Safety by water: remember to stay safe stay away from the edge.

Access: the trail is accessible for pushchairs and wheelchairs. There are ramps to the canal and down to the St George's Quay beside the Maritime Museum or at the Millenium Bridge.

Roads: cross at designated crossings, where indicated. Take care to look both ways, before crossing.