

# Part 1

## Walking the

# Westbourne

*A geological trail along the River Westbourne  
from Branch Hill Pond to the Thames*



# Walking the Westbourne

## ... from the Source to the Thames

*A geological trail along the River Westbourne  
from Branch Hill Pond to the Thames*



**Text by Diana Clements (London Geodiversity Partnership)**  
**Design by Dee McLean Art**



[www.redfrogassociation.org/lost-river-westbourne](http://www.redfrogassociation.org/lost-river-westbourne)



# Introduction

*From its source at Branch Hill Pond the Cannon Stream is joined by the Boundary Stream and several other streams in the Redington Frogal area to form the Westbourne. Further down stream tributaries join the river from both east and west, adding to the flow. In Hyde Park the Tyburn Brook joins at the Serpentine.*

**This geological trail follows the route of the Westbourne from Branch Hill Pond on the edge of Hampstead Heath to its confluence with the Thames close by Chelsea Bridge.**

The Redington Frogal Neighbourhood Forum commissioned Arup to map the lost River Westbourne and its tributaries within the Redington Frogal area. This led to reinstating Branch Hill Pond, the source of the River Westbourne, in 2022. The pond had been painted by John Constable on many occasions between 1819 and 1836, prior to being filled in in 1889.

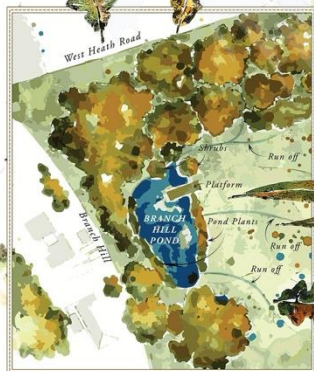
The former route of the River Westbourne is now marked by a series of glyphs at key junctures, wooden bollards with QR codes, and interpretation boards at the junctions of Finchley Road with Heath Drive and Arkwright Road.



*John Constable 1820-1822 showing the spire of St. Mary's, Harrow on the Hill on the right-hand side*



*The view today*



The QR codes link to this geological walking trail from Branch Hill Pond to the Thames. The trail concentrates on the geological processes that dictate the route. Others have written descriptions of the walk focusing on buildings and people along the route, see back cover for details.

The total length of this walking route of the Westbourne is 14.5 km (nearly 9 miles). The Westbourne is the western of three rivers rising on Hampstead Heath that flow into the Thames; the other two being the Tyburn and Fleet. The walk has been divided into three parts.

### Part 1

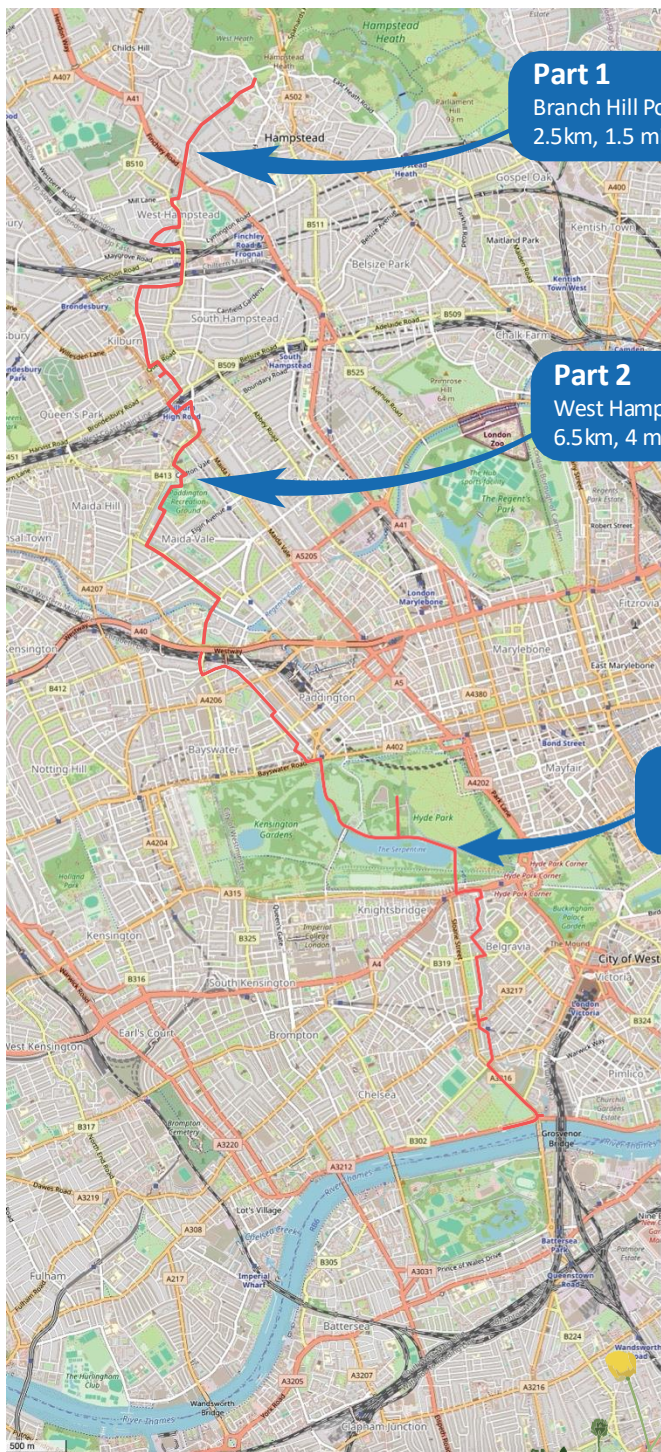
Branch Hill Pond to West Hampstead Station  
2.5km, 1.5 miles

### Part 2

West Hampstead Station to the Serpentine  
6.5km, 4 miles

### Part 3

The Serpentine to the Thames  
5.5km, 3.4 miles

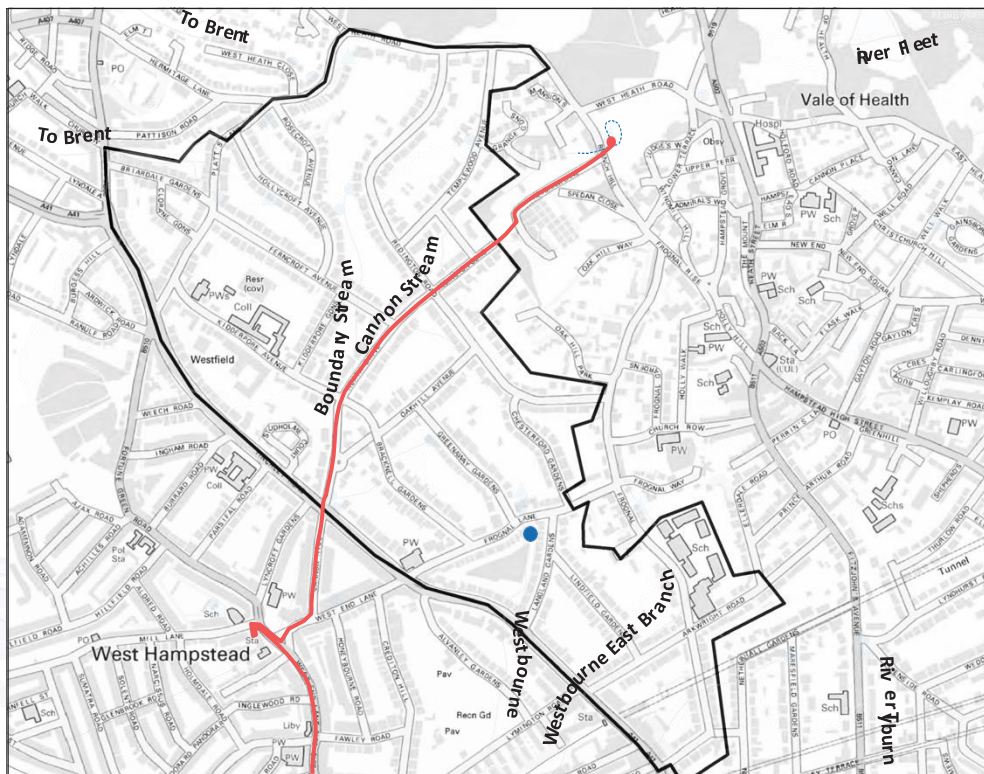




# Part 1

## Branch Hill Pond to West Hampstead Station (1.3km, 0.8 miles)

*The start of Part 1 is Branch Hill Pond (TQ 261 862), Branch Hill, London NW3 6RJ near the junction of West Heath Road and Branch Hill, in the valley approximately 500 metres downhill from Whitestone Pond. From Whitestone Pond to West Hampstead Station there is a steep fall of about 80 metres.*



To West Hampstead Stations

*Geology, Hydrogeology and Street Layout of the Redington Frognal Area (viewable at information boards located in Heath Drive and Arkwright Road)*



|      |          |                |
|------|----------|----------------|
| Key: | ● Pond   | Bagshot Sand   |
|      | ▲ Spring | Claygate Silts |
|      | Stream   | London Clay    |
|      | — Walk   |                |

The Westbourne is fed by water filtering through the Bagshot Formation, a sandy layer, in the valley below Whitestone Pond. It is thought that a spring underlies Branch Hill Pond which is why it often remained a wet area, prior to the reinstatement of the pond. This was a bit of a surprise as it has been proved that the permeable Bagshot Sand underlies the pond allowing any water to run away. The Westbourne will be followed downstream from here.

Anyone familiar with Sandy Heath will know that there are ponds there, also underlain by sand. These were created when Sir Thomas Maryon Wilson excavated the area for sand used in the construction of the new railway line out of St. Pancras in the 1860s.



*Sand digging on Hampstead Heath, 1860s.  
Camden Local Studies and Archives Centre*



*Branch Hill Pond in 2024.  
Photo Redington Frognal Association*

Deeper excavation was prevented by a layer of sand cemented by iron – an iron pan. This impermeable layer also serves to retain water within the ponds. When auguring for Branch Hill Pond, the auger was not sunk to the depth of the ponds on Sandy Heath. However, it is our belief that this pond could also be underlain by an iron pan which allowed springs to erupt at the surface.

Looking towards Whitestone Pond from Branch Hill Pond, it is very obvious that the slope above has been quarried for the Bagshot Sand and many of the pictures painted by Constable also prove this point.

*Virginia Museum of Fine Arts*  
[https://commons.wikimedia.org/wiki/File:John\\_Constable\\_-\\_Branch\\_Hill\\_Pond,\\_Hampstead\\_Heath\\_\(1820s\).jpg](https://commons.wikimedia.org/wiki/File:John_Constable_-_Branch_Hill_Pond,_Hampstead_Heath_(1820s).jpg)



In 2015, Redington Frognal Neighbourhood Forum commissioned Arup to explore underground water features in the area, as part of the evidence base for a policy on underground development. Making use of geology, historic maps and citizen science, Arup's Senior Scientist for Water Environment and Flood Risk, compiled a detailed map of underground water, which has been reproduced for the information boards sited at strategic locations along the route (see also above). One of the objectives concerned flood alleviation and it was suggested that, by recreating Constable's Branch Hill Pond, filled in in about 1889, run off from the Heath would be attenuated, thus reducing surface water flooding further downstream. The idea was taken up by the Redington Frognal Association (which obtained grant funding) and by the City of London Corporation (which owns and manages Hampstead Heath). An added benefit was that that this rather uninteresting corner of the Heath would be enhanced ecologically. Public exhibitions were held at JW3 and Burgh House, so that residents and others could better understand the proposal. Boards were produced by artist, Dee McLean, with input from Robin Lacey, sculptor and designer of glyphs to mark the route of the Westbourne.

*The exhibition boards can be viewed on the Redington Frognal Association website at:  
[www.redfrogasociation.org/project-exhibitions](http://www.redfrogasociation.org/project-exhibitions).*



During a very hot spell in August of 2022, City of London Corporation excavated the pond to a depth of about a metre. But, even before this was finished, a tremendous summer thunderstorm filled the pond. The following year, a deeper area, or sump, was created. This acts as a refuge if shallower areas dry out during hot periods. Puddling clay had been purchased to line the pond (due to the sandy layer beneath) but it seems that when the pond was backfilled in 1889, impermeable London Clay from elsewhere on the Heath had been used. The auger showed this as 'Made Ground', but no tests were undertaken to check its permeability.

In 2023 planting around the perimeter was undertaken by Heath Hands volunteers. A fence was erected, in order to keep out dogs: flea powders given to dogs would destroy the delicate ecosystem and eradicate aquatic creatures.

In early 2024 a large amount of rainfall caused the pond to flood beyond the fence. Although the water was retained within the area, and did not reach the culvert carrying water into the sewer system, much of the planting became submerged and died.



Furthermore, a highly invasive non-native aquatic plant was introduced from a garden pond. Parrot's feather is very hard to eradicate, threatening native aquatic species and often forming dense mats, blocking drainage channels and creating mosquito habitat. If the parrot's feather can be eradicated, native plants to attract wildlife can be introduced. It is of utmost importance that plants or fish from garden ponds are not transplanted into wildlife ponds.



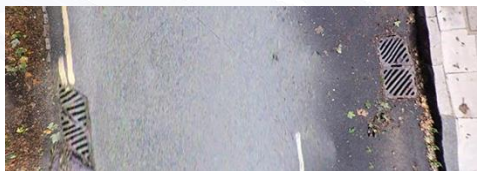
This is the only place on the entire walk where you will actually see the Westbourne now, the rest is lost to the sewer system.

***Go through the opening onto Branch Hill Road and briefly turn right.***

## Stop 1.1

### Gratings on the road on Branch Hill, adjacent to the pond

By peering into the grating, particularly on the east side of the road, you can probably hear water. Any water from the pond area is mixed with road run off. You will observe that this is the low point in the road – always a clue to the routes of the Lost Rivers of London.



*Gratings in Branch Hill above the lost River Westbourne. Redington Frogna! Association, 2025.*

On the pavement opposite, look for a glyph in the pavement indicating the route of the Westbourne and its tributaries through the Redington Frogna! area.



*Glyph designed by Robin Lacey*

***Walk up Branch Hill and take first turning to the right, Heysham Lane which wiggles down to the top of Redington Gardens. Note the bollard with the QR code at the top of Heysham Lane that links to this trail.***

## Stop 1.2

### Brick wall of clinker bricks



Just as you enter Heysham Lane (the passage that leads to Redington Gardens), a long retaining wall of clinker bricks can be seen on your left. We will encounter others en route. These were not desirable bricks and were often used in garden walls. They did not travel far from where the bricks were made and are an indication of local brickmaking. Clinker bricks are a particular feature of the Redington Froggnal Conservation Area and throughout the Froggnal ward.

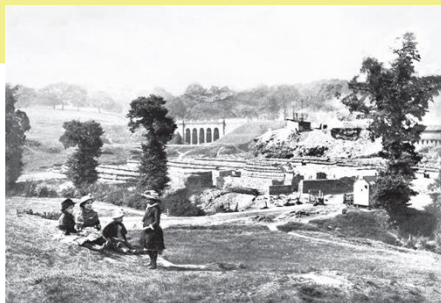
*Clinker brick wall in Heysham Lane.  
Redington Froggnal Association, 2025*

Beneath the Bagshot Sand is a layer known as the Claygate Beds that lies at the top of the London Clay. This is the clay that was used for bricks and it is exposed in a ring right around Hampstead Heath. An examination of geological and other maps often shows exactly where the Claygate Beds were located. In this instance, it is probably from the large brick pits on Hampstead Heath, another of Maryon Wilson's projects to dig up the Heath. His aims were thwarted by the Commons Preservation Society, formed in 1865, and Hampstead Heath Act 1871.

The clay was dug and left to overwinter to break down and destroy the gypsum crystals which are often found in near-surface deposits. Then it was worked by hand, often by itinerant families with the dad as the clot maker, the wife the kneader of the clay, and the children the fetchers and carriers. Organic material was added to the clay, usually ash collected from houses, so that the bricks would become self-firing once initial heat had been applied. Chalk was also added to minimise shrinkage and to prevent the bricks from becoming wonky. The bricks were stacked into low hacks to dry, for about 6 weeks, before being transferred to a large clamp for a further six weeks. Initially, kindling was inserted into the clamp and left to burn for about three days before removal. After this, the organic material completed the process until the clamp was completely cool.

The bricks in this wall are that ones that were overburnt, adjacent to the kindling. The best bricks (malms) were used on the exterior of houses and the less good ones for the interiors, to be covered by plaster. The bricks on the outside were underdone and fired again in the next clamp.

As you walk along the route, look for other examples of over-burnt bricks. The good bricks arising from this method are often yellowish 'London Stock Bricks' so look for these on the exteriors of houses. If you can get close, try to notice the 'squelch marks' as the clay was thrown into the mould. There are also small holes in the bricks, left as organic material was burnt. The holes are often blackened.



*Brick making by the viaduct on Hampstead Heath,  
1860s-1880s.*

*Camden Local Studies and Archives Centre*

***Continue to the top of Redington Gardens***



## Stop 1.3

### Top of Redington Gardens by manhole cover outside Oak Tree House

Here is another opportunity to listen to the water flowing beneath, which is particularly loud after heavy rain. By now, the river is joined by sewage from the houses and run-off from the roads.

A bollard showing an image of the Westbourne glyph and a QR code, linking to this text, has been placed outside Oak Tree House at 1 Redington Gardens, marking this site.

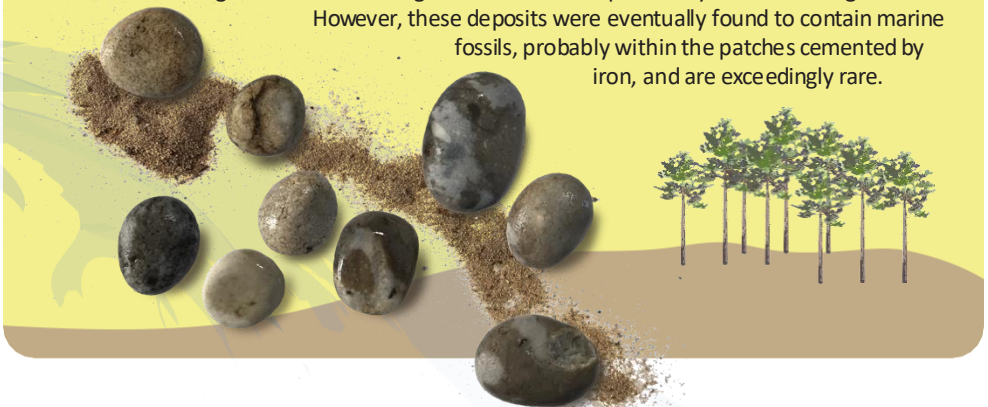
Take a look at the route of the Westbourne when it leaves Branch Hill Pond. It runs under the houses so the exact route of the ancient stream cannot be followed here. In fact, at this point, the water you are listening to is from a small tributary arising to the northeast. According to the geological map, this also appears to start within the Bagshot Sand, but is sufficiently close to the junction to the Claygate Beds and this is probably why springs appear at this point. Notice the notch in the geology made by this small stream.



*The Westbourne can be heard coming from the drain at this point even when it's covered. Photo Arup*

The Bagshot Sand is 50 million years old and is thought to be deposited near a sea shore. It is called Bagshot, as it was first described from the vicinity of Bagshot (Surrey), where it underlies a much greater area than here on the top of Hampstead Heath. The only other places where it can be found in London are: a very small patch on Harrow-on-the-Hill, and further east on the hill tops in Epping Forest and the Havering Ridge.

It probably once covered a considerably larger area, but has since been eroded. For many years, Bagshot Sand was thought to have been deposited by 'The Great Bagshot River'. However, these deposits were eventually found to contain marine fossils, probably within the patches cemented by iron, and are exceedingly rare.



Notice the drains down the middle of Redington Gardens, and later Heath Drive, but do take care of traffic, if you want to listen at these points.

***Follow the route down Redington Gardens. There is another QR code with the link on a bollard at the junction of Redington Gardens and Redington Road.***

## Stop 1.4

### **Junction of the main Westbourne route with the tributary discussed at the top of Redington Gardens**

Glyphs have been emplaced in the pavements to highlight the route of the Westbourne and its tributaries. Look for the one at the junction of Redington Road and Heath Drive. These were designed by artist and sculptor, Robin Lacey, who also assisted in the exhibitions hosted by the Redington Frogna! Neighbourhood Forum. The one here marks the junction of the small tributary, met at the top of Redington Gardens with the main route of the Westbourne. Here it emerges from beneath the houses and gardens to begin its flow down the middle of the road.

*Glyph designed by Robin Lacey*



***Cross over Redington Road and continue straight down the road, now called Heath Drive. When you arrive at Ferncroft Avenue cross the road to the east side of Heath Drive.***

## Stop 1.5

### **Another junction of a tributary from the east**

At this point, another tributary from the east joins the Westbourne. The underground river map drawn by Arup is largely based on the British Geological Survey maps of the 1920s where they show the 'Lost Rivers' (see Introduction to Part 2). The origin of this tributary is shown in Oakhill Avenue, but the geology tells a different story. The notch in the Bagshot Sand implies that it originally arose at that junction, but the spring was no longer visible to the geologist mapping in the 1920s.

The Claygate Beds lie at the top of the London Clay Formation and are composed of alternating layers of silt and sand. Silt is a very slightly sandy form of clay, so another possibility is that the source of this junction is a rather more clay-rich layer than most. They were deposited as the London Clay sea began to shallow upwards, so that the layers at the top (of the total thickness of about 16 m) will be sandier than the ones at the bottom.

***Cross back onto the northwest side of Heath Drive and walk up Ferncroft Avenue to No. 38 (opposite St. Margaret's School).***

## Stop 1.6

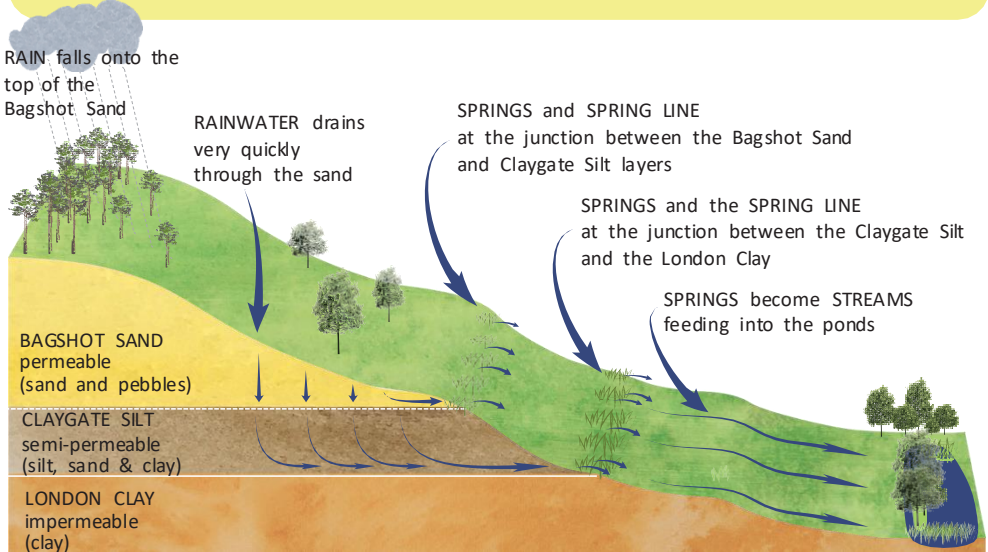
### **Evidence of Boundary Stream found under 38 Ferncroft Avenue (the white house)**

The Boundary Stream is one of a number of minor spring-fed tributaries from near Blacket's Well (behind Rosecroft Avenue) and from Greenaway Gardens. These minor tributaries are likely to have been seasonally flowing and, by the turn of the industrial revolution, already modified somewhat for use as small field ditches or to form boundary hedgerows.

The stream crosses the road at this point. The presence of underground water was confirmed in the past by excavations but the most recent extension to St. Margaret's School found no trace; by now this small tributary had been enclosed in the sewer that runs down the middle of the road. A glyph has been placed to mark the spot. The source of this tributary is certainly the junction with Bagshot Sand and the Claygate Beds.



Wherever there is a change in the geology between a coarser to a finer sand, or a sand to a clay, a spring line becomes a distinct possibility, as the flow of water follows the path of least resistance. The Arup map also shows three ponds that had utilised this tributary. Consideration had been given to “daylighting” a small section of the river higher upstream to promote biodiversity and further reduce the risk of flooding in the area. However, this would harm tree roots and not be practicable.



*Return to the junction of Ferncroft Avenue and Heath Drive and turn right following the route down the hill of both the former river and the sewer that now encases it. Stop at No. 9 Heath Drive.*

## Stop 1.7

### Junction of the Boundary Stream with the Westbourne

The Cannon Stream was a name given to the branch beginning at the former Branch Hill pond, which flowed down the route of the current Redington Gardens and Heath Drive. The Cannon Stream then flowed beside Cannon Hill (providing the name for the stream) before feeding ponds on West End. Outside No. 1-3 Heath Drive a pair of glyphs are embedded in the pavement denoting the junction of the Cannon Stream with the Boundary Stream.

Just a short way further, where Kidderpore Avenue from the west and Bracknell Gardens from the east join Heath Drive, there is a considerable dip in the road. This implies that by now the combined waters must have created sufficient flow to cause the dip. Notice another drain in the middle of the road at this point.

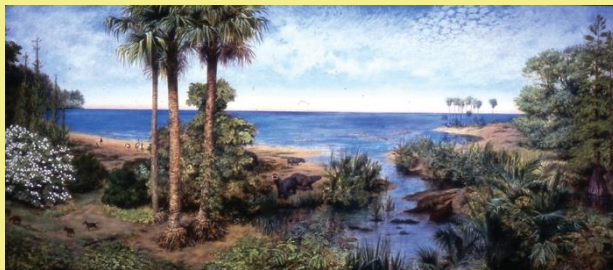


*Drain in middle of Heath Drive. Redington Froggnal Association, 2025*

Here, one is standing firmly on London Clay, which continues underfoot throughout the length of the route to the Thames. However, closer to the Thames, the London Clay is overlain by the considerably younger Thames Gravels.

London Clay was laid down between 54 and 50 million years ago in a sea about 100 m deep when Britain was at the latitude of Barcelona today. The land was far away in the Midlands, and eroded clays were swept into the sea, together with wood, seeds and the bones of land animals, to end up as fossils along with the marine invertebrates, fish and other animals. The best place to find these fossils is on the Island of Sheppey in the Thames Estuary, where a cliff of London Clay is actively eroding. The seeds are particularly useful in telling us about the environment. There are Nipa palms, similar to those found in Malaysia today, as well as flowering plants such as magnolia.

After the extinction of the dinosaurs at the end of the Cretaceous, the small mammals that lived, rather hidden amongst them, evolved rapidly. At Abbey Wood in southeast London there is a fossil pit where mammal bones from the base of the London Clay (now known as the Blackheath Formation), have been discovered. There are tiny hooves of horses, the size of



small dogs, there were early primates and flightless birds as well as carnivores and deer-like animals. All of these were depicted by E. Marsden Wilson.

*E. Marsden Wilson reconstruction  
of the London Clay Environment  
© Natural History Museum,  
London*

***Continue to the Finchley Road, looking out for garden walls with overburnt bricks. The date of 1898 on No. 4 is helpful. This is rather later than the brickpits on Hampstead Heath.***

The BGS map of 1920 (see Introduction to Part 2) shows 'Old Pits' in the London Clay just to the east of Heath Drive. This may well have been the source of the bricks, although it is less clear why the pits were in the London Clay. One explanation could be that this is where the bricks were being manufactured (as opposed to digging clay), with clay extracted from the Claygate Beds from a little higher up the slope; this needs more research. Tunnelling of the railway under Hampstead Hill may be a more likely source of the clay. London Clay is less suitable for brickmaking than the Claygate Beds, as it does not contain sand, which needs to be imported and added to the mix. However, London Clay, extracted from tunnels, was used for bricks in many areas, eg Copenhagen Fields (from tunnels at King's Cross) and along the Archway Road (from the cutting higher up the hill).

*Clinker brick wall at 4 Heath Drive.  
Redington Frognaal Association, 2025.*



## Stop 1.8

### Junction with Finchley Road

An interpretation board with a geological map and the lost rivers is sited at the junction. At this point, another tributary from the east joins the Westbourne. This time the source is the junction between the Claygate Beds and the London Clay, where there had been ponds, one at the source and two more at this junction of Heath Drive and Finchley Road.

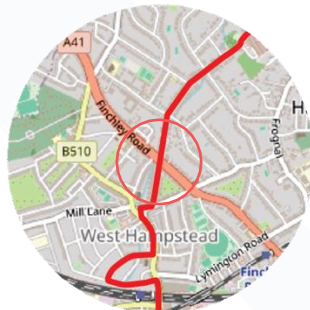


The map shows three other tributaries that cross Finchley Road to the east of the main walking route. Where the tributary at Arkwright Road crosses, there is another interpretation board. Both boards incorporate a QR code linking to this description of the route of the Westbourne from Branch Hill to the Thames. In addition, there are three bollards with QR codes along Froggnal: by Church Row, by Froggnal Way and at the junction with Arkwright Road. This branch of the East Westbourne rises high up the hill at the edge of the Bagshot Sands. The other two are lower down, at the junction of the Claygate Beds and London Clay, the source of the so-called 'sweet water'. The iron-rich water emanating from the Bagshot Sands was the source of the Chalybeate waters that made Hampstead a Spa Town in the 19th century.

*The Chalybeate Well, now in the street in Well Walk*

### Cross Finchley Road and continue down Cannon Hill

Peer into Finchley Road to notice that this is the low point. This is where the Westbourne crosses the road to run under Marlborough Mansions on the north side of Cannon Hill. This junction is an area that had often been flooded but, as far as we are aware, there has not been a flooding incident since the reinstatement in August 2022 of Branch Hill Pond.



*Flooding at junction of Heath Drive and Cannon Hill, 24.9.19. S. L. Harrison*

24 September 2019 – junction of Heath Drive and Cannon Hill



### Cross Finchley Road and continue down Cannon Hill



## Stop 1.9

### Cannon Hill



The contours suggest that the Westbourne diverts slightly to the right fairly near the top of Cannon Hill, under the Mansions to reappear at West End Green. When walking this way in 2023, sand bags were in place at the top of the steep steps to the basements of the mansions. It is obvious that they suffer from flooding, but whether the cause is road run-off or the river running under the mansions is not known.

*Marlborough Mansions protected by sand bags. Redington Frogna! Association, 2023.*

***At the bottom of Cannon Hill turn right to the triangle of green known as West End Green.***

## Stop 1.10

### West End Green

By now, the Westbourne has graduated from a stream to a brook according to the BGS 1920s map. The brook crosses the middle of the green at the low point to disappear under the fire station. A drinking fountain in the centre of the green is appropriately placed, as it was probably a local tradition to take the water from the river, prior to being hidden underground. Would this be an appropriate place to 'daylight' it again here now, in the form of a small elongate pond? Not of the water itself, but as a visual record of where it once flowed.



*West End Green drinking fountain. Redington Frogna! Association, 2025.*

This is another area that has been severely affected by flooding in the past, but in 2025, has not been overwhelmed since the pond at Branch Hill was reinstated.

Interestingly, Crutchley's New Plan of 1835 shows a pond here (as well as Branch Hill Pond) but no hint of the Westbourne between the two ponds.



*Flooding in West End Lane, 24.9.19. S. L. Harrison*

***From West End Green the route of the Westbourne flows under the Fire station but it is worth taking a detour to the road opposite called Mill Lane.***

## Stop 1.11

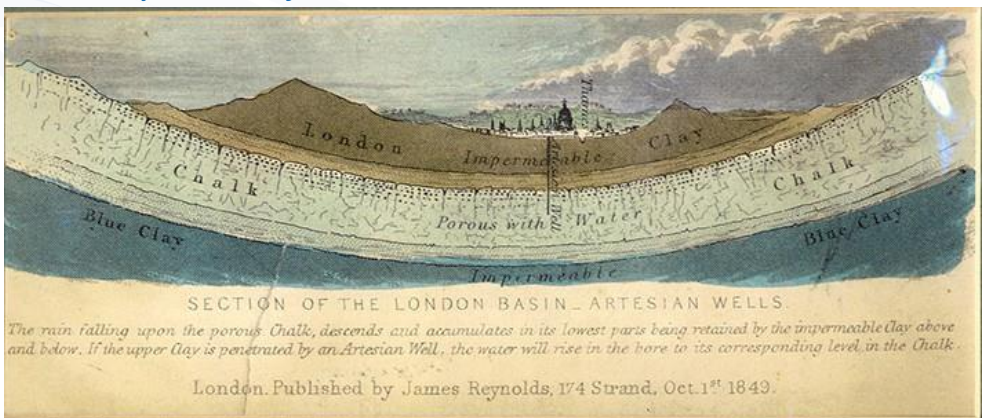
### Mill Lane

It could be supposed that Mill Lane had once been the site of a water mill and, given the proximity to the Westbourne, it would be nice to think that it stood at about the junction with West End Lane. Research indicates that, instead, the road's name derives from a windmill at the other end of Mill Lane where it joins the Kilburn High Road. The windmill burned down in 1861 and no watermill has been located at this point, neither on Rocque's map of 1746 nor other early maps or images. A small meadow to the left dips down and a curiously-shaped building within it is reminiscent of a mill. It is worth entering the meadow to view the building and experience the low point.

***Return to West End Lane, walk past the Fire Station to a right turn named Inglewood Road. The Fire Station was only founded in 1901 and so is unlikely to have been placed in this position in order to draw water from the Westbourne. Following the dip of Inglewood Road and Pandora Road you are walking down the slope of the east bank of the Westbourne until the low point on Sumatra Road is reached. This is where the Westbourne had flowed. Look for gratings in the road where you can hear the water. At this point, the numerous railways have completely obliterated the route forcing one to turn sharp left along Sumatra Road to climb the bank again to join West End Lane near the railway bridge. Close to the junction, the road name Sandwell Road may have a watery connection. When boreholes were sunk for water, they would reach the Thanet Sand, before the main objective of the Chalk aquifer (which underlies London) was reached. Occasionally, fountains of sand would emerge in a dramatic way, perhaps alluding to the road name's origin. However, it is believed that this road may be named after the Sandwell district in the West Midlands.***



A strange-shaped building at the low point near Mill Lane. Photo D. Clements



Reynolds 1849 section showing an artesian well

*Before reaching West End Lane take a pause to look at the railway where the fence is low.*

## Stop 1.12

### Railway Bridge

**(North entrance to Thames Link on the corner with Sumatra Road/West End Lane)**

Looking at the mass of railway lines below, it is hard to imagine this was once a quiet, tranquil spot with a river running lazily through it. Now the river runs in its sewer beneath all three of the railway lines.

The steep incline of Part 1 gives way to a flatter area for a short while until the slope increases again down to the Kilburn High Road.



*Portion of John Rocque's map of 1741 showing the Westbourne flowing through the Fields from West End. This area is now obscured by the railway. Note that Mill Lane was named Shoot up hill Lane and there is no hint of a mill at this date.*

*Reproduced with the permission of the National Library of Scotland*

## Stop 1.13

### Stop 1.15 and finish of Part 1, West Hampstead Stations, West End Lane



West Hampstead provides many refreshment opportunities and, should you wish to walk the Westbourne a part at a time, this would be a good stopping off point. It is well served by public transport.

***To continue the walk go to:***

## Part 2

West Hampstead Stations to the Serpentine  
6.5km, 4 miles →