

London Tideway Tunnels

Modernising London's Sewerage System

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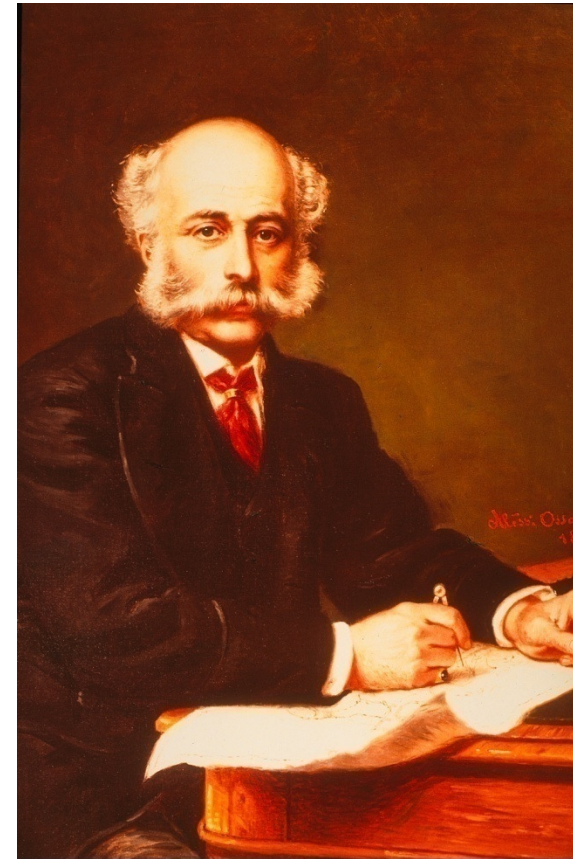
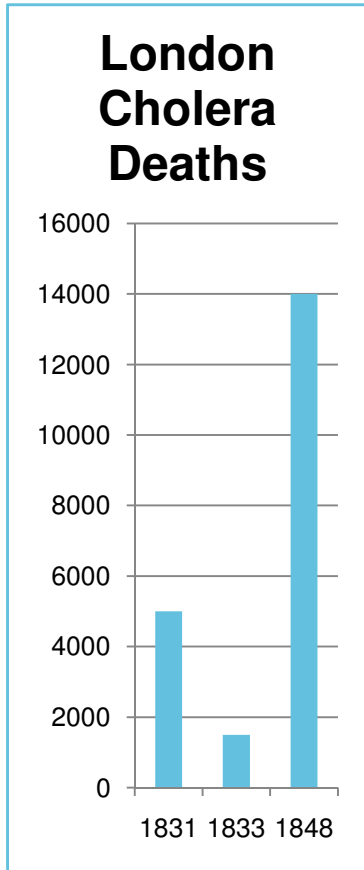


The Background to London's Sewers

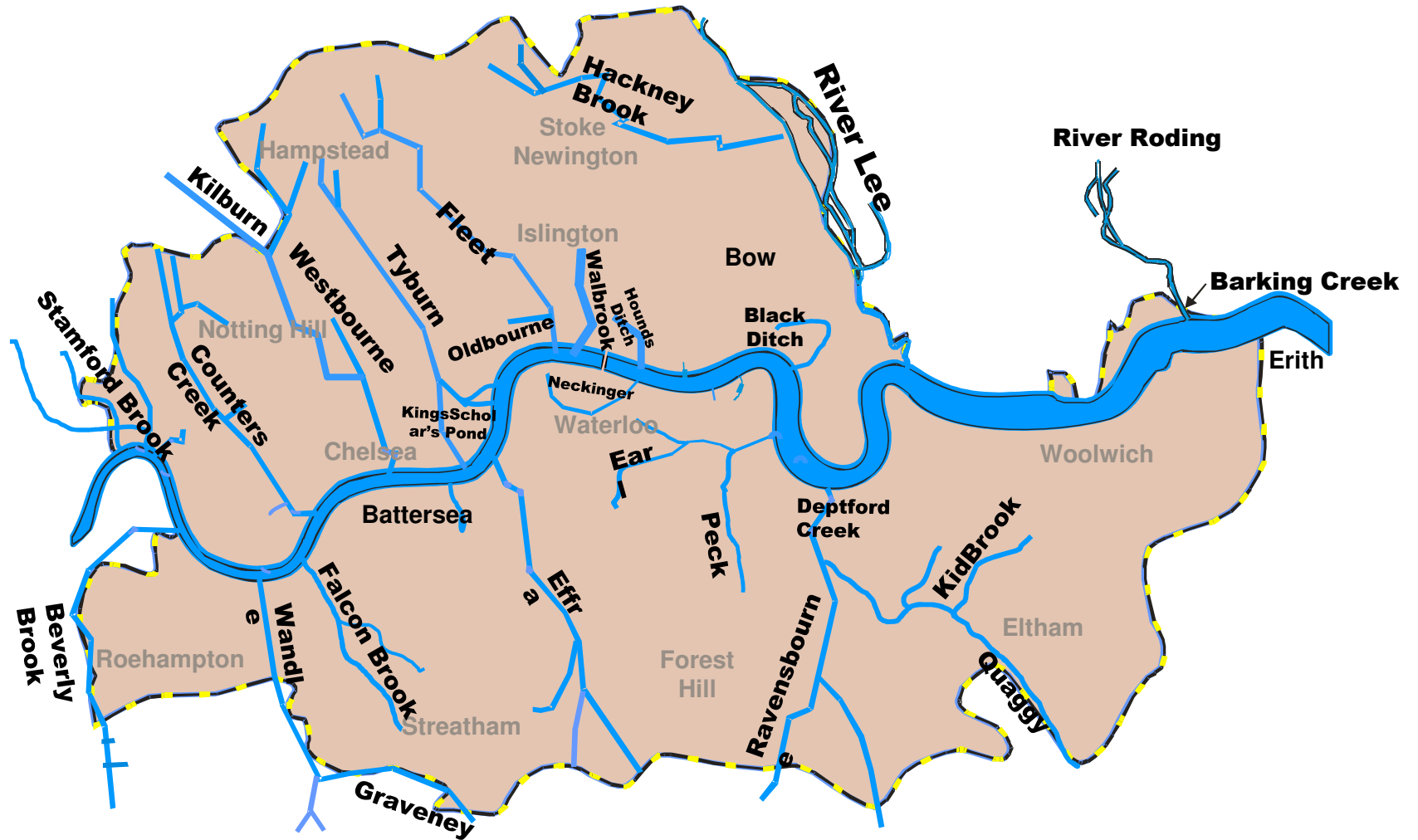


1848 – Cholera deaths peak In London

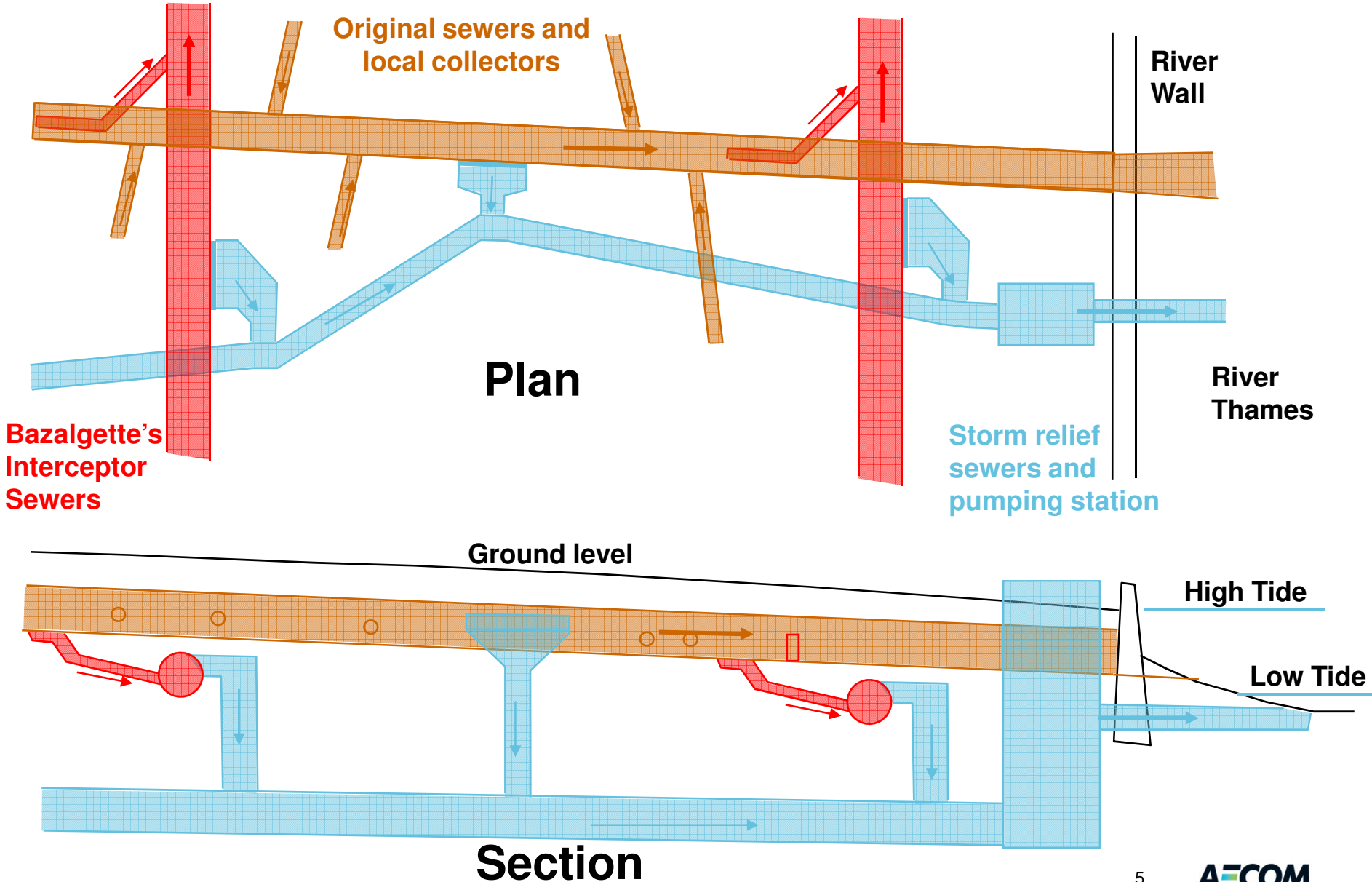
1858 - The Great Stink – Parliament suspended



“Lost” rivers of London



London's Sewers - Evolution and Complexity



Intercepting sewers



1859 – 1865 Construction of Bazalgette's new interceptor sewers

Northern Outfall Sewer



Sewer tunnels



The Victorian legacy



London Tideway Tunnels
Creating a cleaner, healthier River Thames

After 150 yearsan Upgrade is Required



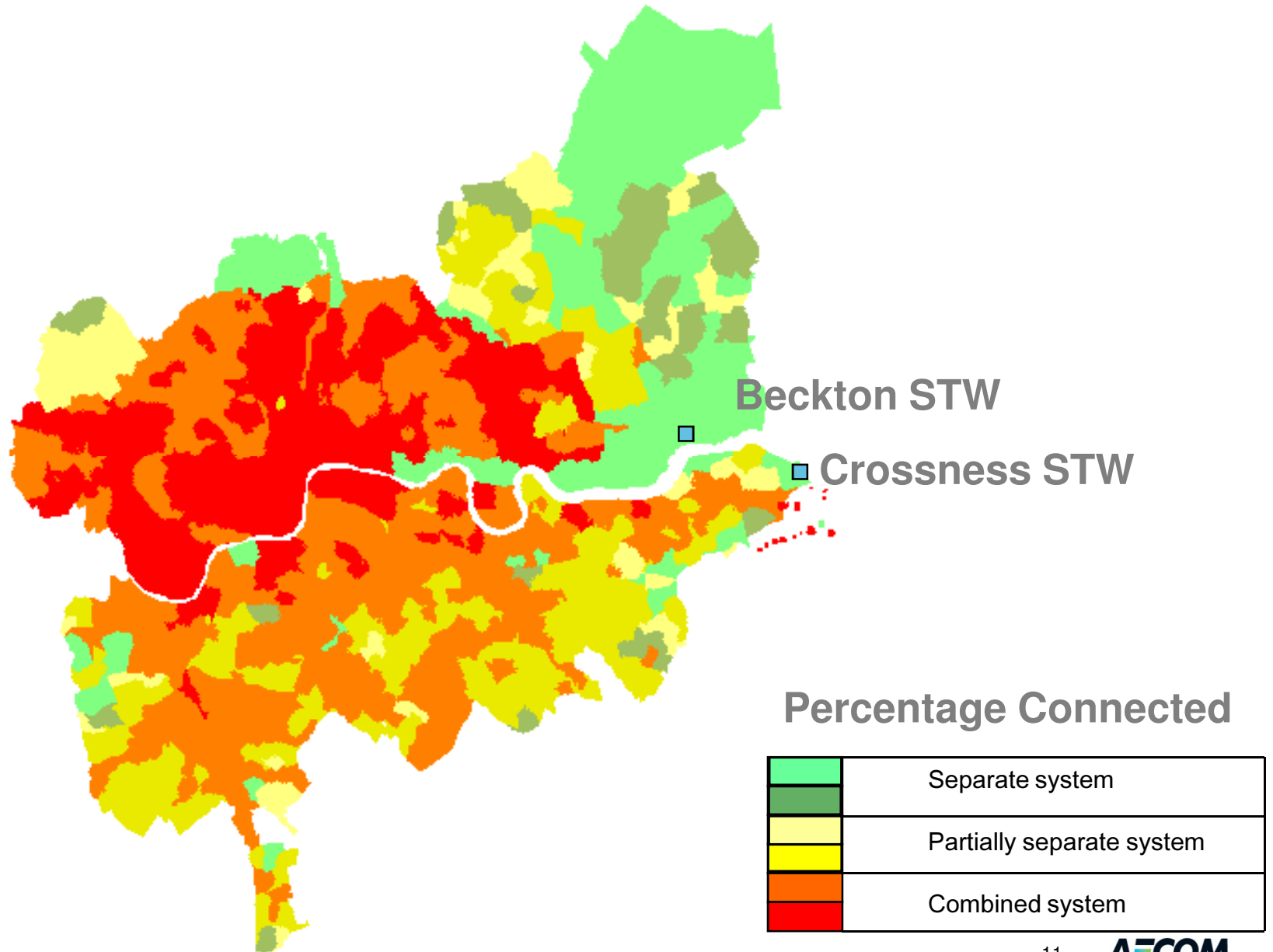
Urban Wastewater Treatment Directive

Environment

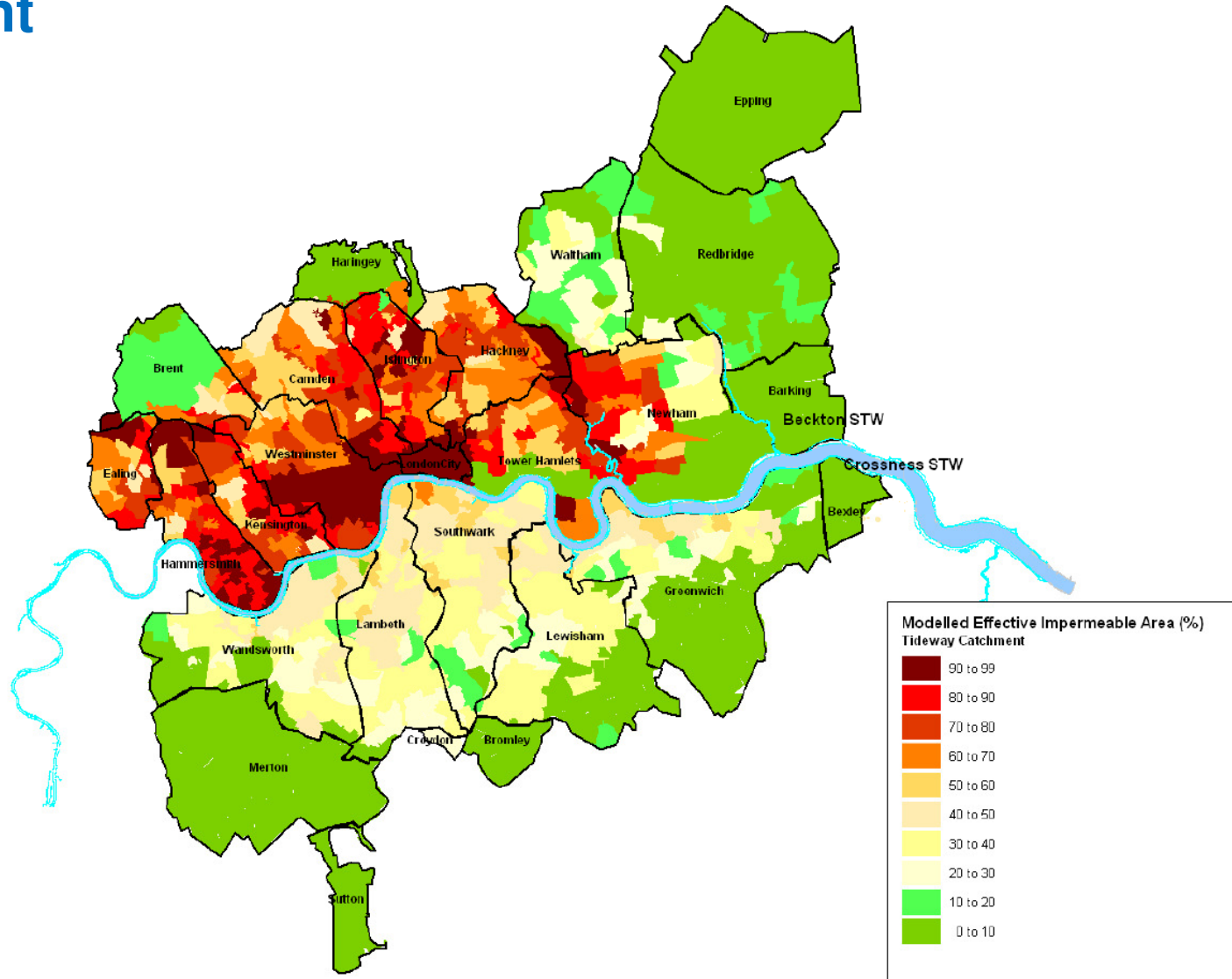
EUROPA > European Commission > Environment > Water > Urban Waste Water



London's sewerage system today – mostly combined

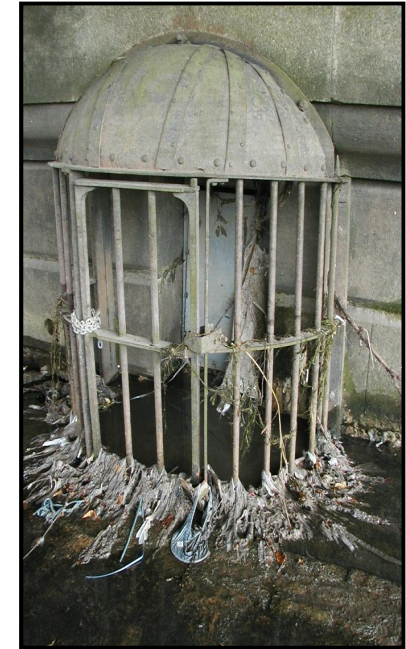


Distribution of impermeability in the Thames Tideway catchment

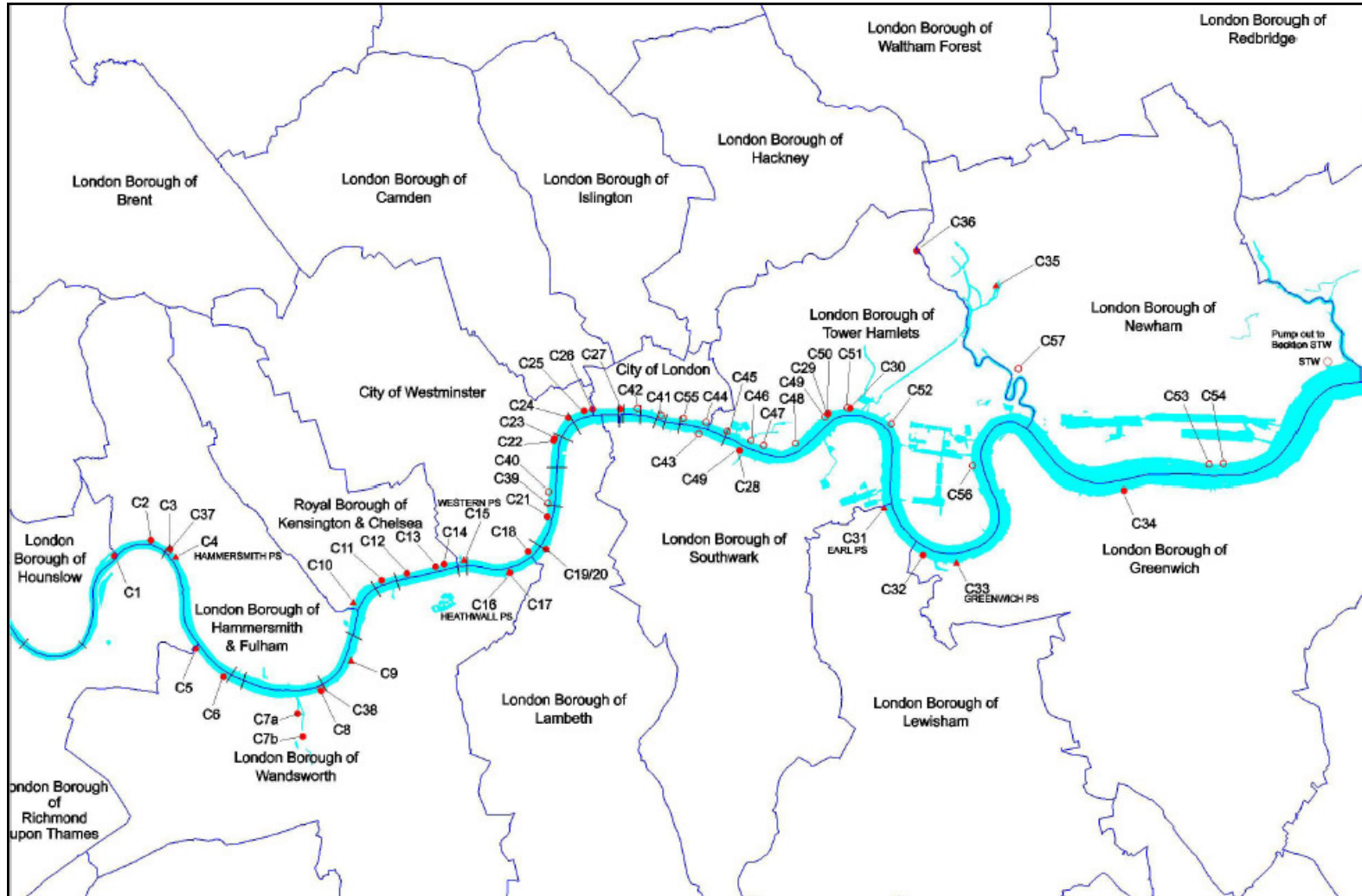


Combined Sewer Overflows (CSOs)

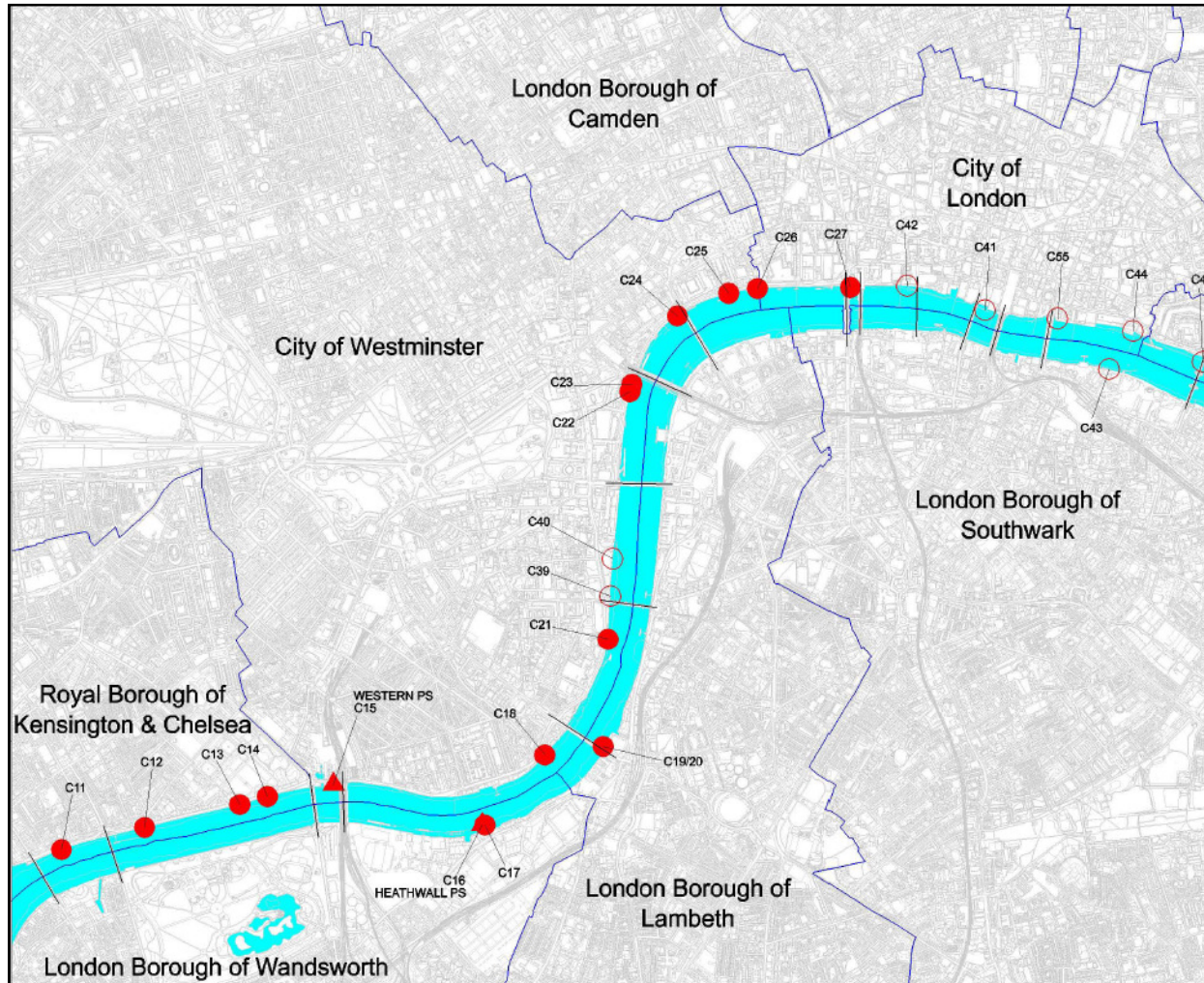
- Sir Joseph Bazalgette's sewerage system constructed with 57 CSO points along the tidal River Thames.
- CSOs prevent flooding to buildings and streets by diverting excess sewage into the river when full to capacity after rainfall.
- On average, in excess of 32 million tonnes of untreated sewage is estimated to be discharged annually.
- Discharges occur more than once a week on average.
- Many sewers run 80% full on dry weather flow
- As little as 2mm of rainfall can trigger a discharge.



57 existing Combined Sewer Overflows



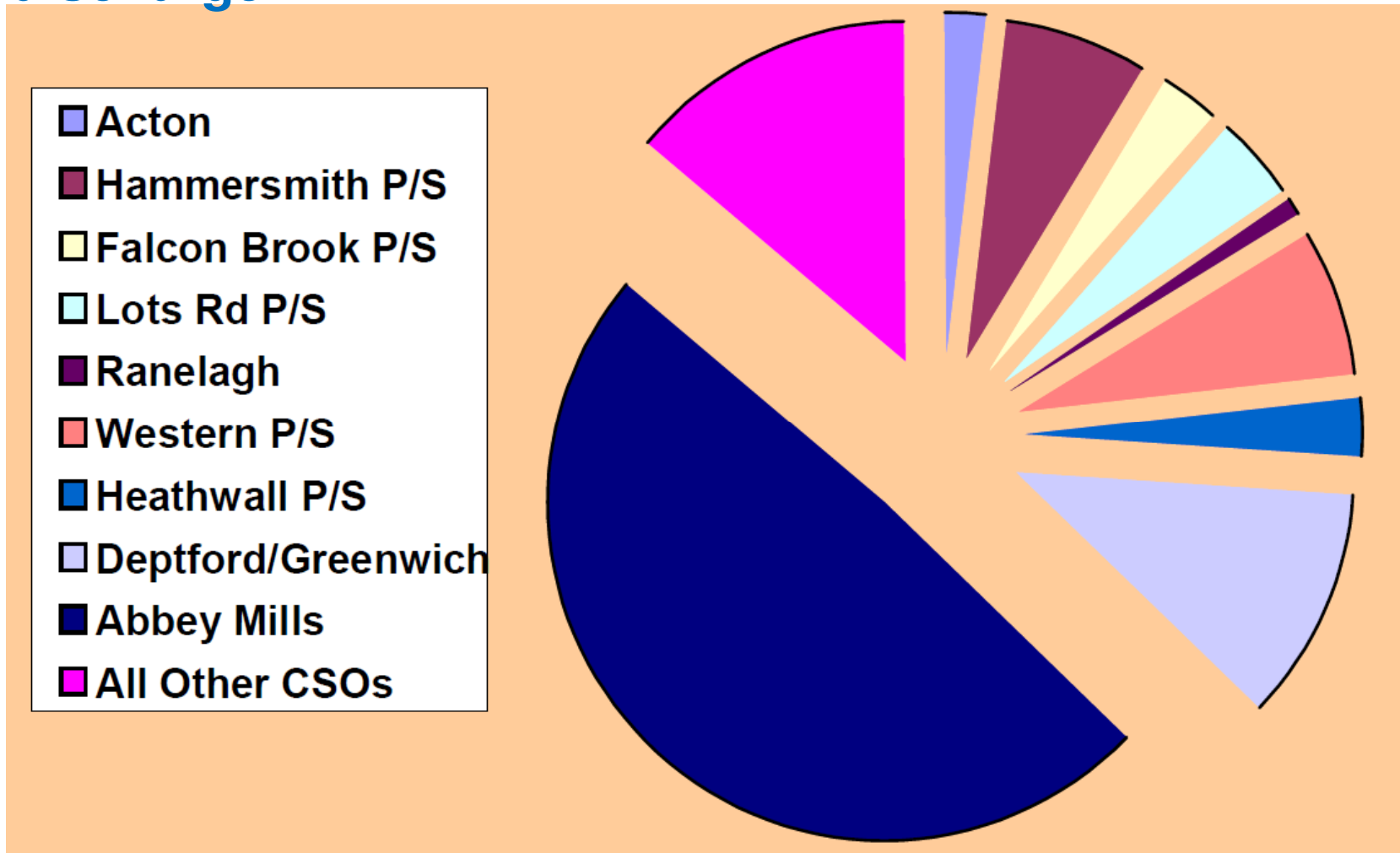
Existing Combined Sewer Overflows



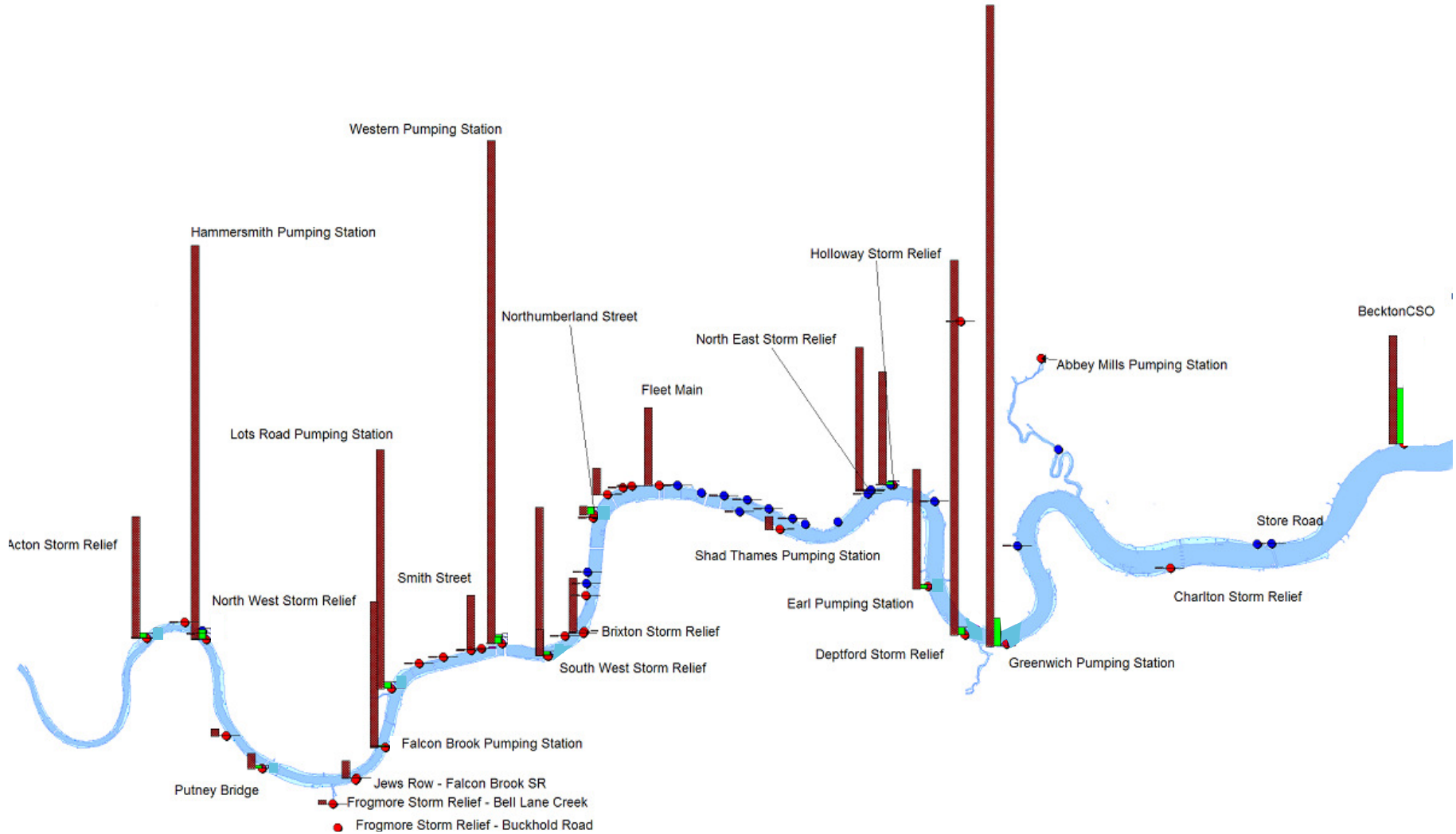
Discharging CSO



London Tideway Tunnels - CSOs proportion of discharge



Thames Tunnel CSOs proportion of discharge



Increasing recreational use of River Thames



Headline news

THAMES FISH IN POISON DISASTER

Thousands killed as big storm forces raw sewage into the river



The Guardian Thursday August 5 2004 11

Storms kill 10,000 fish in Thames



The Solution

The London Tideway Tunnels

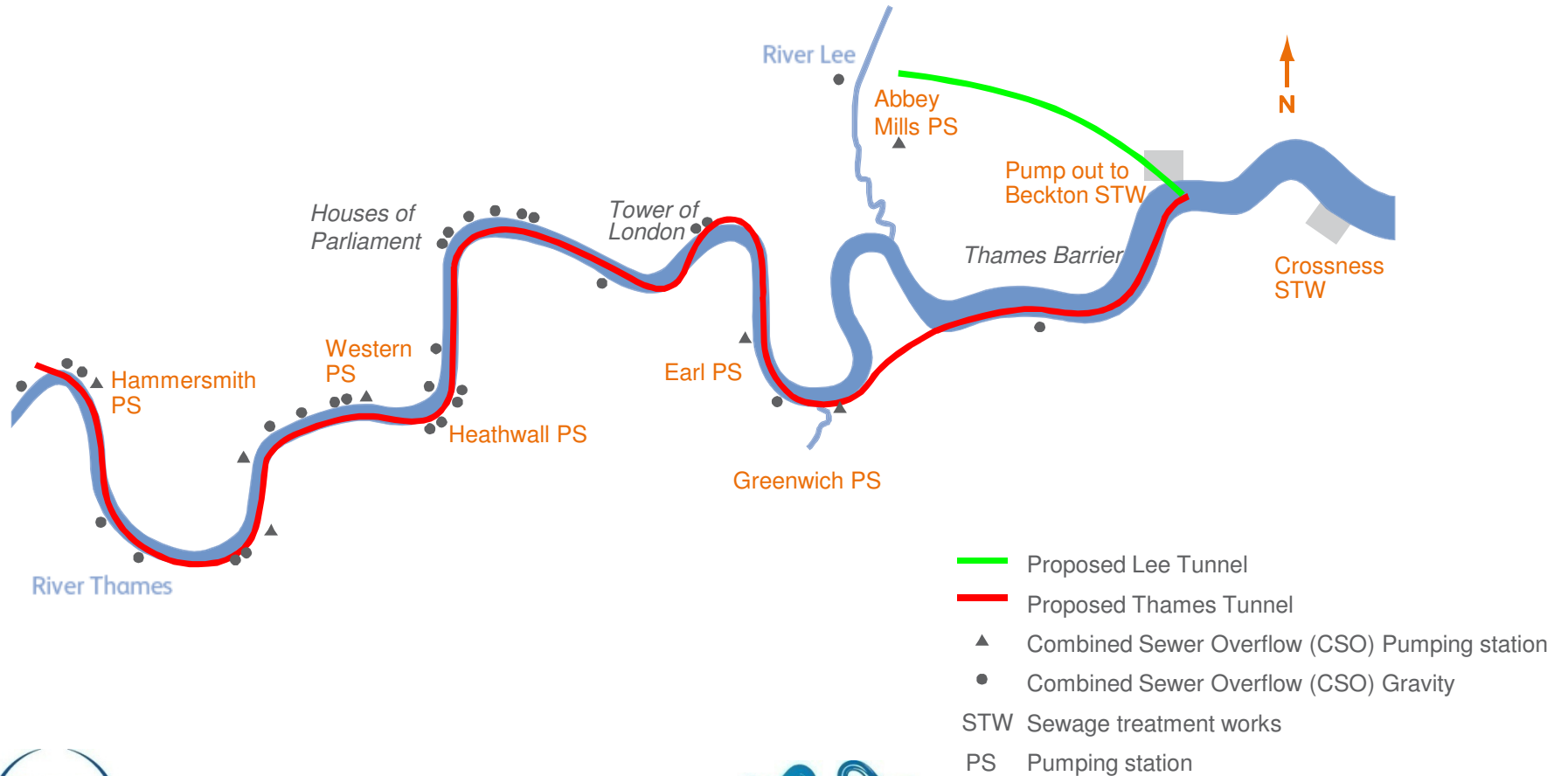


Solutions?

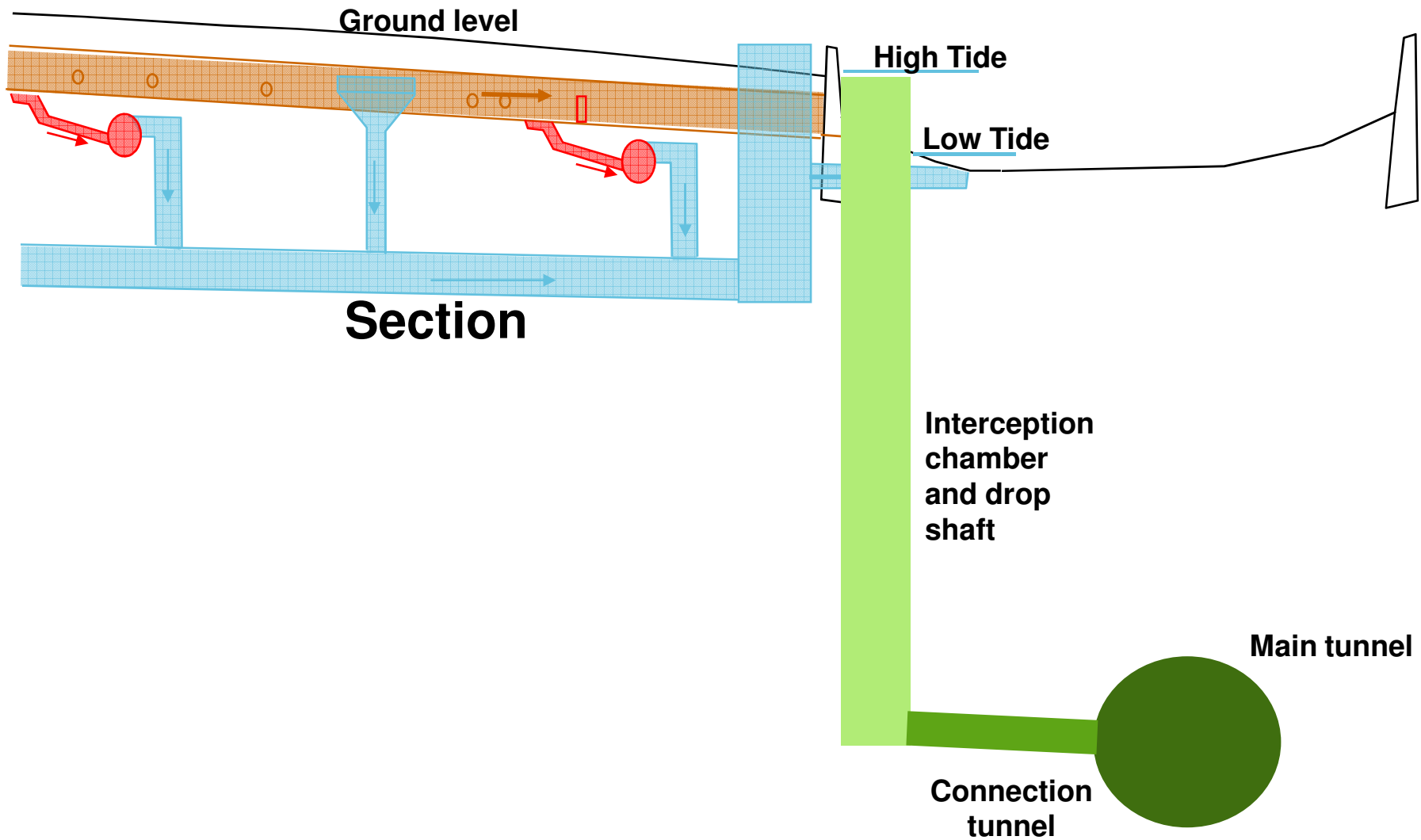
| | |
|---|-------------------|
| <p>Action before sewer: Source Control & Sustainable Urban Drainage Systems (SUDS)</p> | <p>NO</p> |
| <p>Within sewer network: Localised storage & separation.</p> | <p>NO</p> |
| <p>In-river: More 'Bubbler' & 'Skimmer' vessels.</p> | <p>NO</p> |
| <p>Intercept overflows: central storage & transfer.</p> | <p>YES</p> |



The Thames and Lee tunnels Option 1c



CSO Interception



London Tideway Tunnels

Lee Tunnel

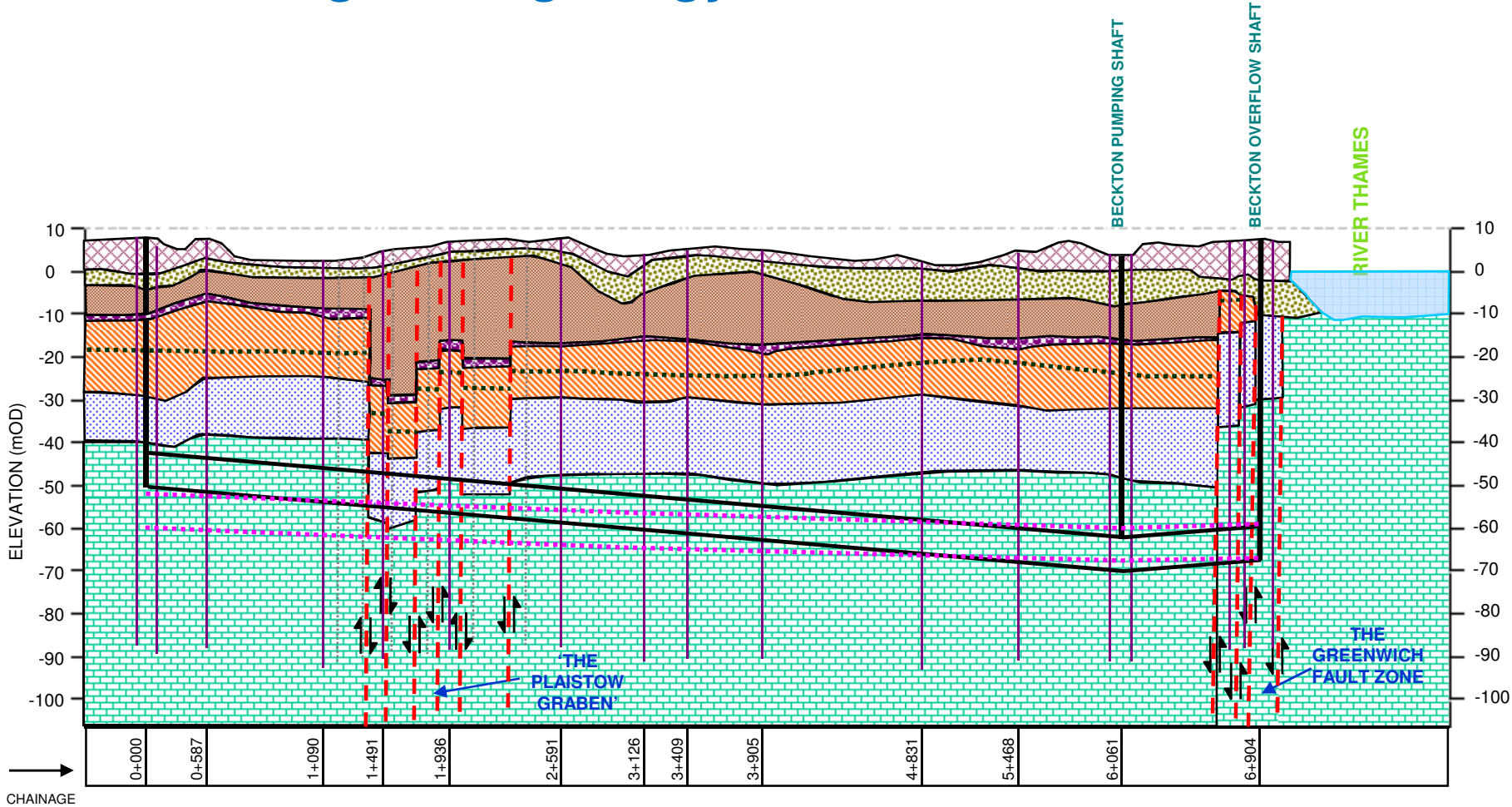
- 6.9km tunnel from Abbey Mills Pumping Station to Beckton STW.
- £400m project. Largest single contract ever awarded by Thames Water.
- Will intercept 16 million cubic metres of storm sewage that currently makes its way into the River Thames.

Thames Tunnel

- 32.2km (20 mile) tunnel from west London to Beckton Sewage Treatment Works.
- Starting point still to be determined, major shaft sites and combined sewer overflow connection points required.
- Planning application to be submitted 2011.
- Construction not expected to start until 2012/13 for completion by 2020.



Lee Tunnel - general geology



KEY TO GEOLOGY

| | | | |
|--|-----------------------|-----------------------------|-------------------|
| MADE GROUND / ALLUVIUM | RIVER TERRACE GRAVEL | LONDON CLAY FORMATION | HARWICH FORMATION |
| LAMBETH GROUP | THANET SAND FORMATION | WHITE CHALK SUBGROUP | |
| POSITION OF MID LAMBETH GROUP HIATUS | | —— BOREHOLE AND DESIGNATION | |
| GEOLOGICAL FAULT | | (PHASE 1, PHASE 2) | |

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**Thames Tideway
Lee Tunnel**



**Beckton Pumping Station
Animation**

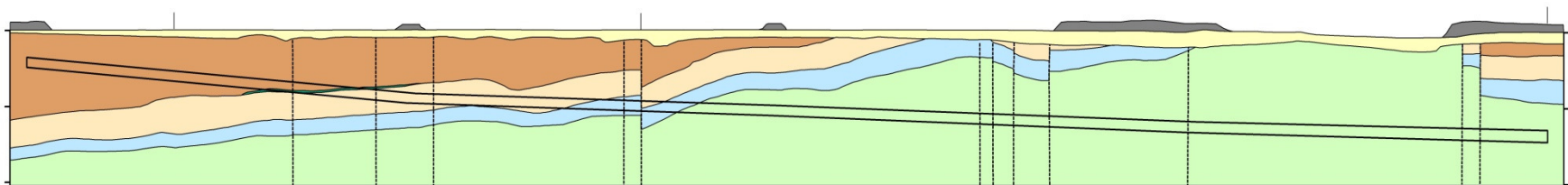
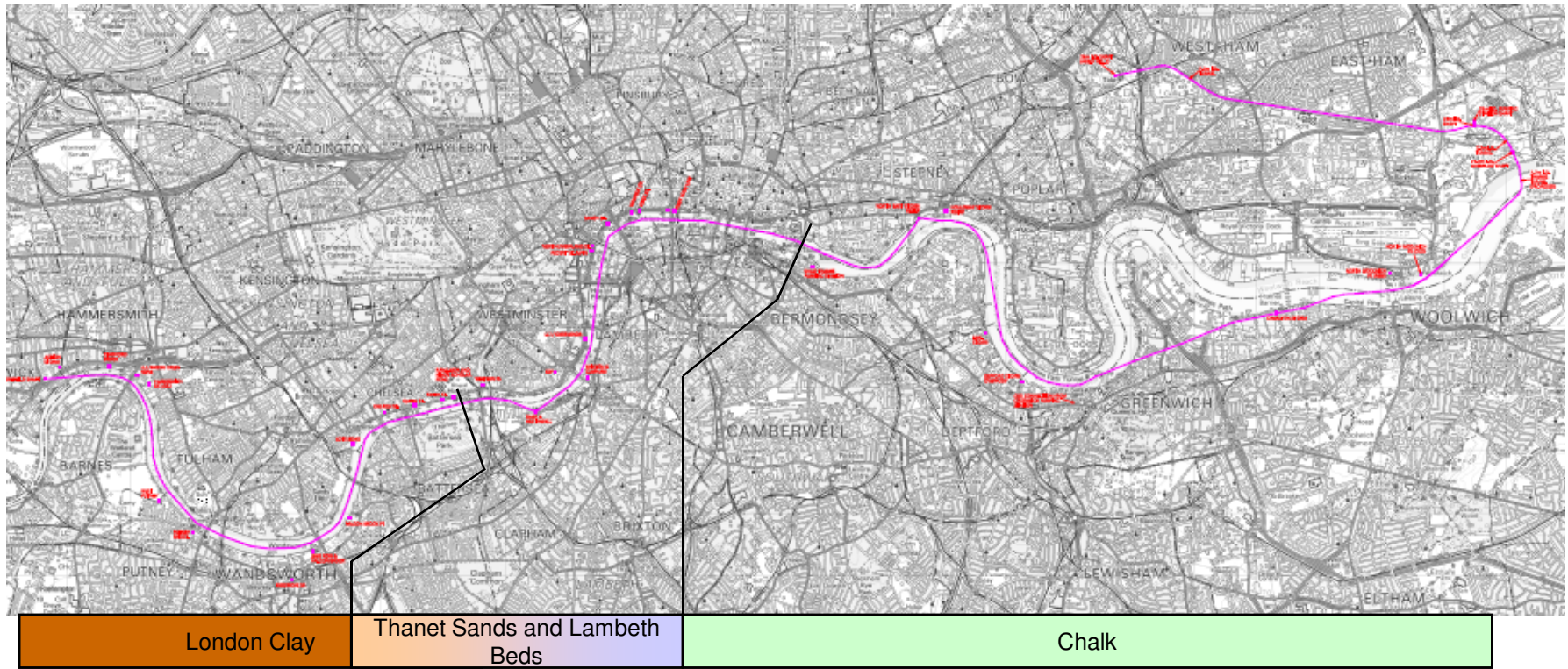
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**Thames Tideway
Lee Tunnel**



**Beckton Pumping Station
Animation**

Thames Tunnel – ground conditions



Tideway Tunnels – 8.8m OD tunnel boring machine (TBM)

Technical challenges

- Tunnel-to-tunnel connections beneath river
- Lining durability - 150 yr design life
- Transient pressure waves
- Aquifer protection
- Proximity to other tunnels
- Settlement impact on third parties
- Construction logistics: 80m water pressure through chalk/very long drives



Earth Pressure Balance Machine

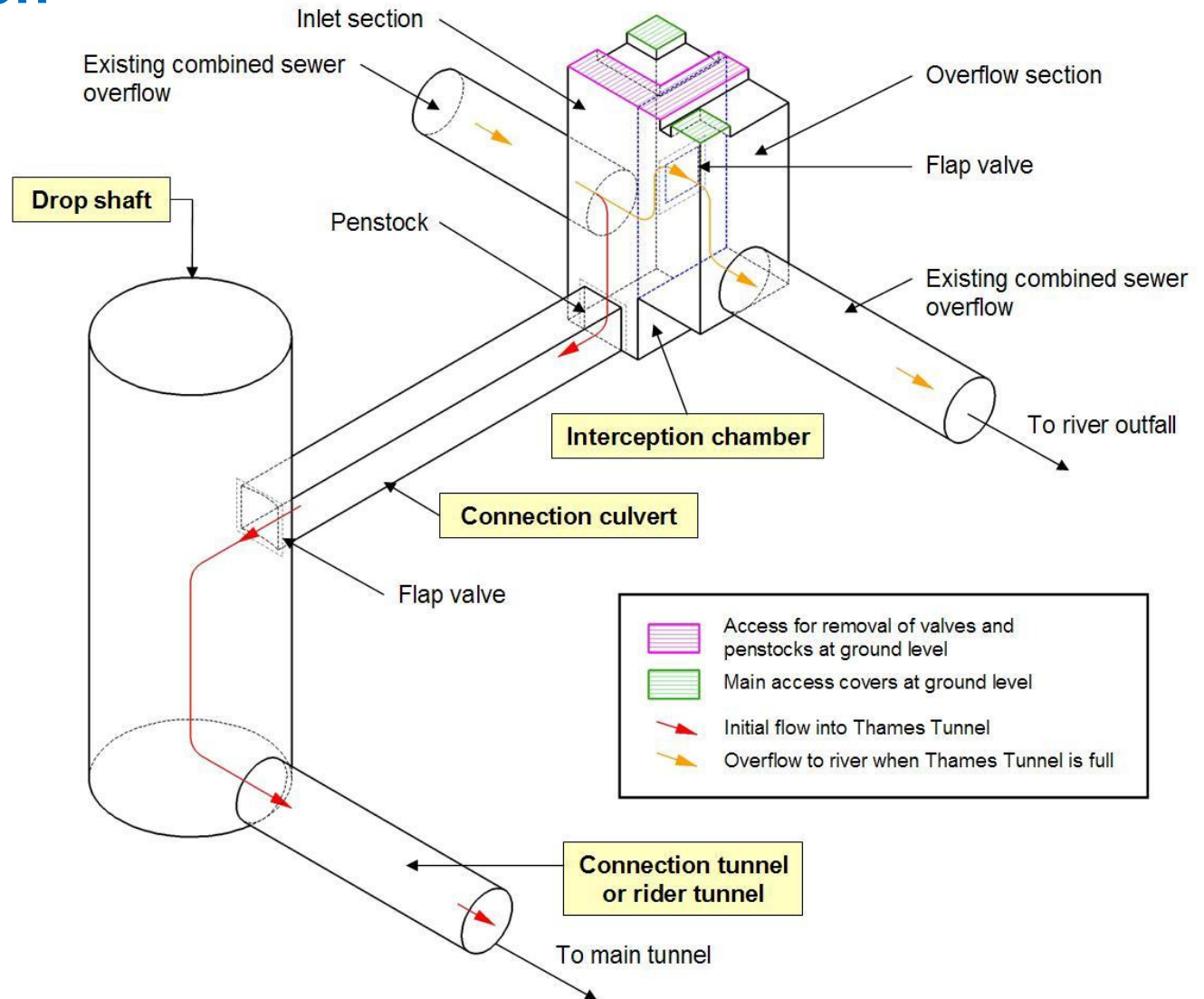
Ground investigations



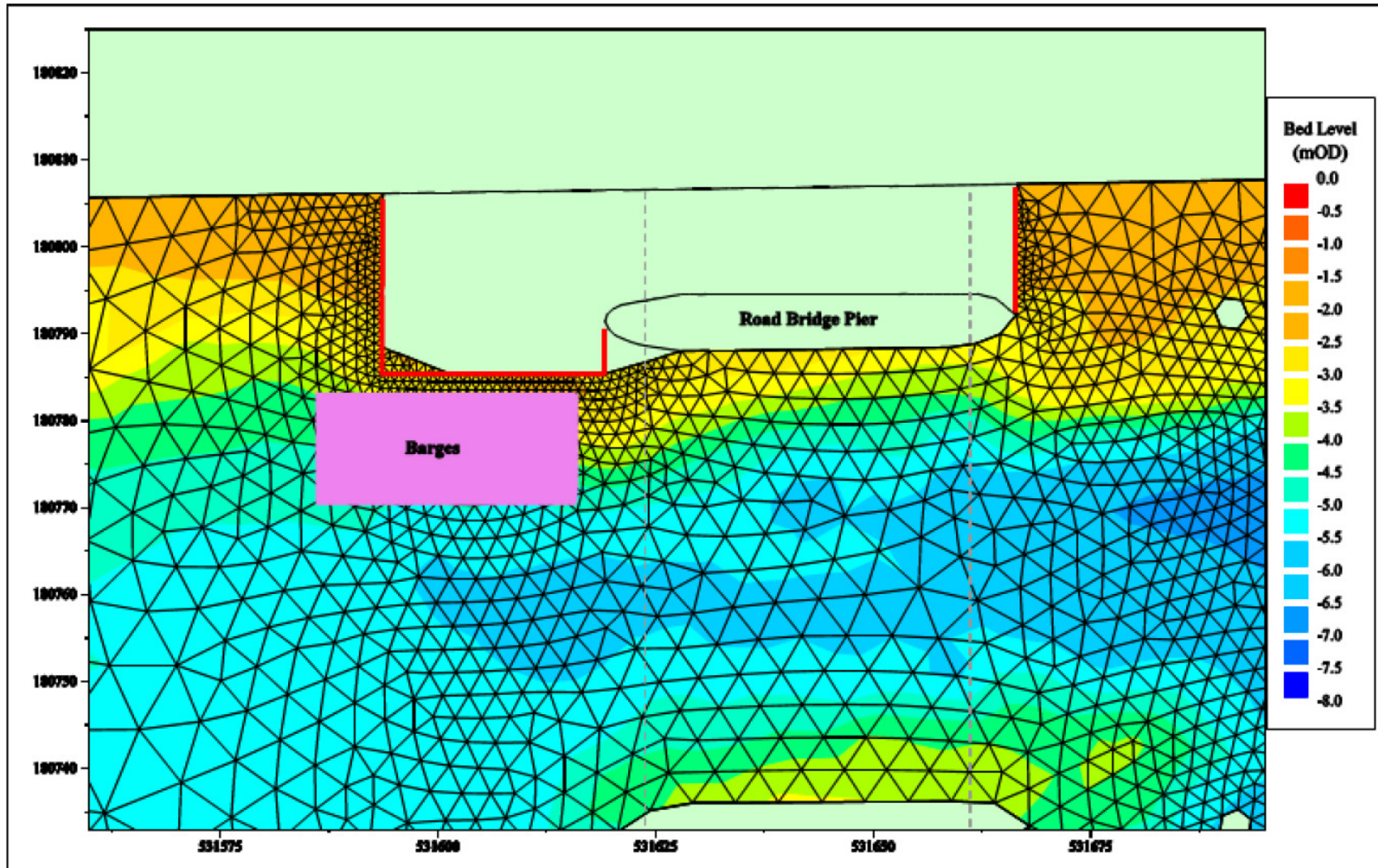
CSO interception

Challenges

- 34 CSOs
- Up to 60m³/s
- Up to 30m dia shafts
- Up to 75m deep
- De-aeration
- Air release
- CSO interception in river or busy London Streets



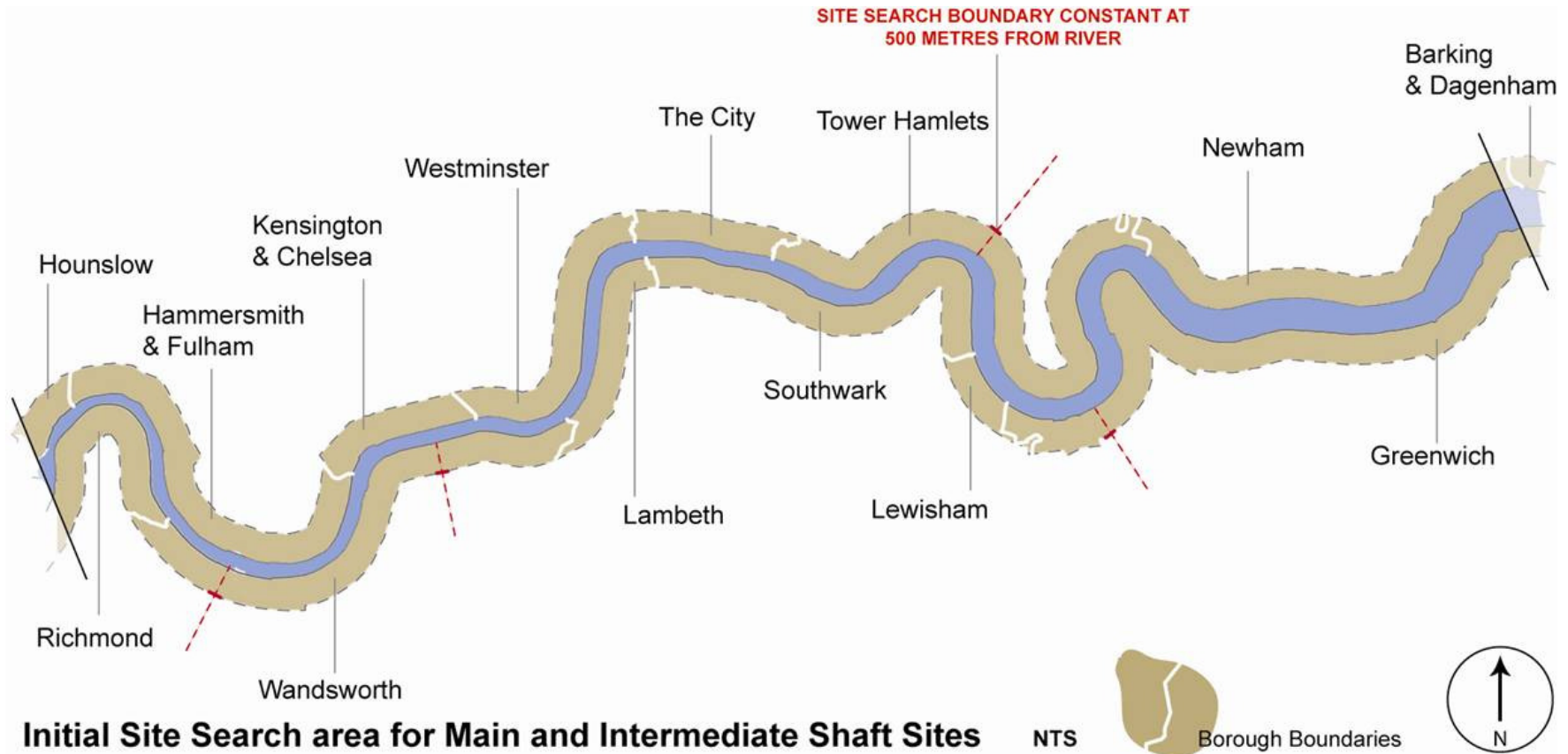
Assessment of fluvial impact of works



Operation and maintenance - purpose made inspection vehicle in Milwaukee sewer tunnel



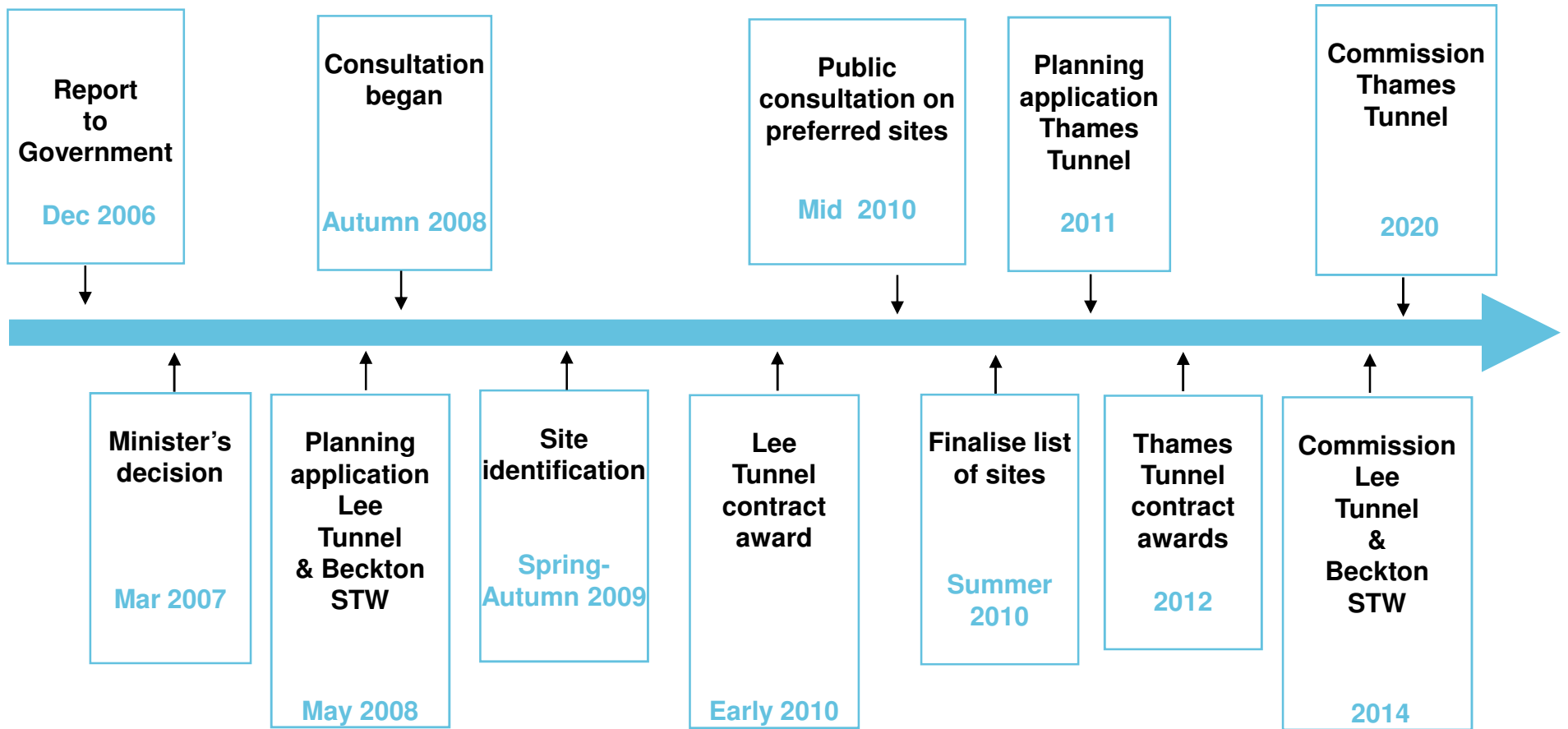
The search for shaft sites



Consultation



Timeline



Thank You
Questions?

