

# Executive Summary & Key Insight Documentation

**Option:** [NOT A REAL PROJECT]

**Date:** 2026-09-03

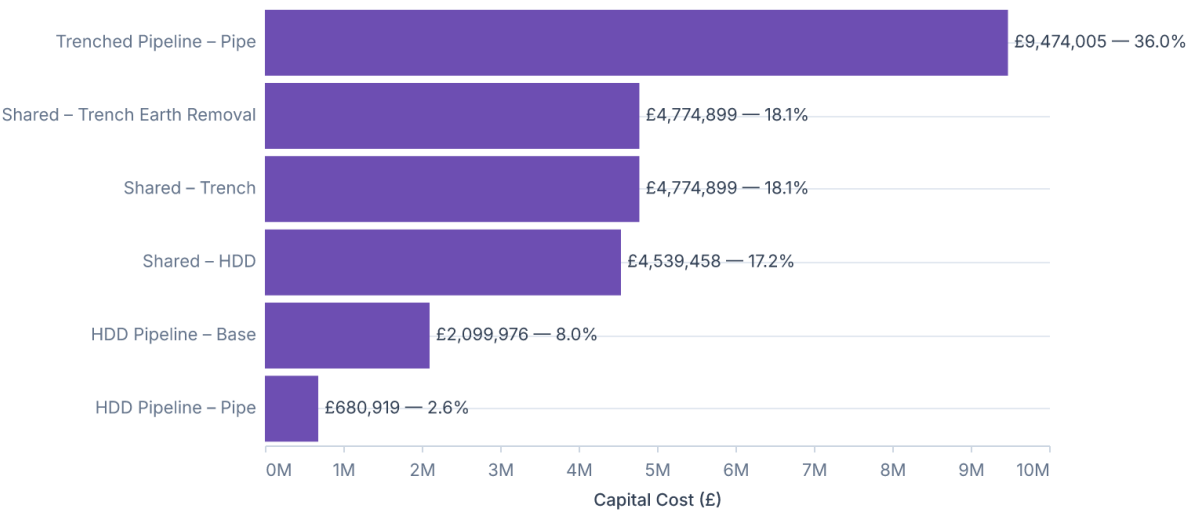
## 1. Summary

The [NOT A REAL PROJECT] pipeline route is 21.2 km in length. Total capital cost is £26,344,155 (£1.24 M/km). The largest single cost element is Trenched Pipeline pipe at £9,474,005 (36.0% of total). Ten thematic constraint groups were assessed; no constraint was classified at any significance band in the supplied data, giving zero constraints in the fundamental and Major classes. The route records 28 linear crossings: 13 road, 12 watercourse, 2 infrastructure, and 1 leisure crossing. Five groups require feature-level assessment. 89.3% of the route (18.9 km) proceeds by open trench; 10.7% (2.3 km) by horizontal directional drilling (HDD — trenchless boring beneath obstacles). See Appendix Tables A1–A4.

## 2. Cost

- Total capital cost: £26,344,155 (£1.24 M/km) across a 21.2 km route.
- Shared construction cost allocations — trench, trench earth removal, and HDD: £14,089,256 (53.4% of total); attributable to the full 21.2 km route construction.
- Trenched Pipeline – Pipe: £9,474,005 (36.0% of total); attributable to 18.9 km of open-trench pipeline construction.
- HDD Pipeline elements (base and pipe combined): £2,780,895 (10.6% of total); attributable to 2.3 km of HDD construction.

Capital Cost Distribution by Element



Full breakdown at *Appendix Table A2*.

### 3. Principal Constraints and Crossings

The route passes through ten thematic constraint groups. No layer in any group was flagged as significant in the optimisation output; no no-go constraints were configured. The cumulative optimisation penalty of 142,259 reflects unmitigated exposure across all layer interactions. Eleven habitat and ecological designation layers are intersected, accounting for 11,805 m of area passage. Twelve watercourse crossings and 3,546 m of hydrology area passage are recorded. Cultural and Historical Sites (13 layers), Contaminated Lands (4 layers), Population Density and Demographics (5 layers), Natural Hazards (2 layers), and Land Use and Land Cover (1 layer) record no route intersection within their assessment buffers.

- **Habitat Networks – Lowland Meadows** (designated habitat network): within, 6,762 m across two corridor segments (Ch 0–3.5 km and Ch 12–16 km); no significance band assigned.
- **Watercourses** — Rivers (6 crossings, mean crossing angle 69°), Named River (1 crossing), Unnamed Watercourses (5 crossings): 12 crossings in total; HDD construction method applied at all crossings.
- **Ch 4.0–5.5 km constraint overlap zone**: six area designations simultaneously active — Habitat Networks – Lowland Fens (1,585 m), Lakes (1,036 m), SSSI (national ecological or geological designation, 329 m), Priority Habitat (637 m), Water Bodies (939 m), and Surface Water (878 m) — with rail and NESO Circuit infrastructure crossings within 1.3 km of chainage; no significance band assigned.
- **Road network** — five road classes: 13 crossings (4 minor, 3 restricted local access, 2 A-road, 2 B-road, 2 local); open-trench construction method.
- **Rail – Multi Track** (mainline railway) and **NESO Circuit Upgrades – Strategic Options** (strategic electricity network): 1 crossing each at Ch 5.3 km and Ch 4.9 km respectively; HDD construction method.

Detail at *Appendix Tables A3 and A4*.

#### Constraint Distribution Charts

The chart disaggregates the four key overlapping constraint layers into separate horizontal bar tracks sharing a common chainage axis, with the same crossing point markers superimposed on each track to indicate where discrete crossings coincide with each specific layer.

Chart 2 — Constraint Layer Tracks and Discrete Crossings by Chainage



Across the four tracks:

- **Rivers 100 m Buffer**: active in seven distinct chainage bands totalling approximately 1,729 m. The widest concentration is at Ch 4.0–5.3 km (at the twin river/Named River crossing cluster), with further bands at Ch 10.3–10.8 km, Ch 11.8–12.8 km, and Ch 16.25–16.75 km, each associated with one or more river crossing events (red markers).
- **Surface Water**: heavily present at Ch 3.75–5.25 km; scattered minor intersections at Ch 10.75 km, Ch 12.25–12.75 km, Ch 16.25 km, and Ch 20.25 km corresponding to individual river crossing locations. Total passage: 878 m.
- **Water Bodies**: concentrated entirely in the Ch 3.75–4.75 km band (939 m), coinciding with the cluster of river and rail/NESO crossings.
- **SSSI**: a single compact band at Ch 4.25–4.75 km (329 m), within the same dense constraint cluster as Water Bodies and Lakes Habitat. The two river crossings nearest this band (Ch 4.0 km and Ch 5.1 km) are flagged red on this track.

The tracks collectively confirm that the Ch 4 km to Ch 5.5 km corridor is the highest-density constraint zone along the entire route, where six distinct area-based designations overlap with two river crossings, one rail crossing, and the NESO infrastructure crossing occurring within approximately 1.3 km of chainage.

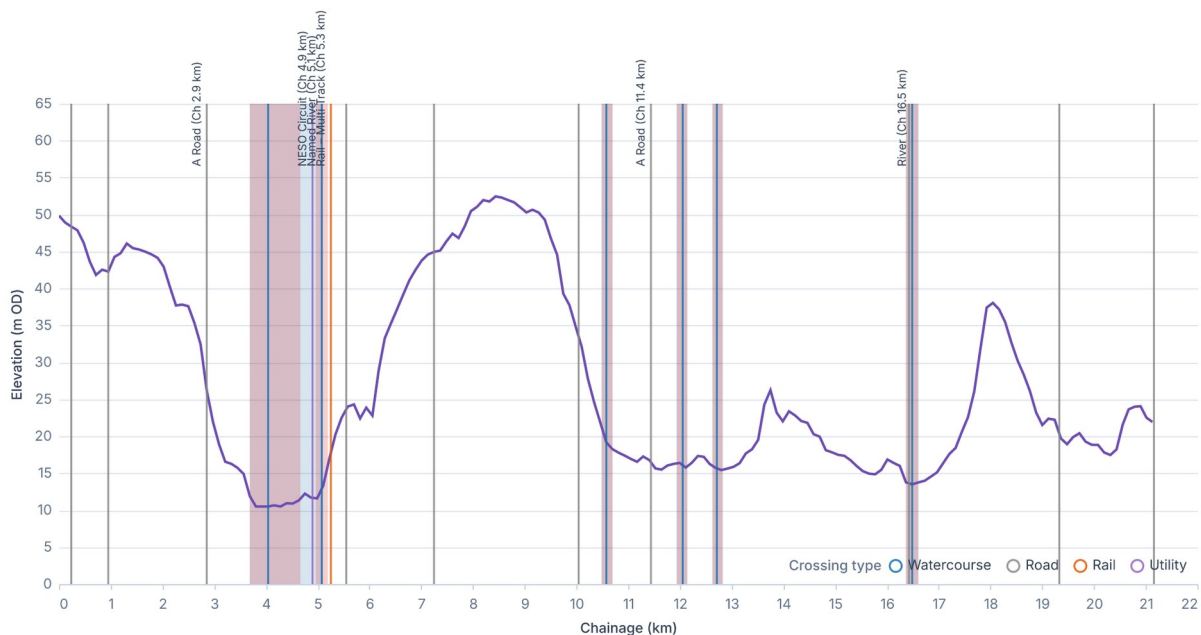
## 4. Route Summary

The Grafham to Cambridge 600 mm pipeline option is 21.2 km in length (measured along the route centreline), with terrain relief adding 4 m of additional length relative to a straight-line distance. Ground-level elevation ranges from a minimum of 10.5 m OD to a maximum of approximately 52.5 m OD, with a mean of 27 m OD. The route thus spans roughly 42 m of topographic relief. Maximum slope is 7.3°; mean slope is 1.9°. No sections exceed a critical slope threshold, and no sections exceed any elevation limit. The terrain is low-lying and gently rolling, characteristic of the Cambridgeshire chalk fringe and fen-edge transition.

The elevation long section below presents the full terrain profile from start (Ch 0.0 km) to end (Ch 21.2 km). Coloured vertical rule-lines mark every recorded key crossing — watercourses (blue), roads (grey), rail (orange), and utilities (purple) — with the most significant crossings labelled by name directly on the profile. Shaded background bands indicate the extent of active Surface Water constraint zones (blue), which correspond to the low-lying river corridor between approximately Ch 3.7 km and Ch 5.1 km as well as a series of shorter extents at Ch 10.5 km, Ch 11.9–12.1 km, Ch 12.6–12.8 km, and Ch 16.4–16.6 km. Red-shaded bands indicate sections where Horizontal Directional Drilling (HDD) is the specified construction method, corresponding directly to the principal watercourse and infrastructure crossings.

Elevation Long Section with Key Crossings and Constraint Zones

Grafham to Cambridge 600 mm Pipeline — Option 174763



**Profile description.** The route begins at approximately 50 m OD and descends steeply over the first 3.7 km to reach the low-lying Surface Water zone at around 10.5 m OD. This valley floor section (Ch 3.7–5.3 km) carries the highest density of key crossings: an unnamed watercourse at Ch 4.0 km, the NESO Circuit utility at Ch 4.9 km, the Named River at Ch 5.1 km, and the multi-track railway at Ch 5.3 km — all of which trigger HDD construction. The route climbs back to a secondary ridge between Ch 6.0 km and Ch 9.0 km, reaching the route maximum elevation of approximately 52.5 m OD near Ch 8.4 km. It then descends progressively into the lower Cambridge vale from Ch 9.5 km onwards, with ground levels settling between 13 m and 25 m OD for most of the second half.

A second group of watercourse crossings occurs in the mid-route lowlands: rivers at Ch 10.6 km, Ch 12.1 km, and Ch 12.7 km, all with associated Surface Water constraint zones and HDD sections. A further watercourse crossing and HDD section occur at Ch 16.5 km. Road crossings occur at eight locations: two A-road crossings (Ch 2.9 km and Ch 11.4 km), two B-road crossings (Ch 5.6 km and Ch 12.7 km), two minor road crossings (Ch 7.2 km and Ch 10.6 km), and restricted-access road crossings at Ch 0.2 km and Ch 10.0 km, as well as a local road crossing near the route end (Ch 21.2 km). The National Cycle Network route crosses at Ch 0.2 km. Overall, 89.3% of the route is constructed by conventional open trench and 10.7% by HDD. HDD is concentrated at seven discrete sections, each associated with a watercourse, railway, or utility crossing. The Surface Water constraint zone exerts the greatest influence on construction method selection along this corridor.

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## 5. Citations

- Habitat Networks — Natural England
  - Priority Habitats Inventory — Natural England / DEFRA
  - Site of Special Scientific Interest (SSSI) data — Natural England
  - GCN Class Survey Licence Returns — Natural England
  - National Forest Inventory 2023 — Forestry Commission
  - Water Bodies (Corine Land Cover) — European Environment Agency
  - NESO Circuit Upgrades — Strategic Options — National Energy System Operator
  - Ordnance Survey road and transport network
  - Rail network data
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## Appendix

Tables only.

### Appendix Table A1 — Option at a Glance

| Measure                                   | Value                                              | Note                                                 |
|-------------------------------------------|----------------------------------------------------|------------------------------------------------------|
| Route length                              | 21.2 km                                            | Along route centreline; terrain relief adds 4 m      |
| Total capital cost                        | £26,344,155                                        | All placed asset types; inclusive of shared costs    |
| Cost per km                               | £1.24 M/km                                         | Derived: total cost divided by route length          |
| Largest single cost element               | Trenched Pipeline – Pipe:<br>£9,474,005<br>(36.0%) | 18.9 km open-trench construction                     |
| Total constraint crossings                | 28                                                 | 12 watercourse, 13 road, 2 infrastructure, 1 leisure |
| Constraints — fundamental and Major class | 0                                                  | No significance bands assigned in supplied data      |

### Appendix Table A2 — Cost Breakdown

| Cost element                  | Value      | Share of total | Attributable feature or condition                   |
|-------------------------------|------------|----------------|-----------------------------------------------------|
| Trenched Pipeline – Pipe      | £9,474,005 | 36.0%          | 18.9 km open-trench pipeline construction           |
| Shared – Trench               | £4,774,899 | 18.1%          | Trench construction allocation; shared across route |
| Shared – Trench Earth Removal | £4,774,899 | 18.1%          | Earth removal allocation; shared across route       |
| Shared – HDD                  | £4,539,458 | 17.2%          | HDD allocation; seven HDD sections across route     |
| HDD Pipeline – Base           | £2,099,976 | 8.0%           | Base cost; 2.3 km of HDD construction               |
| HDD Pipeline – Pipe           | £680,919   | 2.6%           | Pipe material; 2.3 km of HDD sections               |

**Appendix Table A3 — Constraints**

| <b>Constraint (name and designation)</b>                        | <b>Interaction</b> | <b>Extent or count</b>             | <b>Sensitivity</b> | <b>Significance</b> | <b>Standard mitigation</b>                  |
|-----------------------------------------------------------------|--------------------|------------------------------------|--------------------|---------------------|---------------------------------------------|
| Habitat Networks – Lowland Meadows (designated habitat network) | Within             | 6,762 m (Ch 0–3.5 km; Ch 12–16 km) | Not assigned       | Not assigned        | Feature-level assessment required           |
| Rivers 100 m Buffer                                             | Within             | 1,729 m                            | Not assigned       | Not assigned        | Feature-level assessment required           |
| Habitat Networks – Lowland Fens (designated wetland habitat)    | Within             | 1,585 m (Ch 3.75–5.75 km)          | Not assigned       | Not assigned        | Feature-level assessment required           |
| Habitat Networks – Lakes (designated lake ecosystem)            | Within             | 1,036 m (Ch 3.75–5.75 km)          | Not assigned       | Not assigned        | Feature-level assessment required           |
| Water Bodies (Corine Land Cover)                                | Within             | 939 m (Ch 3.75–4.75 km)            | Not assigned       | Not assigned        | Feature-level assessment required           |
| SSSI (national ecological or geological designation)            | Within             | 329 m (Ch 4.25–4.75 km)            | Not assigned       | Not assigned        | Feature-level assessment required           |
| Watercourses (Rivers ×6, Named River ×1, Unnamed ×5)            | Crossing           | 12 crossings                       | Not assigned       | Not assigned        | HDD construction method (trenchless boring) |
| Rail – Multi Track (mainline railway)                           | Crossing           | 1 crossing (Ch 5.3 km)             | Not assigned       | Not assigned        | HDD construction method (trenchless boring) |

**Appendix Table A4 — Crossings and Third-Party Interfaces**

| <b>Crossing type</b>                                                      | <b>Count</b> | <b>Named instances</b>                                             | <b>Construction implication</b>                               |
|---------------------------------------------------------------------------|--------------|--------------------------------------------------------------------|---------------------------------------------------------------|
| Watercourse (Rivers, Named River, Unnamed)                                | 12           | Named River Ch 5.1 km; rivers at Ch 4.0, 10.6, 12.1, 12.7, 16.5 km | HDD at all crossings; mean river crossing angle 69°           |
| Road (5 classes: A, B, minor, local, restricted)                          | 13           | A Roads at Ch 2.9 km and Ch 11.4 km                                | Open-trench; Ch 10.6, 12.7, 16.4 km within watercourse buffer |
| Rail – Multi Track (mainline railway)                                     | 1            | Ch 5.3 km                                                          | HDD construction method                                       |
| NESO Circuit Upgrades – Strategic Options (strategic electricity network) | 1            | Ch 4.9 km                                                          | HDD construction method                                       |
| National Cycle Network                                                    | 1            | Ch 0.2 km                                                          | Feature-level assessment required                             |