Feasibility study

Windermere discharge options

February 2024

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Introduction and summary

Between July and December 2023, a team of 15 engineers from multiple disciplines carried out a feasibility study to assess options to remove all discharges from the Windermere catchment in a comparable way to that achieved at Lake Annecy in France.

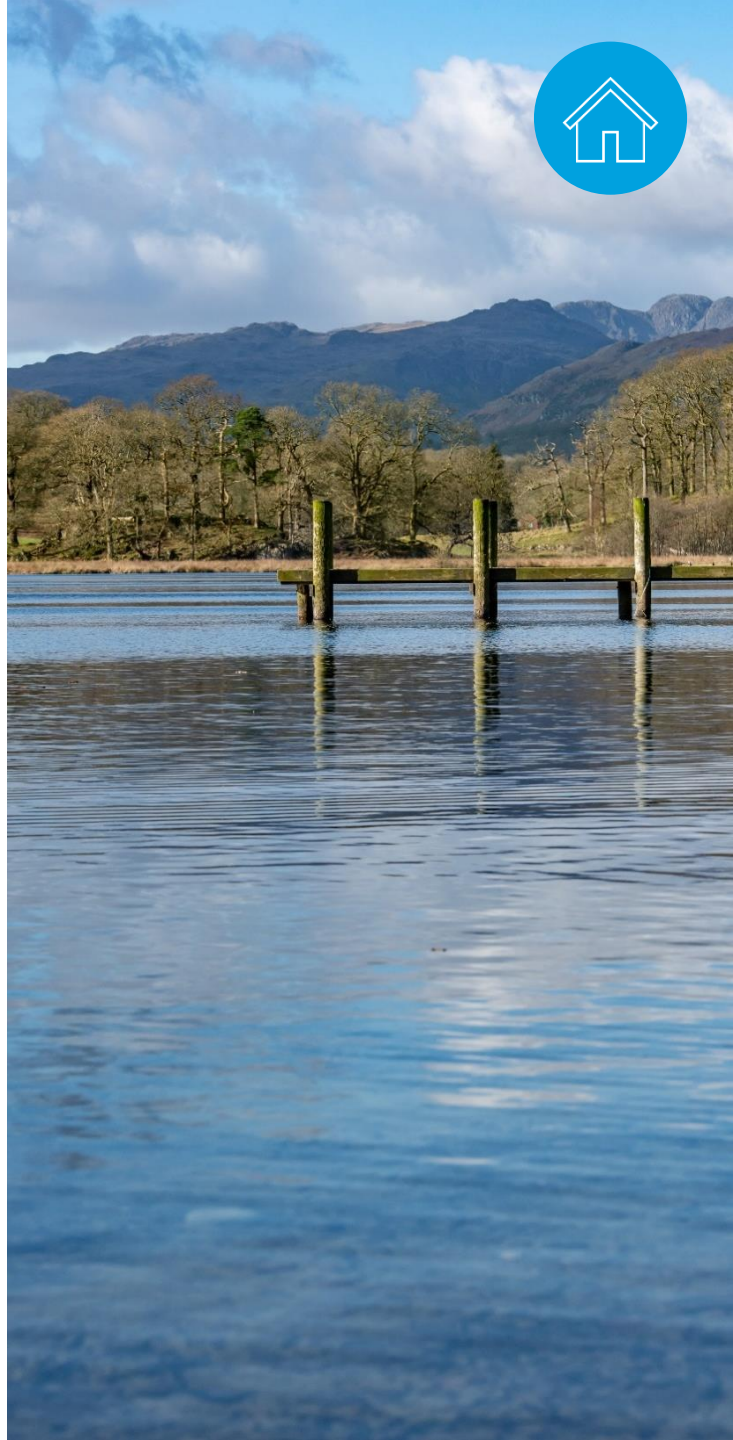
While the study accounts for known factors such as topography and areas of ecological importance, the proposals are conceptual and include a theoretical route for a new sewer system as well as a new treatment works at Grange-over-Sands. Key considerations include an assessment of the impact that such a scheme would have on local communities, tourism, businesses and the local environment in this area of the Lake District National Park. A proposed route was developed applying several principles to mitigate the impact of the scheme as far as possible.

Two phases are assessed:

- Development of a high-level solution to move flows collected by the public sewer network from the Windermere catchment to a new, notional, downstream location at Grange-over-Sands, via a theorised 67km (42 miles) of new network. This includes both treated wastewater and storm water from combined sewer overflows; and
- Development of a high-level solution to collect all remaining private sewage facilities, including 1800 septic tanks, via an estimated 330km (205 miles) of additional network within the Windermere catchment and connect them to the theorised sewer network.

While both options are high level, they provide an indication of the scale of work involved. Clearly, developing a detailed proposal for a scheme of this magnitude would require further in-depth investigation.

This study was carried out as a contribution to the local interest being shown in a Lake Annecy type model for Windermere involving the removal of all discharges into the lake. We would be happy to participate in any further work. For further information please contact Windermere@uuplc.co.uk.



Phase 1

Relocation of wastewater from the public network

Summary of possible solution

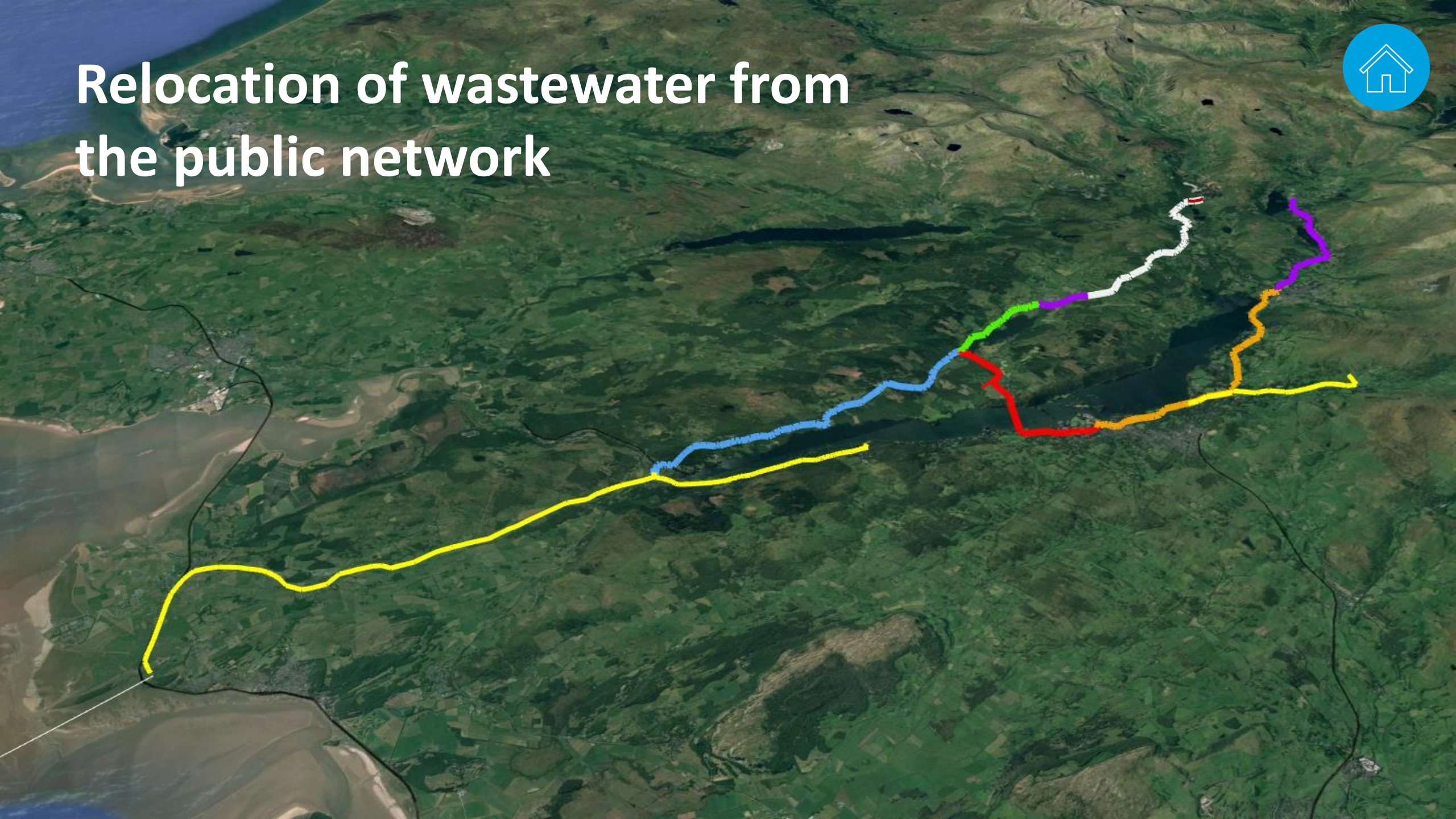
- 67km (42 miles) of new sewer extending from Grasmere to Grange-over-Sands. Pipe sizes ranging from 300mm to 1500mm for the full extension.
- Proposed new sewer network would be largely off-highway, though some sections would be in the road to accommodate the size of the pipe at 1500mm diameter, particularly through Bowness and between Tower Wood and Newby Bridge.
- Includes 1.1km (0.7 miles) tunnel underneath Windermere using a smaller diameter 600mm pipe, to minimise disruption to traffic. The alternative would be highway work for a further 3.8km (2.4 miles) to Tower Wood – given that a pipe diameter of 1200mm would be needed, this would require a full road closure while the work takes place.
- Proposed route would require 15 new pumping stations and 8 new break tanks.
- A new, theoretical wastewater treatment works at Grange-over-Sands (replacing the existing one), as well as a new 6km (3.7 miles) 1500mm diameter long- sea outfall pipe into Morecambe Bay. Existing wastewater treatment works could remain part of the sewerage network but they would not discharge into the lake.
- For cost assessment purposes, the treatment works has been assumed as a 'treat all flow' site with ultraviolet treatment. These assumptions are theorised based on the protected shellfish beds in Morecambe Bay and existing permits along the northern shore of Morecambe Bay, although this would be subject to Environment Agency approval and permit issue.

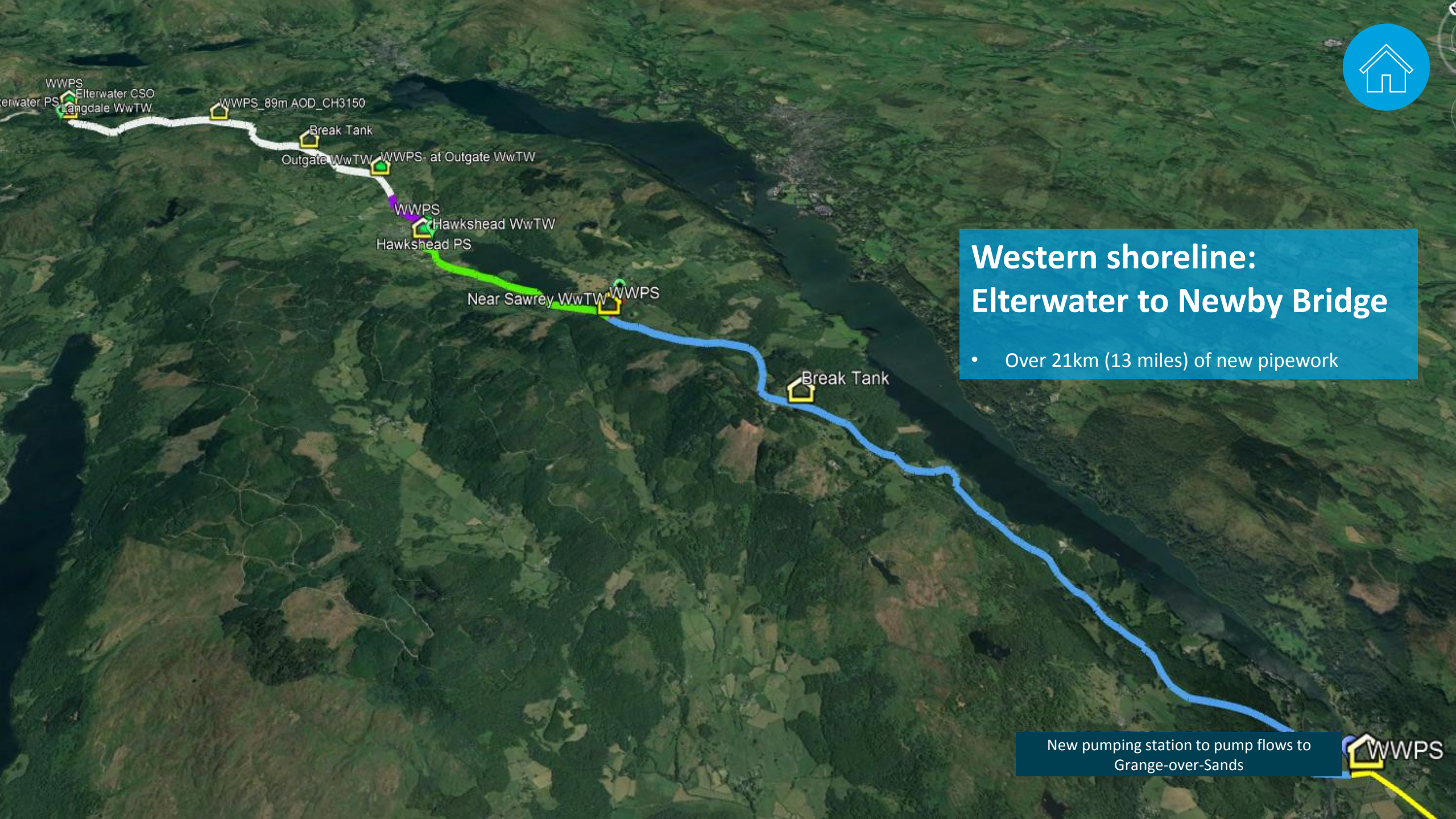
Design principles

To develop a high-level assessment, a route has been designed applying the following key principles:

- minimise the total length of sewer;
- minimise impact on communities, businesses and tourism by ensuring minimum possible flow and pipe size through population centres;
- high elevations and large changes in elevation were avoided given the challenging topography;
- avoid large areas of trees given many ancient woodlands in the area (where unavoidable, tunnelling under has been assumed);
- avoid laying in highway where possible to avoid lengthy traffic diversions; and
- avoid areas of environmental, ecological and archaeological importance.

Relocation of wastewater from the public network





Western shoreline: Elterwater to Newby Bridge

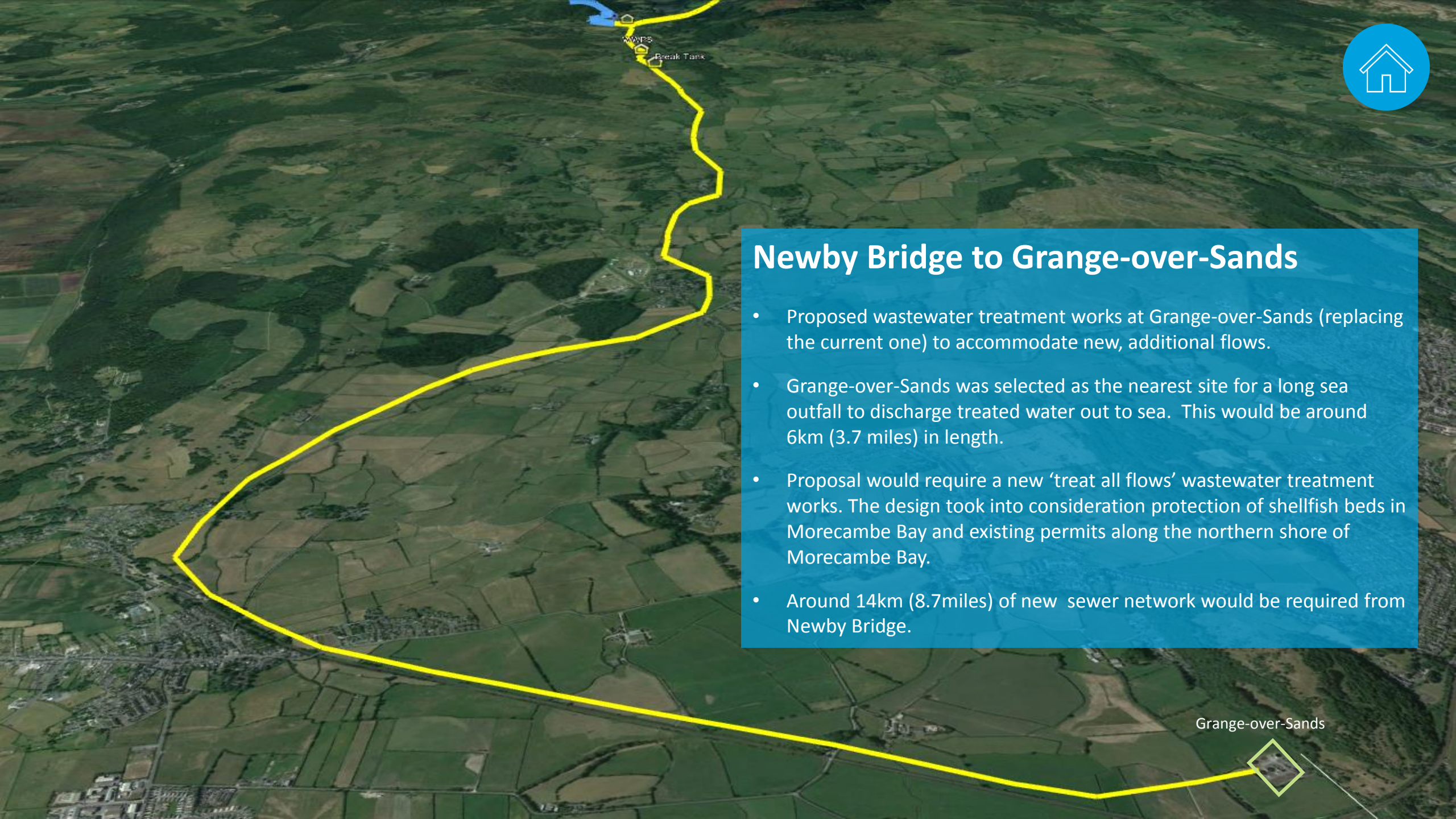
- Over 21km (13 miles) of new pipework

Eastern shoreline: Grasmere to Western Side

- Includes 1.1km (0.7 miles) tunnel across bed of Windermere

Windermere to Newby Bridge connection

- 5.5km (3.4 miles) of network linking Tower Wood to southern section, leading to Grange-over-Sands



Newby Bridge to Grange-over-Sands

- Proposed wastewater treatment works at Grange-over-Sands (replacing the current one) to accommodate new, additional flows.
- Grange-over-Sands was selected as the nearest site for a long sea outfall to discharge treated water out to sea. This would be around 6km (3.7 miles) in length.
- Proposal would require a new ‘treat all flows’ wastewater treatment works. The design took into consideration protection of shellfish beds in Morecambe Bay and existing permits along the northern shore of Morecambe Bay.
- Around 14km (8.7miles) of new sewer network would be required from Newby Bridge.

Phase 2

Connection of all private assets

Connection of private assets

- There are approximately 1,800 privately-owned septic tanks in the Windermere catchment.
- Given the scale and complexity of developing connection options for all of these assets, it was not possible to assess each of them in terms of scope, cost and impact.
- Instead, an area with a reasonable proportion of private septic tanks was selected to develop a solution. Findings from this area were used to give an indication of the total scope and cost of connecting all septic tanks in the catchment to the theoretical new network.
- Rydal village was chosen, connecting from the south of the village to the northern outskirts of Ambleside.
- In the chosen area, 42 properties were identified as likely having privately-owned septic tanks.
- A conceptual solution was developed to connect these properties to the local public sewerage network.

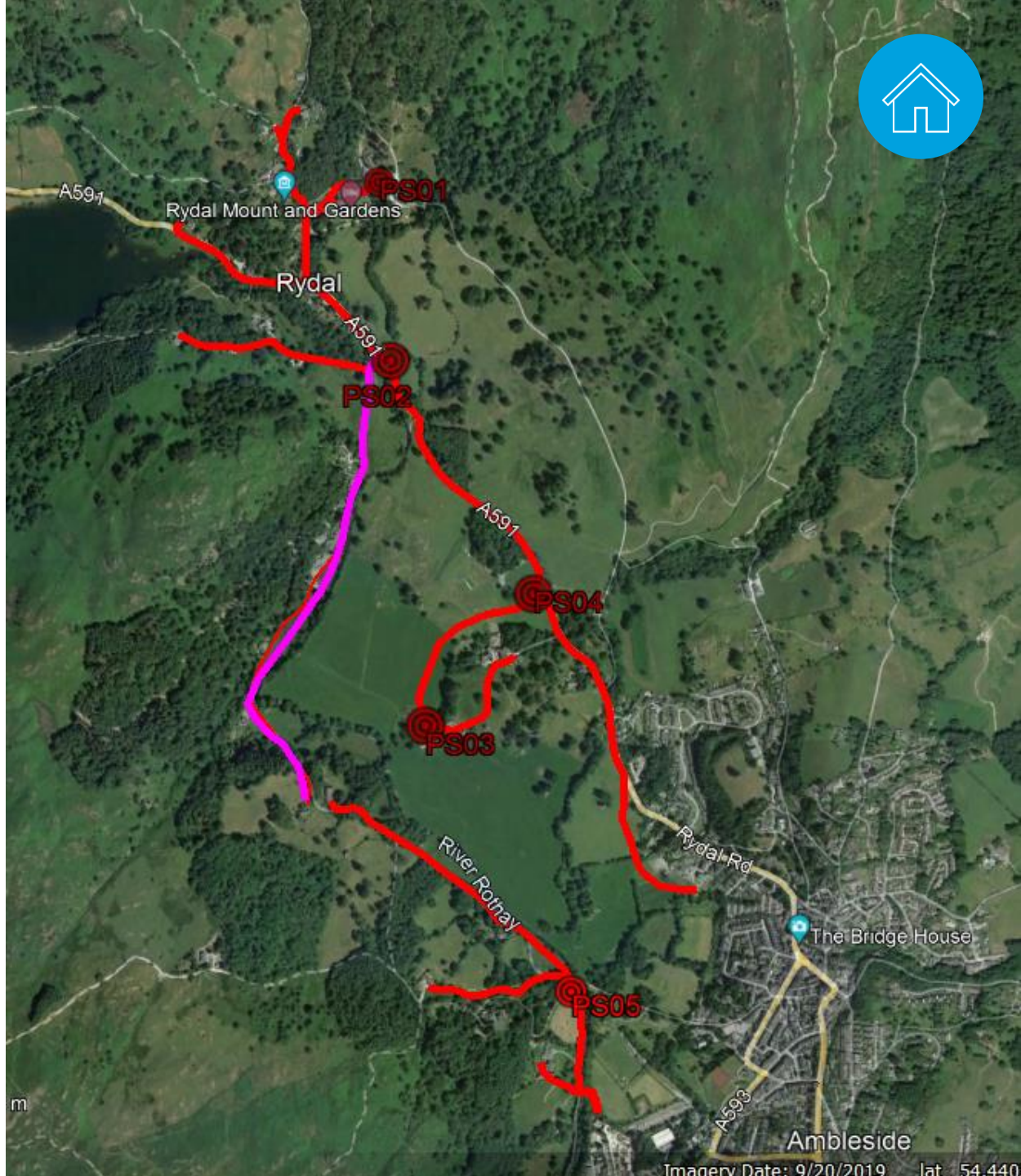
Key assumptions

There are some important assumptions in this septic tank assessment.

1. Rydal is an average representation of the scope, cost and impact of connecting all privately-owned septic tanks in the Windermere catchment.
2. The downstream sewerage network is hydraulically-capable of accepting septic tank flows without the need to modify the existing network (no allowance has been made for this).
3. All septic tanks would connect to the sewerage network, even though currently there is no obligation for private septic tank owners to connect to the public network. In the case of Lake Annecy, legislative change was required to ensure all owners of private discharges connected to its new interceptor sewer.

Conceptual solution for Rydal

- Total length of sewers = 7.7km (4.8 miles)
  - 5.8km (3.6 miles) of gravity sewers
  - 1.2km (0.75 miles) of rising mains
  - 0.7km (0.4 miles) of tunnels (5 needed).
- Five new pumping stations.
- Would require laying 1.7km (1.1 miles) of new sewers in the A591.
- Pro-rated across c.1,800 septic tanks in the Windermere catchment, this equates to around 330km (205 miles) of new sewers to connect all septic tank properties to the public sewerage network.



Estimated costs and methodology

Estimated costs and methodology

Estimates have been produced based on a bill of quantities priced against an extensive cost database. Methodologies are aligned with guidance and recommendations of the Infrastructure Projects Authority and Association for the Advancement of Cost Engineering (ACCE).

The project team developed a bill of quantities totalling more than 650 items, covering typical elements such as temporary and permanent access roads, new buildings (such as for pumping stations), fencing and the sewer itself (including whether it would be laid in an open excavation or via a 'no-dig' / tunnelling method). A comparative estimate was made for the new wastewater treatment works at Grange-over-Sands.

Given the scale of the proposed solution and timescale to complete the study, this solution can only be considered conceptual and subject to very high estimating tolerances, i.e. an 'order of magnitude' estimate.

To estimate the removal of all septic tanks, costs associated with the Rydal case study were pro-rated across remaining assets within the catchment.

Costs (estimate accuracy is AACE Class 4: -0% to +50%. Prices forecast at FY31):

Total cost to divert all flows: £3.5bn to £6.4bn.

Current actions

Investment by United Utilities to improve water quality

Already delivered

Since 2000, United Utilities has invested more than £75m upgrading its wastewater treatment works, sewer network & pumping stations in the Windermere catchment.

- The amount of phosphorus entering the lake from its assets has halved since 2015.
- Spills from its storm overflow at Glebe Road have reduced from around 230 per year to less than 30 per year in 2022.
- Ultraviolet treatment has been installed at sites to support bathing water quality improvements – all four Windermere locations have held excellent Bathing Water status since 2015.

In progress

- A further investment of £41m at four sites to reduce storm overflow operation by 50% on 2022 figures.
- Expected to reduce phosphorus inputs into the lake by 4% in the north basin of the lake and 8% in the south basin.
- The four sites are:
    - Ambleside – new storm water detention tank (7,000 – 10,000 cubic metres).
    - Elterwater – new storm water detention tank (2,500 – 3,000 cubic metres) and a natural sustainable drainage solution.
    - Hawkshead – new storm water detention tank (400 cubic metres).
    - Near Sawrey – natural sustainable drainage solution and surface water separation.

The company has opened an Information Centre in Windermere to provide more details about its work to improve water quality in the lake

Working in partnership: Love Windermere

- The Love Windermere partnership brings together nine members from a range of sectors with the collective expertise to make a difference to water quality at Windermere.

- Led by the Environment Agency, the partnership takes a scientific and evidence-based approach to better understand the complex pressures facing Windermere and prioritise effective solutions to improve the condition of the lake.

- Partnership research activities include:
  - Installing monitors around the lake to enable real-time water quality reporting.
  - A new source apportionment model to identify sources of pollution and opportunities to address them.
  - A citizen science project to take quarterly samples of lake water to enable better understanding of water quality through the seasons.

- Partnership communication and engagement activities include:
  - Engagement with residents and local councils including public events.
  - Information published for residents and visitors on algal blooms and how to report them along with a history of the lake.
  - Advice and guidance to septic tank owners.

Westmorland & Furness Council
Lake District National Park
National Trust
Environment Agency
United Utilities
NFU
SCRT South Cumbria Rivers Trust
ldf Lake District Foundation visit.give.protect
CLEP

https://lovewindermere.co.uk/

- Partnership actions to improve water quality include:
  - Septic tank trials to encourage regular maintenance and emptying.
  - Investment in land management including recruitment of a farm adviser by the Lake District National Park Authority.
  - Restoration of reed beds to provide natural treatment of phosphorus.