Finding and Managing Culverted Watercourses

Thames Water Lane Rental Industry Publication

TRANSPORT FOR LONDON

Introduction

Rivers are an integral part of the landscape and historically, at the heart of communities providing water, food, and transport. As cities became intensively urbanised, many of its smaller rivers were piped, buried and forgotten. There were several reasons for doing this, including making space for development and providing road and rail crossings.

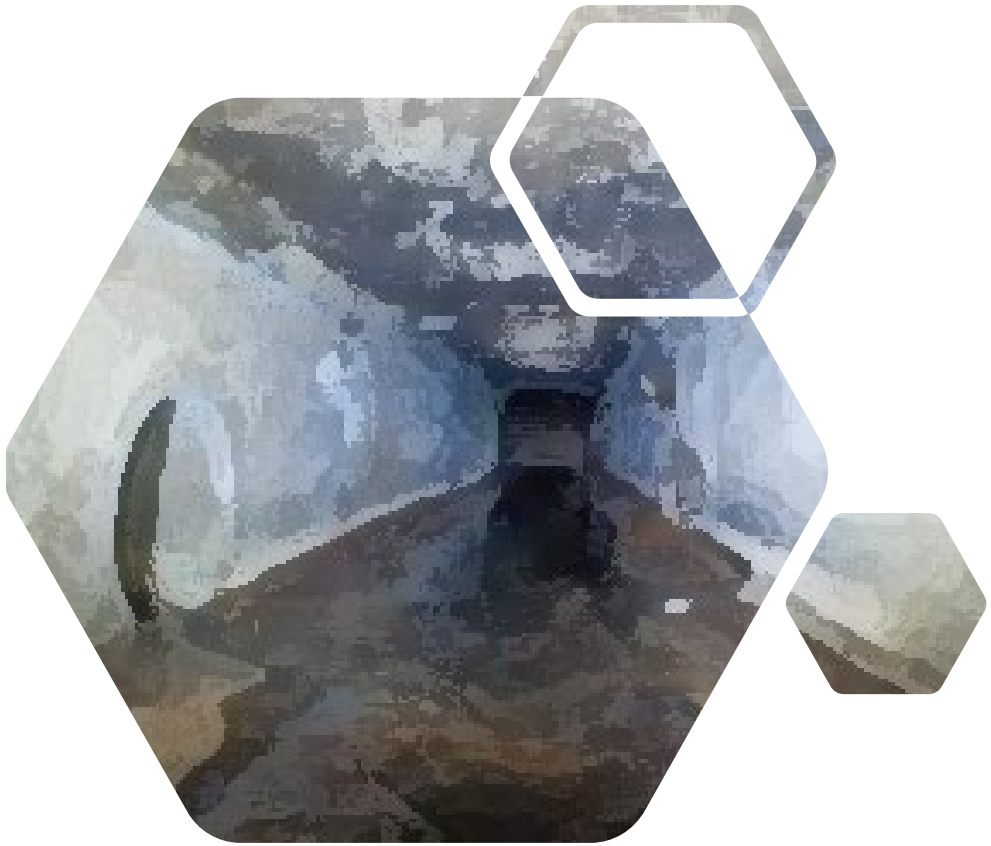
In London, there is a large legacy of culverted watercourses dating back to the 19th and 20th century. Since these structures were built, changes to the governance of drainage has resulted in many assets being transferred between authorities and in the process, the accuracy of records has become skewed. Subsequently, many culverted watercourses in London have been incorrectly mapped as public sewers.

It is therefore important to identify as many “lost rivers” as possible to maximise the opportunities for restoring them, improve the understanding of potential flood risks in the Capital and, to inform the stewardship of many critical pieces of drainage and transport infrastructure.

The Project

An example of a culverted watercourse is the River Gade flood relief. It is a 2x2m box culvert with a length of 4.8km running under Hemel Hempstead. It was constructed in 1959 to protect Hemel Hempstead from flooding from the River Gade, however it is currently mapped as a public sewer on the Thames Water sewer map and receives no maintenance.

The project had two stages; to accurately map the lost rivers and then use this information to identify culverted watercourses within the London sewer network. This was done through the following process;



- # Mapping Lost Rivers

In the first instance, historical maps from Ordnance Survey (ranging from 1896-1994) were used to record lost rivers. Environment Agency (EA) river data and Digital Terrain Model flowline were then used to highlight existing main rivers and to indicate natural drainage patterns respectively.

Once historical maps were examined, information from London's Lost Rivers, by Paul Talling (2011) was used to record rivers around Central London as historical maps do not go as far back as pre-urban London and a map produced showing the lost rivers (highlighted in pink).

- # Identifying Culverted Watercourses

Various datasets were used to provide evidence of sewers being a culverted watercourse including river network data, end sewer item data, sewer flooding data, flow accumulation data, and sewer purpose diameter and material.

In addition to this, sewer pipe shape, name, distance to nearest EA river, distance to nearest lost river, distance to nearest end sewer item (inlets) and distance to nearest high flow accumulation area were used as evidence

- ## Field Trials to Evaluate the Site and Asset Characteristics

Field investigations were then carried out after completing the mapping to assess the validity of the method being used. Random sites were investigated and captured key variables to show the evidence of culverted watercourses to different extents. Many sites were investigated to verify the categorisation of the sewer pipes and the details aided to identify variables relevant for assessing the characteristics of these sites.

Outcomes

Using a range of historical and contemporary datasets, this a total of 444km of lost rivers and 386km of culverted watercourses (152km already recorded) were identified in the London area. The results can now be disseminated to a wide range of organisations from environmental Non-Governmental Organisation (NGOs) to major infrastructure owners, to help facilitate the management of buried watercourses in London. The results will also be published through Thames Arc-Online and could be a valuable dataset for Greater London Authority's Infrastructure Mapping Application.

Lessons Learnt

As historical maps were not created as vector data, signs and symbols are not always clear; in many cases, the assigned symbol for ‘streams’ was not always followed but instead plain straight lines or tree lines were used. Lines were also used for land divisions and roads on historical maps and therefore, may not have been recognised as streams.

In addition, historical maps from different periods cover different areas resulting in historical maps not being available for certain areas when there was no/minimal urbanisation taking place and have not been recorded.

Finally, the low resolution Talling (2011) maps were used to draw the lost rivers in Central London which could not be viewed directly on ArcGIS, so landmarks were used to follow the general route and to map the lost rivers

Conclusion / Recommendations

Identifying lost rivers and culverted watercourses is crucial to better aid the understanding of flood risks, asset management, and river restoration opportunities. The methodology of this project was developed using various sources of spatial data which provide evidence for lost rivers and culverted watercourses. Automatic and manual processes were undertaken to produce maps displaying the locations and lengths of lost rivers and culverted watercourses and the field investigations undertaken to support the validity of the results.

The data produced in this study is from other data sources and must be interpreted with caution. Lack of historical map coverage in some areas may cause some lost rivers to be left unmapped. The quality of historical maps will affect the interpretation of symbols and this may have resulted in land features which are not streams to be mapped as lost rivers.

To improve the understanding of these mapped assets, it is recommended that newly mapped culverted watercourses are integrated into the asset data capturing process and that a register of culverted watercourses is routinely populated. The study proposes further detailed site surveys and data analysis to understand the condition of the assets and their impacts on the environment and customers.

An online template has been created as part of this project that can be populated directly from the field during site investigations to collate the necessary information to facilitate the resolution of queries regarding the ownership and responsibilities for these types of assets.

TfL Lane Rental Scheme

Optimising customer journeys through the delivery of safer, innovative and sustainable roadworks

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