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ROAD POLLUTION SOLUTIONS TOOL

Technical Summary

Funded by The Mayor of London, Zoological Society of London & the Environment Agency.

Undertaken in partnership with Middlesex University, South East Rivers Trust, Thames Water and the British Geological Survey.

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1. Introduction

The nation's rivers are polluted. Along with sewer overflows, misconnections and agriculture, a key source of river pollution is 'road run off'.

To address this, the Mayor of London, Transport for London (TfL) and Thames Water commissioned from Thames 21 to deliver the first phase of the study. This took place in 2019 and categorised roads in terms of potential to contribute towards pollution of London's rivers, to help identify the best locations for interventions to address this issue.

Three years later, this second phase of the project has created an online, interactive, evidence-based decision tool (titled: Road Pollution Solutions) that predicts the level of pollution risk posed by London's strategic road network, identifies pollution pathways into the river and guides and prioritises where and how nature-based solutions can be used to tackle road runoff pollution.

The Road Pollution Solutions Tool was developed to help identify sections of London's road networks that are likely to contribute the most pollution to our rivers, visualise the pathways of this pollution from the roads to the rivers and to identify and shortlist potential nature-based treatment solutions at the roadside or in adjacent greenspaces.

The spatial extent of the tool is limited to the roads use data collected by TFL (this contains some key National Highways sections of roads and larger Local Authority Highway roads where they interact with TFL roads) and larger rivers (as a result of the currently available data). The extent is also limited to outer London (due to the use of separate surface water drains). Surface water runoff is rainfall that passes over roofs, driveways, drains and gutters. In outer London it drains directly to rivers through a separate network of pipes to that which collects and transports domestic foul water. Central London has a combined drainage system i.e. surface water is conveyed in the same network of pipes as domestic foul water to the sewage works for treatment. Due to inner London mainly having combined sewers, only the areas in these boroughs where known separate surface water sewers are located were modelled.

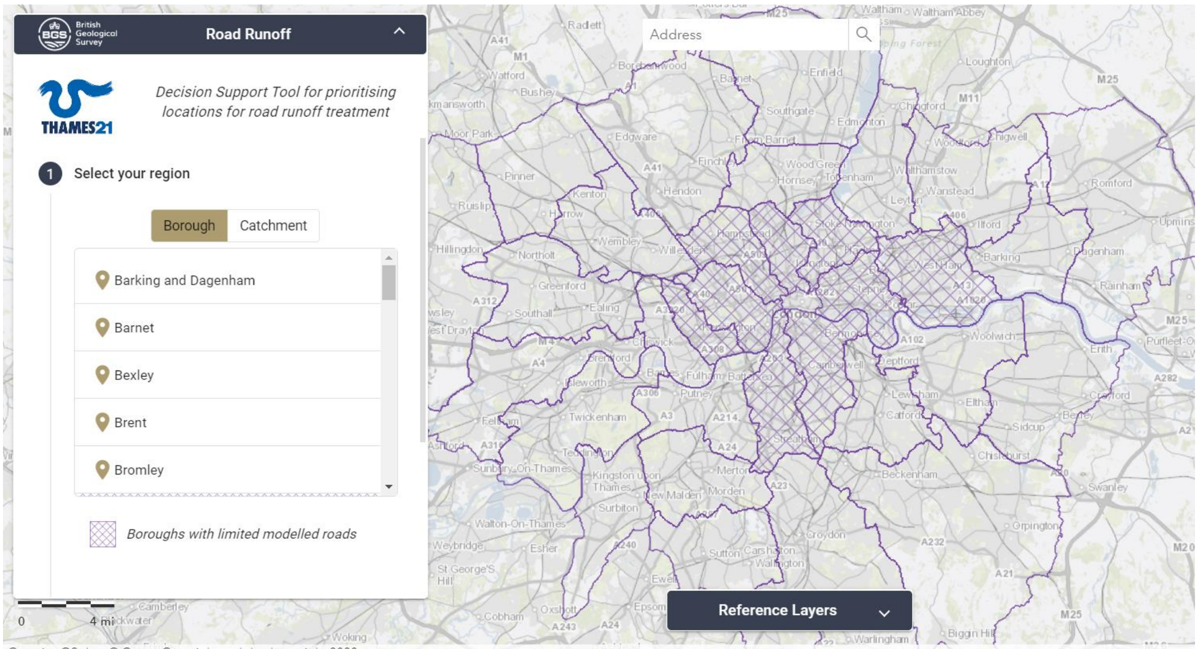

Figure 1: The boroughs of London not included in the Road Pollution Solutions Tool, depicted as hatched areas with limited modelled road network contained within them.

This document outlines the methodology underpinning the 'Road Pollution Solutions' tool, and provides an overview of its application in practice. The primary solution for road runoff pollution is source control, i.e. reducing traffic volumes, congestion and the number of the most polluting road vehicles and so reducing the amount of pollution produced in the first place. However, this study focuses on nature-based solutions, which can help reduce residual road runoff and provide additional benefits to local communities. These include flood risk mitigation, enhanced biodiversity, and improvement of verges and greenspaces for public enjoyment.

2. Methodology

The methodology was developed by Middlesex University (Revitt, et al., 2022) and has been adapted to determine:

- the relative risk posed by road runoff to receiving waters across outer London
- identify which types of Sustainable Drainage Systems (SuDS) may be suitable for addressing those risks.

The methodology predicts the mass of selected pollutants deposited on road surfaces that can potentially enter rivers through road stormwater runoff. This section provides an overview of the inputting datasets and calculation steps performed in creating the Road Pollution Solutions tool.

2.1 Datasets

This section provides an overview of how the datasets were linked together. The tool has been created to be semi-automated allowing us to update the inputting layers and datasets as new data become available. A full list of inputting dataset sources can be found below and are referenced on the tool portal.

- **OS Open Greenspaces & OS Open Rivers** - Available under Open Government License v3.0. Contains OS data © Crown copyright and database right 2022.
- **Soil Permeability** - Adapted from BGS Soil Parent Material Model, used in the development of the Sustainable Drainage Systems (SuDS) Grid. Freely available under Open Government License v3.0 . Licensed version available in 1:50k scale. Contains British Geological Survey materials © UKRI 2023.
- **River Catchments** - Made available via DEFRA. Available under Open Government License v3.0 © Crown Copyright 2021.
- **London Borough Boundary** - Available under Open Government License v3.0 . Contains National Statistics data ©Crown copyright and database right 2023 and Ordnance Survey data ©Crown copyright and database right 2023.
- **Road pollutants (Outer London)** - Layer prepared using annual average daily traffic data (London Atmospheric Emissions Inventory (LAEI 2019)), HadUK 1km daily rainfall, Transport for London's (TfL) Strategic Road Network
- **Sustainable Drainage Systems (SuDS) Grid** - Layer prepared using pollutant concentrations as defined in the 'Road Pollutants' output, alongside BGS Parent Material Dataset ,EA Contour depth to groundwater and Groundwater Source Protection Zones (Environment Agency), available via Open Government Licence v3.0. Contains OS data © Crown copyright and database right 2022, to identify suitable roadside SuDS.
- **River End Items** - Points where surface sewer water network ends in/near a river. Extracted by analysis from the Thames Water surface water sewer network (2020). © 2001 - 2023 Thames Water Utilities Limited. All rights reserved.
- Greenspaces - Polygon layer created using OS Open Greenspaces, Wood, Pasture and Parkland (Natural England), Country Parks (England)
- **SuDS Retrofit installations** - Point layer showing installed SuDS retrofit installations across London, collated by the THE MAYOR OF LONDON as part of the London Sustainable Drainage Action Plan.
- **Images** - available from ©susDrain 2023
- **Strategic Road Network** - The data provides modelled traffic data (LAEI 2019) for the strategic road network, including 585km of the Transport for London Road Network, as well as some sections of National Highways and borough roads.

2.1.1 Traffic Data

Transport for London's (TfL) Annual Average Daily Traffic (AADT) data from 2019 was obtained for most of the major roads across Greater London. The modelling for this project only applies to the strategic road network (major roads in outer London and some minor roads deemed by TfL to be of strategic importance) for which TfL have modelled or observed data around vehicle movements. This includes some sections of National Highways roads and some Local Authority Highway roads.

The AADT data was combined with vehicle emissions rates from published studies to derive mass of pollutants deposit on roads as a reflection of current patterns of traffic volumes and vehicle types within Greater London. The types of vehicles explored within the model are listed in Table 1. National data was used to determine the proportion of cars that are taxis, and to distinguish buses from coaches.

Table 1: Types of vehicles investigated within road runoff project, including the type of fuel.

Vehicle Types	Energy/Fuel Source
Motorcycle	Petrol
Taxi	Diesel
Car	Electric
	Petrol
	Diesel
Private Hire Vehicle	Electric
	Petrol
	Diesel
Light Goods Vehicle	Electric
	Petrol
	Diesel
Rigid Axle Heavy Goods Vehicle (2 axles, 3 axles, 4 axles or more)	Diesel
Articulated Heavy Goods Vehicle (3 to 4 axles, 5 axles, 6 axles)	Diesel
Buses	Diesel
Coaches	Diesel

Similar vehicle types from Table 1 were combined to allow for emissions factor values to be applied where none were present. This provided a new list of vehicle types:

- **Petrol Car** = Petrol Car + Petrol Private Hire
- **Diesel Car** = Diesel Car + Diesel Private Hire
- **Electric Car** = Electric Car + Electric Private Hire
- **Rigid HGV** = Rigid - 2 Axles + Rigid - 3 Axles + Rigid - 4 or more Axles
- **Artic HGV** = Articulated - 3 to 4 Axles + Articulated - 5 Axles + VKM Articulated - 6 Axles
- **LGV** = Electric LGV + Petrol LGV
- **Buses**
- **Coaches**
- **Motorcycles**
- **Taxi**

2.1.2 Road Width

Major roads visible from 60 kilometres (km) distance on Google Earth were manually measured in metres (m). Sections of each road were visited and measurements were carried at pre-defined intervals. Roads excluded from the manual measurement process were B and

C roads. These roads were given the following values: C Roads – 8 metres, B Roads – 9 metres and A Roads – 10 metres following further field measurements of these road types.

2.1.3 Pollutant Emissions

Using data from the literature, the mass of each pollutant deposited on a road surface per vehicle type was identified for each of the following emission categories: tyre wear, engine emissions, brake wear, road surface wear and oil leakage (Revitt, et al., 2022 and references therein):

- Exhaust Emissions: Vehicles in the UK burn petrol, diesel, compressed natural gas and liquid petroleum gas resulting in exhaust emissions which contribute to environmental pollution levels. Particulates released from exhausts are primarily airborne, with a small proportion (estimated at 10%) depositing directly on the road surface as a result of particle size distribution.

- Brake Wear Emissions: The lining of brakes are made of different materials with non-asbestos organic, low metallic and semi-metallic materials being the most widely used. Wear and tear leads to the release of brake-lining particles, especially in urban areas where regular breaking occurs. As a function of particle size, round 50% of these particles are predicted to stay airborne with 50% of brake wear emissions directly deposited onto roads. Metallic compounds such as copper, zinc and cadmium are regularly found in brake dust. Polycyclic aromatic hydrocarbons (PAH) such as pyrene and benzo-a-pyrene are also reported.

- Tyre Wear Emissions: The emissions from tyre wear is not only dependent on the tyre's themselves but also on the road surface characteristics and vehicle operation. Zinc oxide is used in a range of processes to harden rubber used for tyres, this leads to significant quantities zinc in tyre tread and tyre wear debris. PAHs are also used in the tyre manufacturing phase (to make the product easier to work with), and to improve the tyre's grip onto wet roads.

- Road Surface Wear Emissions: Asphalt is used to create road surfaces and is composed of stone material, filler and bitumen binder. The road surfaces breakdown releasing particulate matter which contain a range of metals and organics.

- Oil Leakage Emissions: Oil leaking from the engine is directly released onto roads surfaces with some further oil lost due to high operating temperatures released as vapours or retained within the vehicle (10%).

The emission values taken from the literature (Revitt, et al., 2022) per category per vehicle are then combined with site specific data relating to traffic density data per vehicle type, rainfall data and contributing surface area to produce a 'total monthly average runoff concentration (in µg/L)' for benzo(a)pyrene, pyrene, cadmium, copper and zinc and 'total monthly average concentration (in mg/L)' for total suspended solids. Reported concentrations are expressed as a sum of all the vehicle categories shown in section 2.1.1.

2.1.4 Rainfall Data

The Hadley UK gridded climate observations for the UK with daily 1km rainfall grids derived from the Met Office Station Data were used. Data was averaged over a 5 year period (1/1/2017 to 31/12/2021) and then converted to vector cells which intersected with the retrospective road segments. Rainfall depth data was converted to volume discharging using road width and road length data. Finally, the rainfall data was merged with the emissions data for each road segment, to predict pollutant concentrations as average monthly runoff values per road section.

2.1.5 Sewer Systems

A significant contributing factor with regards to road runoff pollutants entering a receiving waterbody is determined by whether the borough/catchment is treated using a combined or separate sewer. If surface water is treated by a combined sewer, for example, the inner London Boroughs of Tower Hamlets and City of Westminster, then surface runoff water will, most of the time, be conveyed to a sewage works for treatment. During high rainfall the combined sewer system can be overwhelmed resulting in discharge of untreated sewage and surface runoff directly into rivers in an event called a combined sewer overflow (CSO). CSO events occur more frequently and for longer durations than previously recognised [https://theriverstrust.org/sewage-map] with the result that road runoff pollution is entering water courses in the combined sewer areas of catchments/boroughs and this is currently not included in this model. Separate to this report, work is underway to address this issue and hold Thames Water and other utilities to account to rectify this. Areas with a separate sewer system have two sewers, one to take foul water to a sewage treatment works, and the other to take surface water. A GIS map layer provided by Thames Water highlights the areas covered by combined or separate sewers and this distinction between sewer types, i.e. separate or combined, is integrated within the developed method. The Road Pollution Solutions tool models only separate sewers; hence inner London is excluded from the visualisation of the tool.

2.1.7 Greenspaces

Greenspaces were identified as potential sites for SuDS as follows: a minimum size (2 hectares) for a constructed wetland in London (which would be designed to mitigate pollution such as road runoff), and within close proximity to a surface water drainage pipe. To qualify as a road runoff pollution treatment opportunity, a greenspace should be located downstream of a polluting road in order to intercept the pollution (i.e., between the road and the river). Greenspaces upstream of the polluting road do not intercept road runoff pollution and were therefore excluded. Similarly, if the surface water drain running through/near a greenspace later empties into a foul (combined) sewer the pollution does not impact the river directly and the greenspace was excluded.

2.1.8 SuDS Input

The tool highlights what types of Sustainable Drainage Solutions (SuDS) could be used to address identified pollution risks based on site constraints. Firstly, it assesses the suitability of twelve types of SuDS interventions on their ability to resolve the pollution on an urban roadside.

The different types of SuDS interventions included are:

- Swale
- Filter drain
- Filter strip
- Infiltration basin
- Infiltration trench
- Biofiltration (e.g. rain garden, tree pits)
- Constructed Wetland
- Soakaway
- Detention basin
- Retention pond
- Porous surfacing (without storage)
- Porous surfacing (with storage)

2.2 Methodology Performed

This section provides a brief overview of the methodology involved in generating the SuDS solutions, suitable greenspaces and visualisations within the tool.

2.2.1 Integrated Pollution Classification

The total monthly average concentrations generated within the tool for each of the six separate pollutants were ranked from highest to lowest concentrations. The per pollutant rank scores were then integrated to develop a single integrated combined ranking score for each road section, which could then be categorised to identify road sections with relatively higher polluting potentials (see Table 2 and can be seen in the 'All' section within the Road Pollution Solutions tool; Figure 2).

Table 2: Shows the classification split applied to the roads based on their priority level.

Percentage of Roads	Category	Colour Assigned
0 to 5%	High Priority	Red
6 to 15%	Moderate Priority	Pink
16 to 40%	Lower Priority	Orange
Remainder	Lowest Priority	Teal

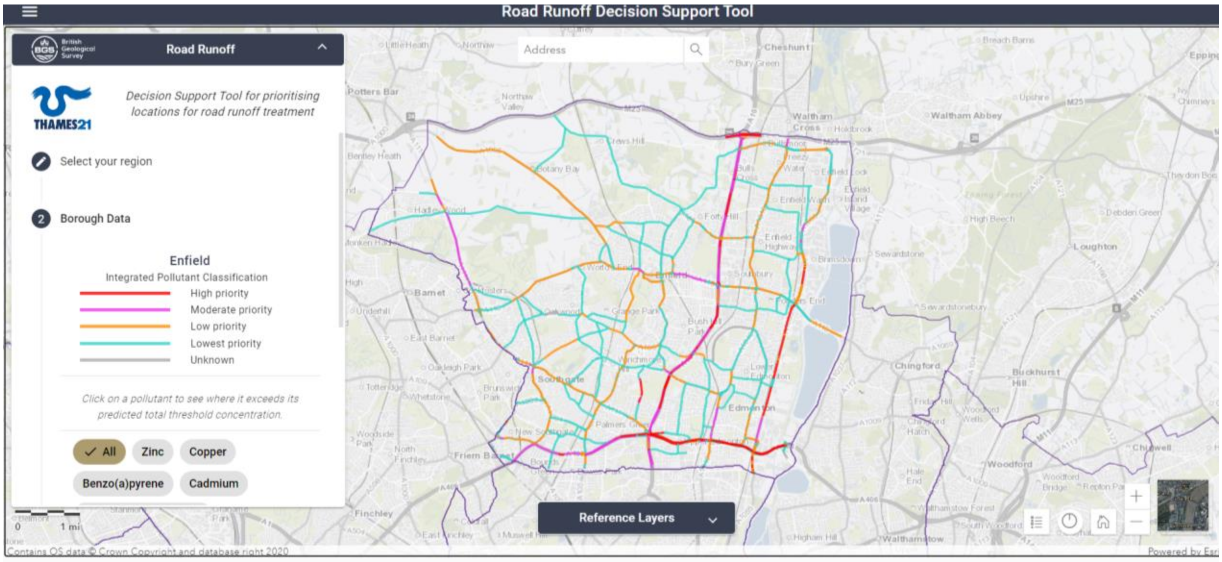

Figure 2: Shows the borough Enfield on the tool and the display visible for the Integrated Pollution Classification method.

2.2.3 Predicted Total Concentrations

The model predicts total pollutant concentrations within road runoff based on traffic volume and type, rainfall and road surface area. To assess the environmental impact of pollution concentrations on receiving waters, predicted concentrations require comparison with relevant water quality standards / guideline values which are available for all identified pollutants (with the exception of pyrene for a quality standard has yet to be developed; still included in the model as an important indicator of traffic pollution). A further challenge in comparing predicted concentrations with available standards is that the approach supports prediction of total concentrations whereas water quality standards (WQS) typically refer to dissolved or bioavailable fractions. This was addressed by converting water quality standards – where required – to an equivalent total concentration. Zinc and solids etc can come from other sources, whereas pyrene is an important indicator of traffic pollution because it is formed by combustion - for example in a vehicle engine. Pyrene will potentially be important to any future work for ground truthing the model against water sampled from road runoff pollution events. Pollutant concentrations were compared to their WQS and then ranked according to the level of exceedance of this standard.

Risk to receiving water ecological status was then assessed through development of risk characterisation ratios (RCRs) for each road section. This involves the division of the predicted pollutant concentration by the predicted non-effects concentration (i.e., the converted water quality standard). An RCR >1 indicates a risk to receiving waters, with ranges of RCR use to develop a prioritised scale. The results of this can be found within the Road Pollution Solutions tool by clicking on the respective pollutant names. This demonstrates the road sections where the pollutant has exceeded its total predicted concentration. For example, Figure 3, shows that zinc, benzo(a)pyrene and total suspended solids all exceeded their respective water quality standards.

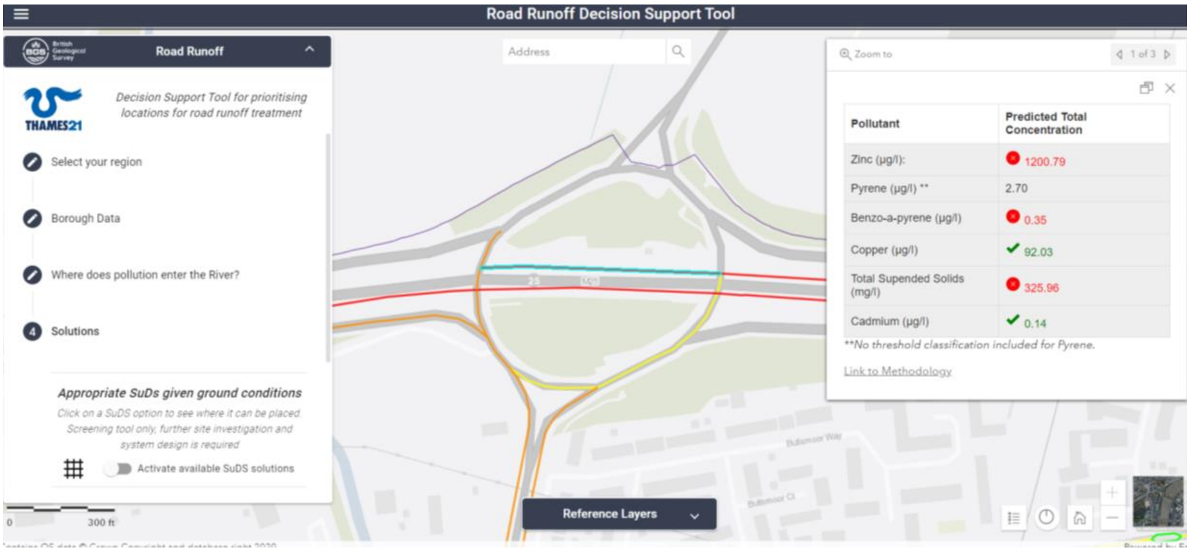

Figure 3: Example of the visualisation of how the predicted concentrations for individual pollutants for a single modelled road section are displayed in the online Road Pollution Solutions tool

2.2.4 SuDS Selection

The SuDS selection element of the tool supports identification of which SuDS may be appropriate for use at a particular site through an assessment of site-specific characteristics which influence their use, including soil type, depth to groundwater, groundwater sensitivity, area of road being drained and the predicted pollution concentrations at a road section level.

2.2.5 Greenspaces

After analysing the available greenspaces in London and excluding those that did not meet identified criteria (see section 2.1.7, above), 416 suitable treatment locations remained. When utilising the tool, greenspace sites identified as having potential for a constructed wetland for treating road run off pollution can be prioritised by local site and catchment managers when assessing the possibility of installing a wetland. It is noted that additional local site constraints and factors (e.g. existing infrastructure influencing flow pathways) may further influence sire suitability, and should be identified and considered as part of a comprehensive feasibility study following the above screening process. Key examples of further aspects to be included in such feasibility studies are listed below:

- Contaminated land / Historic land uses
- Historic landscape designation
- Cultural heritage designations
- Nature / conservation designations e.g. SINCs
- Sensitive habitats including priority habitats in London
- Presence of utilities infrastructure
- Depth to sewer
- Depth to groundwater
- Groundwater sensitivity to pollution (e.g. nitrate vulnerable zone)

Potential Additional Benefits:

- Flood risk mitigation

- Enhanced biodiversity
- Additional pollution treatment (e.g. misconnections)
- Public and sports amenity
- Health and wellbeing
- Climate change mitigation (e.g. carbon storage)
- Air quality improvements
- Urban heat island mitigation

Further Considerations:

- Long term maintenance (including funding and resourcing)
- Aesthetics – attractiveness to the public vs effective pollution treatment.
- Relationship with other mitigation schemes planned or already carried out in the catchment

It should be noted that further investigations should be carried out at short-listed greenspace sites to determine if other factors - such as planning permission – are required. Additionally, whilst the model incorporates some screening variables (Depth to sewer, Depth to groundwater and Groundwater sensitivity to pollution), further exploration by the user should be carried out for the specific greenspace. In particular, this should include verifying the surface water sewer network, which is known to contain considerable uncertainties.

2.2.6 Contributing Sewer Network

Pipe segments were derived from Thames Water's surface water sewer network of Outer London. The GPS coordinates of the start and end points of pipes did not always overlap so individual pipes were linked together into pipe networks by joining pipes that started or ended within one meter of each other and assigning each end as either upstream or downstream. Networks were then selected based on whether they intersected with a greenspace; buffered by 25m to capture pipes flowing adjacent to a greenspace. Using this exported set of networks, contamination values were added to each pipe in the network from roads within 10m. The network was then traced and the pollutant values in each network were then added together to generate the total predicted pollution concentration for each pipe network. Convex hulls were used to display the area of the network contributing pollution to a particular outfall. The pipe network is not displayed in detail for security reasons and due to multiple possible flow directions of the network depending on flow conditions.

3. FAQs

Why is my borough listed but not available to view?

The Road Pollution Solutions tool is limited to outer London, because in outer London there is a separate surface water system. Surface water runoff is rainwater that runs over roads, roofs, pathways and driveways etc. In outer London it drains directly to rivers through a separate surface water piped system, whereas central London has a combined drainage system, where surface water drains alongside domestic foul water pipes to sewage treatment works. Therefore, pose lower threat to rivers.

Why can I only see some roads when I click on an individual pollutant name, for example zinc?

When clicking on an individual pollutant the roads shown are only those that are predicted to exceed relevant water quality standards for that specific pollutant. If you wish to know more about a particular road, please click on 'All' then select the road you are interested in. This will allow you to see more information about the pollutants on that road section and the concentrations for each of the pollutants.

Why is pyrene not listed as a separate option to click on?

Currently pyrene does not have a water quality standard and is therefore not shown separately. If you wish to know more about the concentrations of pyrene for a road section you are interested in, please click directly on that road to view the pop up information. When a water quality standard becomes available, we hope to be able to incorporate this into the model.

I know of a ditch, stream or river that is not shown when I activate the 'Surface Water Sewers Outfall' layer. Why is this?

In order to make this tool widely accessible at no cost, it is underpinned by freely available data sets, i.e., already in the public domain. The OS Rivers layers is a public resource, but it currently only maps the main rivers and tributaries and excludes many smaller and seasonal tributaries and ditches. This tool can still be of use even where local knowledge is more detailed than the current model. This can be achieved by overlaying the road pollution risk map from this model with your own information about pollution pathways into local rivers to identify risk hotspots and potential treatment solutions. It is intended that this model will be updated in future as more spatially detailed information becomes available.

Why is the greenspace I am interested in not being shown?

Not all greenspaces identified were suitable as road runoff treatment opportunities (for example cemeteries or parks below a minimum area (2 hectares) were excluded as unsuitable for installation of treatment cells) and some were excluded as they do not intercept road runoff pollution due to being located upstream of a polluting road, or not having any surface water network in the vicinity. An additional reason for exclusion was locations where the surface water drain later emptied into a foul sewer; therefore does not impact the rivers directly.

Every greenspace site identified as having potential for a constructed wetland for treating road run off pollution should be evaluated by local site and catchment managers to assess the feasibility of installing a wetland.

This tool has its limitations and the knowledge of local practitioners may be more detailed at a local level than this London-wide tool is currently. However, the model should still be used to further explore greenspace areas of interest even if not listed on the map of the tool. This can be done by looking at the pollution risk of roads in the local area and the presence of any known water courses or ditches that are too small to feature on the current OS rivers layer used by this model to evaluate pathways into the local river.

Why does the 'Sewer Pipes' layer not show all sewer pipes in the borough or catchment?

An original sewer layer was provided to us from Thames Water. The sewer pipes visible in a bright pink colour in the online tool, only represent those sections of the sewer that pass through or nearby a greenspace where a constructed wetland can be placed to mitigate road runoff pollution. Further investigations will still need to be carried out into the possibility of using this pipe as a suitable connection point.

4. Limitations

The Road Pollution Solutions tool is a great first step towards prioritising the most polluting roads but this work needs further phases of development. The points listed below are known limitations of this study and the actions needed in order for this tool to be improved.

It is important to note that source control should also be a focus of treating road runoff pollution and nature based solutions should be designed specifically to removal of the pollutants they capture.

- **Ordinary Watercourse or ditches network needed.** The smaller tributaries and ephemeral streams are currently not included in the OS Rivers layer. A detailed river network was not available during this study. Therefore, the surface drainage networks that empty into small watercourses are not included when considering pollution pathways to the river and which greenspaces may be suitable for intercepting and treating road runoff using wetlands. These greenspace sites are highly likely to be receiving road runoff pollution, as well as offering potential solutions to the pollution. Action is required from other organisations such the lead local flood authorities with a responsibility for ordinary watercourses to develop an appropriate river network map which can be used to develop this work in the future so that more solutions can be identified and therefore rivers restored.
- **The study focused on the strategic road network.** This comprises National Highways Roads and A roads managed by TfL as well as some minor roads that Local Authority Highways are responsible for where traffic count data existed, based on data collected by TfL. = All these strategic roads were identified as a high risk to in regard to predicted concentrations of Benzo(a)Pyrene causing damage to river health, smaller roads not yet assessed are also likely to be causing damage to river health.
- **The surface water drainage network map needs improvement.** Thames Water's surface water network data is poor. The data came from Local Authorities when the water companies were privatised and has had minimal if any updates since. It's known there are many Combined Sewers within the study area but their catchments are not mapped at a suitable level of confidence that can inform this programme. It's also known that there are significant interactions between the surface water network and foul water sewers, this puts sewage into rivers at times (illegally), and rainwater into the foul network, contributing to Combined Sewer Overflow spills. Some of these interactions are known but are not mapped. Action is required to ensure that Thames Water contractors currently update data when they investigate and find issues. Each site feasibility study should include a detailed investigation to verify the drainage pipe network and its depth.
- **Full details of all the surface water assets along the entire road drainage network needs to be captured.** Only Thames Water's part of the road drainage network was modelled. Highways England's or TfL or Highways Authorities network of road drains were not included as there is not consistent coverage of them all, yet they would be crucial for deriving a complete overview of road runoff mitigation opportunities and greenspace opportunities.
- **Pollution risk is based on pollution potential.** Pollution concentrations were estimated based on data on concentrations deposited on the roads, rather than the impact on the water body they wash in to. In reality, pollution may be further diluted

during its passage through the drainage network as well as by larger volumes of water within the river than those assumed. Integration with river flow models is possible but was not part of this study.

- **Road width data should be comprehensively captured.** It was manually estimated for this project as currently it does not comprehensively exist. A small proportion of roads were measured and used to inform assumptions made for similar road types. The calculations on the mass of pollutant deposited and volume of runoff which mobilises it are dependent on road width and therefore any uncertainties in these factors will influence the results generated. In future, road width data should be captured in the asset information of LLFAs and Highways authorities.
- **This study has not yet been ground truthed with water sample data.** More consistent monitoring of road runoff pollutants, in particular from first flush events, is required across London in order to verify the outputs of this modelling. This is a critical next step for the Environment Agency. Previous water sampling work has been published regarding the level of pollution entering, e.g., the Frogs Ditch (tributary of the River Crane) under the M4 in West London, however not all the samples recorded were from the first flush event. Further to this the samples recorded were taken upstream and downstream of the outfalls into the Frogs Ditch and therefore did not record the immediate pollution impact as dilution would've occurred with the river water.

5. Future Work and Recommendations

This project has considerable areas for expansion and refinement, especially in relation to the layers underpinning this model.

The below suggestions will help to improve the layers underpinning the model, therefore increasing the reliability of the tool.

- The creation of a detailed river network layer that includes all smaller tributaries and ephemeral streams.
- The implementation of an increased road network data layer that includes all B roads and residential roads to determine the impact to rivers from road runoff pollution collecting on these smaller roads.
- It's critical that Thames Water develop processes to continuously improve their surface water sewer assets data layer to address the current issues of incompleteness and inaccuracy. This is essential for improving the accuracy of the model and more broadly in supporting partnership work to improve water quality and resilience to flooding. The inclusion of the road drainage network from Highway's England and/or TfL is crucial for providing a complete overview of opportunities.
- Comprehensive data to be made available on road widths for the strategic road network used to ensure the correct mass of pollutant deposited is calculated.
- Carrying out 'first flush' water samples to verify the impact of the pollution on discharge to receiving waters.