UK ROADS LIAISON GROUP

FOOTWAYS AND CYCLETRACK
MANAGEMENT GROUP

Footways and Cycle Route Research
Task 3 Cycle Service Levels and Condition Assessment

Version 1.0

March 2018

Acknowledgements

Contents

Executive Summary

The *Cycle Service Levels and Condition Assessment* task comprises the third of three related research tasks undertaken for Transport for London (TfL) on behalf of the Footway and Cycletrack Management Group (FCMG) in support of its remit "*To champion the role of good maintenance and asset management practices in realising the benefits associated with increased levels walking and cycling*":

1. Review of Footway and Cycleway Construction Materials
2. Footway and Cycletrack Risk Modelling
3. Cycleway Condition Assessment and Service Levels

The *Cycle Service Levels and Condition Assessment* task arose from an acknowledgement on the part of the FCMG that current approaches to condition assessment of cycle infrastructure have been largely developed for footways or carriageways and based on the needs of pedestrians and motor vehicles. This resulted in this particular research task, the aim of which is:

> *To determine whether current methods of assessing and determine levels of service for cycling infrastructure are the most appropriate and reflect aspects of condition and usability that are important to cyclists, and which impact on safety and take up of cycling.*

The research has developed an approach to the asset management of cycle infrastructure that is tailored to cycling that will support asset managers in managing risk and minimising costs over the life of the asset and will consider how condition, serviceability and risk can best be assessed and reported on cycleways.

The *Cycle Service Levels and Condition Assessment* research task comprised the following activities:

1. *Review of Current Cycleway Asset Management Practice*
2. *Review of Previous Research, Development and Guidance*
3. *User Survey*
4. *Proposed Asset Management Framework for Cycleways*
   a. *Cycle Network Hierarchy*
   b. *Condition Assessment*
   c. *Level of Service Assessment*
   d. *Service Levels Reporting*

User focused asset management has an important role to play in promoting cycling and in securing the benefits associated with increased levels of cycling. Through an understanding of those aspects of condition and serviceability that are important to users, and which influence the quality of cycling journeys and ultimately the decision whether or not to cycle, asset managers can develop maintenance regimes that make the best use of limited resources. Drawing upon the results of the user survey, this report proposes a number of improvements for assessment of service levels and asset management of cycle infrastructure, including an approach to the definition of network hierarchy, and a method for assessing asset management related Level of Service of cycleway networks; highway authorities can adapt these for their own asset management plans.

1. Introduction

In recent years, as the benefits of cycling to health, the environment and the economy have become recognised, there has been a significant, ongoing investment in the provision of new cycle infrastructure. In order to support this, a wealth of guidance has been produced covering the planning design and implementation of such new infrastructure. Significantly less attention has been given to the role ongoing management and maintenance of these infrastructure assets in realising these benefits of cycling over the long term.

The Footway and Cycletrack Management Group (FCMG), part of the UK Roads Liaison Group and Roads Board structure, comprises representatives of Highway Authority asset managers and other advisors from all parts of the UK, and has the remit

> "*To champion the role of good maintenance and asset management practices in realising the benefits associated with increased levels walking and cycling*".

In 2016, the Department for Transport ("DfT") funded a programme of research on behalf of the UK Roads Liaison Group ("UKRLG") and its subgroups. This included a specific research project for the Footway and Cycletrack Management Group ("FCMG") which was procured and managed by Transport for London ("TfL") on behalf of FCMG and the DfT comprising three tasks:

1. Review of Footway and Cycleway Construction and Materials Review
2. Footway and Cycletrack Risk Modelling
3. Cycleway Condition Assessment and Service Levels

In contrast to the first two tasks which also cover footways, this third task is specific to cycleways.[1] Figure 1 describes how the three tasks work together to promote the benefits of walking and cycling through good asset management practice.

---

[1] i.e. dedicated infrastructure, including both cycle tracks, including those shared with pedestrians (off-carriageway) and cycle lanes (on-carriageway) but excluding cycling on areas of the carriageway that are also used by motor vehicles The FCMG intend, should funding become available, to extend the research to cover cycling on the carriageway at a future date.
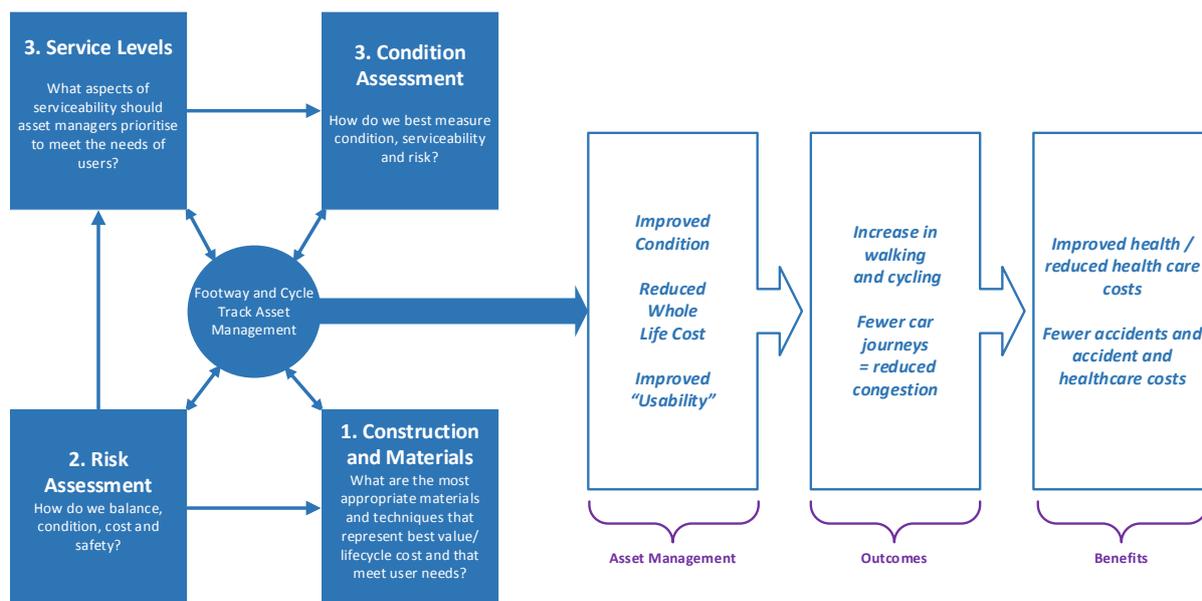
Figure 1 Project Outcomes and Benefits

Research Scope and Objectives

The *Cycle Service Levels and Condition Assessment* task arose from an acknowledgement on the part of the FCMG that current approaches to condition assessment of cycle infrastructure have been developed for footways or carriageways and to the extent that they consider the impact of condition on the user experience, were focused on pedestrians and vehicle users rather than cyclists. This resulted in the commissioning of research, including consultations with cyclists, to understand what aspects of condition and serviceability of cycle infrastructure are important to users, how they impact on the user experience, and how approaches to asset management and maintenance of cycle infrastructure might need to be modified to reflect this.

For the purpose of the research, "condition" relates to physical condition and state of repair of the cycle infrastructure, including the surface and other assets including signs, markings, lighting etc. "Serviceability" relates to the quality of service experienced by the user of that infrastructure, including aspects such as safety, comfort, ease of use, visual attractiveness etc. i.e. the project took a wider view of "condition" and "serviceability" that considered all aspects of the cycleway that could be influenced by asset management interventions, including:

- Small-scale repairs (e.g. pothole filling)
- Larger-scale planned surface maintenance schemes
- Lighting maintenance
- Maintenance of vegetation, such as weed removal, grass and tree cutting
- Cleansing
- Drainage maintenance, such as gully cleansing
- Replacement of road markings

The research excluded aspects of the user experience that were not generally related to, or influenced by asset management interventions, including:

- The design of cycleway itself

- Environmental and locational factors such as gradient, weather etc.

The aim of the project was:

> *To determine whether current methods of assessing and determining levels of service for cycling infrastructure are the most appropriate and reflect aspects of condition and usability that are important to cyclists, and which impact on safety and take up of cycling.*

The research is intended to develop an approach to the asset management of cycle infrastructure that is tailored to cycling, rather than adapted from that used for footways or carriageways and designed to meet the need of pedestrians or motorists, based upon an evidence-based understanding of how condition and serviceability impacts upon the user experience of cycling on that infrastructure, and how these should be used to prioritise maintenance interventions. This asset management framework will support asset managers in managing risk and minimising costs over the life of the asset and will consider how condition, serviceability and risk can best be assessed and reported on cycleways.

Collectively, the outputs of the research will support the hierarchy of national guidance as described in figure 2, below.
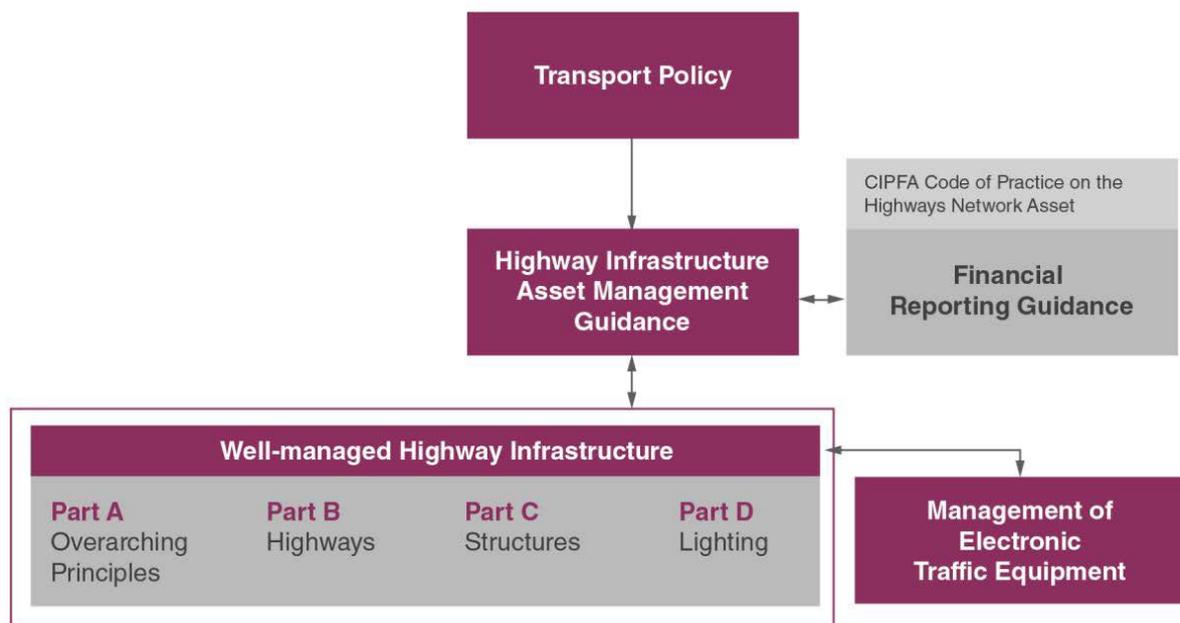
Figure 2 Hierarchy of Guidance

The *Cycle Service Levels and Condition Assessment* research task comprised the following activities:

1.	*Review of Current Cycleway Asset Management Practice*	An assessment of current practice in the asset management of cycleways in the UK.
2.	*Review of Previous Research, Development and Guidance*	A summary of previous work undertaken in this area.
3.	*User Consultation*	A user survey carried out on a range of typical cycleway types in London to determine user priorities in respect of cycleway condition and maintenance.
4.	*An Asset Management Framework for Cycleways*	A proposed framework for asset management of cycleways, which can be adopted and adapted by highway authorities in developing their own asset management plans, which includes: a. *Network Hierarchies* Review of the current approach to network hierarchies for cycle infrastructure for use in risk-based asset management and service level reporting. b. *Condition Assessment* Considering how surface condition is best assessed and reported for asset and maintenance management of cycle infrastructure c. *Level of Service Assessment* Assessment of how service levels and associated measures might be used to support asset management of cycleways, reflecting user needs and supporting highway authorities in adopting a risk-based approach. d. *Service Levels Reporting* Proposals for reporting condition and serviceability for cycleways, and utilising existing information sources and surveys to best support risk-based asset management of cycle infrastructure that both reflects the needs and aspirations of users and meets the information needs of asset managers.

Table 1: Scope of Task 3 Cycle Service level and Condition Assessment

2.   Review of Current Cycleway Asset Management Regimes

National and Regional Cycling Strategies

In recent years, the benefits of cycling and the role of dedicated infrastructure in realising those benefits have been acknowledged, and there has been significant investment and development of guidance for the design of such infrastructure on a number of fronts.

In England the DfT have published a Cycling and Walking Investment Strategy (Department for Transport, 2017), released in April 2017, with an allocation of £1.2bn to encourage cycling and an *"ambition to make cycling and walking a natural choice for shorter journeys"*. This funding has been focused on the development of new cycle infrastructure and upgrading of existing infrastructure rather than ongoing maintenance and asset management. The Strategy forms parts of the government's plan to increase levels of cycling and acknowledges the benefits of this, including improved heath and air quality, and reduced traffic. This work is supported by a Cycle Proofing Working Group, which provides advice to the DfT and other public bodies on "cycle proofing"[2] policy and activity.

On the strategic network, Highways England published its Cycling Strategy in 2016 (Highways England, 2016), acknowledging the role of their network in in supporting the needs of cyclists and "creating routes that are attractive, safe and separate from traffic to encourage people of all abilities to cycle."

In London, Transport for London's London Cycling Design Standards (CLDS) (Transport for London, 2014) gives comprehensive guidance for the planning and implementation of cycling infrastructure.

Transport Scotland's Cycling Action Plan for Scotland 2017-2020: Cycling as a Form of Transport (Tansport Scotland, 2017) promotes modal shift to cycling and the shared vision of "10% of everyday journeys to be made by bike, by 2020".

In Wales, the Active Travel (Wales) Act 2013 resulted in initiatives including the production of an *Active Travel Action Plan* (Welsh Government, 2016) and the release of supporting *Design Guidance* (Welsh Government, 2014) covering network planning, design and a discussion of maintenance and management considerations.

In Northern Ireland, *Changing Gear: A Bicycle Strategy for Northern Ireland* (Department for Regional Development , 2015) sets out a vision of "A community where people have the freedom and confidence to travel by bicycle for every day journeys" and recognises that "Where we provide bicycle infrastructure it is very important that it is maintained to a high standard".

The *Greater Manchester Cycling Strategy* (Transport for Greater Manchester, 2014) aims for a 300% increase in cycling trips by 2025 and includes the commitment to "work with highway authorities to review and develop maintenance regimes that prioritise pothole and drainage repairs and street cleaning for cycling routes"

Risk-Based Asset Management

Alongside the development of strategic guidance for the development of cycling infrastructure, approaches to asset management of highways have been developing, more recently linked to funding

---

[2] Cycle proofing is a process which over time ensures that the built environment generally, and roads specifically, are seen to be safe, convenient and pleasant for cycle use by people of all ages and abilities. *(UK Cycle Proofing Working Group – Terms of Reference, 2015)*

of highway maintenance through, in England, the DfT's Highway Maintenance Incentive Fund and self-assessment questionnaire. Highway Authorities are encouraged to develop and implement highways asset management plans for their networks, including their cycling infrastructure, and are being supported in this through a number UK local road guidance documents, including:

Highway Infrastructure Asset Management Guidance Document (UKRLG/HMEP, 2013) which sets out the benefits of asset management planning including guidance and recommendations on development and implementation of asset management; this document is applicable to all highways assets, including cycling infrastructure, although no cycling-specific content is included.

Well Managed Highway Infrastructure: A Code of Practice (UKRLG, 2016) provides guidance for applying a risk-based approach to the management and asset management of highway infrastructure. Specific guidance for cycle routes is provided in relation to asset condition and investigatory levels and service inspections and much of the broader guidance is also applicable. The introduction of the risk-based approach is a significant change to previous versions of the codes, and implies a locally based approach to service standards; highway authorities are expected to have implemented the provisions of the code by October 2018.

Asset Management Regime

Asset Management regimes for cycling infrastructure in the UK, especially on the UK local highway network are largely adapted from that for carriageways and footways.

A typical regime comprises:

1. Cyclical safety inspections to identify, evaluate and respond to defects that present a risk to cyclists and other road users
2. Ad-hoc inspections in response to reports of defects from users and other organisations, to assess risks and determine responses
3. Service inspections of both cycleway surfaces and other assets associated with a cycleway such as lighting, signs and road markings to determine programmes of defect repairs where defects do not present a safety risk, in order to maintain serviceability
4. Condition assessment surveys to determine the overall condition of a cycleway, for use in a number of ways including:
   - Developing forward work programmes, including determining the timing and specification for maintenance schemes
   - Reporting on the condition and performance of cycleways, sub-networks and networks
   - Assessing the depreciated value of the cycle infrastructure assets in financial terms as part of determining the value of a highway authority's asset stock
   - For asset lifecycle planning purposes, determining the stage within a predicted lifecycle for cycleway assets and the asset stock for use in future investment planning purposes

The activities that comprise this regime typically make use of a network hierarchy, which categorises each asset on the basis of importance of the asset both in terms of the numbers of users and other factors related to its importance/value in the network. With the implementation of *Well Managed Highway Infrastructure* (UKRLG, 2016) authorities are expected to determine this network on the basis of risk, which implies the determining of local risk factors.

Typical practice, for local authorities in the UK is described below. Highways England and TfL will have their own equivalent approaches.

Network Hierarchies/Categories and their Application

> Well Managed Highway Infrastructure (UKRLG, 2016):
>
> **Recommendation 12:** *A network hierarchy, or a series of related hierarchies, should be defined…including…cycle routes…The hierarchy should take into account current and expected use, resilience, and local economic and social factors such as industry, schools, hospitals and similar, as well as the desirability of continuity and of a consistent approach to for walking and cycling.*
>
> *A network hierarchy based on asset function is the foundation of a risk based maintenance strategy. It is crucial in establishing levels of service….*

Local authorities typically adopt the categories in Well Managed Highway Infrastructure (UKRLG, 2016) for their cycle route hierarchies. *Well Managed Highway Infrastructure,* rather than identifying Maintenance Hierarchies for cycle infrastructure based on volume of type use, sets out a number of "Factors to Consider" describing the physical characteristics of the type of cycle infrastructure as set out in the table below. The document also acknowledges that authorities may wish to establish their own hierarchies based on use, particularly where the level of use is significant.

Table 2, below (table 3 in Well Managed Highway Infrastructure) gives the suggested categories or "factors to consider":

Description
Cycle lane forming part of the carriageway, commonly a strip adjacent to the nearside kerb. Cycle gaps at road closure point (no entry to traffic, but allowing cycle access).
Cycle track - a highway route for cyclists not contiguous with the public footway or carriageway. Shared cycle/pedestrian paths, either segregated by a white line or other physical segregation, or un-segregated.
Cycle provision on carriageway, other than a marked cycle lane or marked cycle provision, where cycle flows are significant.
Cycle trails, leisure routes through open spaces. These are not necessarily the responsibility of the Highway Authority, but may be maintained by an authority under other powers or duties.

Table 2 Cycle Route Categories (from Well Managed Highway Infrastructure – Table 3 – Factors to Consider – Cycle Routes

An examination of local authorities' highway maintenance documents shows that these categories have been widely adopted; whilst they are a useful starting point for development of a cycle network maintenance hierarchy, as cycleway networks develop, and levels of use increase, they may not be sufficient as the basis of a full risk-based asset management regime for cycle infrastructure in a number of respects:

    a. They do not fully reflect risk factors, which need to consider risks wider than just safety risk to include other aspects of serviceability and outcomes and benefits resulting from cycling;

    b. They do not reflect the importance of a cycleway, both in terms of the level of use that it attracts and its importance in the context of the cycleway network as a whole, and the resilience of that network;

    c. They are not a "hierarchy" in the sense that there is no notion of one category being more or less than any other and therefore requiring a higher level of service. This is also limits their usefulness as the basis for assessing risks to users and serviceability; and

    d. They do not necessarily reflect user priorities and service aspirations.

Whilst, under the new risk-based approach recommended in *Well Managed Highway Infrastructure* it would not be appropriate to define a set of network hierarchy categories for cycleways for national

adoption, since authorities need to consider their own local requirements and determine their own local categories, the FCMG have determined that a more fully developed approach to developing hierarchies, based on risk, for cycleways would be useful for local authority asset managers, as a starting point that can be adapted to local needs.

Condition Assessment

Current practice for Condition assessment of cycle infrastructure, to determine overall condition and performance, as opposed to individual defects, is largely based on the surveys of associated footways and carriageways.

On local roads and footways, UKPMS provides a range of existing surveys that are used by authorities for condition assessment:

Abbreviation	Survey	Carriage-way	Footway	Cycletrack	Cycle Lane	Notes
DVI	Detailed Visual Inspection	Yes	Yes	Yes	Yes	Detailed manual/walked survey
CVI	Coarse Visual Inspection	Yes	Yes	Yes	Yes	Coarse manual survey, typically from a moving vehicle
FNS	Footway Network Survey	No	Yes	Yes	No	Developed by FCMG. Many local variants.
SCANNER	Surface Condition Assessment for the National Network of Roads).	Yes	No	No	No	Machine survey of surface texture, cracking and shape/ride quality. Survey would generally avoid cycle lanes and take the motor traffic line.
SCRIM	Sideway-force Coefficient Routine Investigation Machine	Yes	No	No	No	Machine survey of wet surface skidding resistance of road traffic lanes.

Table 3: UKPMS Surveys

In addition to these surveys, a new AEI (Annual Engineering Inspection) survey is in development for UKPMS, which will allow users to make a coarse assessment of a whole cycletrack in a street or section of a street as a whole.

The UKPMS visual surveys[3] (DVI, CVI, FNS) all have the potential to record information on condition of cycletracks, particularly if the "full" cross-section referencing method is used, which allows them to

---

[3] See http://www.ukroadsliaisongroup.org/en/asset-condition/road-condition-information/data-management/uk-pavement-management-system-ukpms/ukpms-user-manual-volume-2-.cfm for detailed information on UKPMS surveys

be identified separately. The modes of deterioration that are recorded as part of these surveys on cycle tracks, however, have been designed for footways and are applied, without modification. As such, they do not take into account the needs of cyclists or the particular defects that are of significance to cyclists and the cycle user experience. Although they are of value, particularly for engineers/asset managers in assessing maintenance need, they are less useful as a means of reporting on quality of service, since they are not designed around those defects that influence quality of cycling, such as user comfort, safety, attractiveness and ease of use. The user survey that has been carried out as part of this research task (see section 4 below), is aimed at identifying those aspects of condition and serviceability that are important to cyclists in order that asset managers can use them for assessing and prioritising maintenance need as well as providing a more meaningful means of reporting on performance.

The FNS survey was designed on behalf of the FCMG to provide a rapid, cost-effective survey of the footway network; since its implementation in 2010 the survey has not been applied consistently or universally, and many local variants of the survey have arisen, limiting the potential to derive nationally consistent performance reporting from the survey. The FCMG intend to carry out a review and update of the survey as part of its research programme, as part of its forward business plan.

In Scotland and Wales, as part of the SCOTS/CSSW RAMP/HAMP[4] projects, a custom Footway Visual Condition Assessment has been developed, which can be used for identifying and prioritising maintenance, reporting on condition and supporting asset valuation. The survey is related to the FNS condition categories and could also be applied to shared and dedicated (off-carriageway) cycle tracks.

Machine surveys that are designed for the assessment of carriageways are not generally of value in assessing the condition of the cycle lanes associated with a carriageway since those surveys take the line of the motor vehicular traffic. Whilst in theory drivers could be instructed to cover the cycle lane, it would be difficult to achieve meaningful results, there would need to be specific traffic management to avoid compromising the safety of cyclists, and physical barriers would prevent survey in many locations. There could be scope to derive useful information on the nearside of the carriageway, in determining condition and performance from cyclists' perspective; this is outside the scope of this report but may be considered in future.

Defect Identification and Rectification

Local authorities generally follow the provisions of *Well Managed Highway Infrastructure,* and the predecessor document *Well Maintained Highways* for their regimes for identifying, assessing risk and responding to individual defects on the network. In this context, "defects" includes not only defects to the surface of the cycleway (potholes, cracking etc.) but other issues relating to the cycle infrastructure for which highway authorities are responsible, including standing water, defects to signs and fencing, street lighting faults etc. It also includes issues with assets that are the responsibility of 3rd parties such as statutory undertakers, adjacent landowners etc., where the highway authority will report and liaise with those asset owners to ensure risks to cycleway users are rectified. Authorities will typically carry out regular "safety" inspections of cycleways to identify defects, will assess the risk presented by those defects to road users and to the fabric of the cycleway and will then respond accordingly. Task 2 of this Footways and Cycle Route Research, *Asset Management Guidance for*

---

[4] The Society of Chief Officers for Transportation in Scotland (SCOTS) / County Surveyors Society Wales (CSSW) Road/Highways Asset Management Project which produces guidance and provides good practice advice to local highway authorities in Scotland and Wales.

Footways and Cycle Routes: An Approach to Risk Based Maintenance Management¸ provides highway authorities with guidance and tools to assist in the defect risk assessment.

Frequency of Inspection

Inspection frequencies are commonly linked to the categories of cycleway type in *Well Managed Highway Infrastructure* (UKRLG, 2016), with a typical regime being:

Cycleway	*Typical Inspection Frequency*
Cycle lane forming part of the carriageway, commonly a strip adjacent to the nearside kerb. Cycle gaps at road closure point (no entry to traffic, but allowing cycle access).	At the same frequency as the associated carriageway.
Cycle track - a highway route for cyclists not contiguous with the public footway or carriageway.	6 months
Shared cycle/pedestrian paths, either segregated by a white line or other physical segregation, or un-segregated.	At the same frequency as the associated footway
Cycle provision on carriageway, other than a marked cycle lane or marked cycle provision, where cycle flows are significant.	At the same frequency as the associated carriageway.
Cycle trails, leisure routes through open spaces. These are not necessarily the responsibility of the Highway Authority, but may be maintained by an authority under other powers or duties.	1 year

Table 4: Typical Routine (Safety) Inspection Frequencies

These frequencies are derived from the predecessor to *Well Managed Highway Infrastructure* (UKRLG, 2016)*, Well Maintained Highways* (Roads Liaison Group, 2005 (updated 2013))*;* as highway authorities adopt the recommendations of *Well Managed Highway Infrastructure* (UKRLG, 2016)*,* recommended to be in place by Autumn 2018, one would expect there to be more variation in these frequencies. *Well Managed Highway Infrastructure* (UKRLG, 2016) recommends taking a local risk-based approach in determining hierarchies and to deriving associated frequencies. The proposed approach to cycle hierarchies (see below) will support such an approach, compared to the existing categorisation based on the type of cycle infrastructure, which isn't necessarily a good indication of risk.

Defect Risk Assessment and Responses

In line with the risk-based approach recommended in *Well Managed Highway Infrastructure* (UKRLG, 2016), there is variation in highway authority approaches to the investigatory levels that are applied in determining a defect in a cycletrack, and the risk assessment and responses that are invoked. Previous research on behalf of the FCMG indicated that for the most part defect thresholds are derived from those applied to carriageways and/or footways rather than using thresholds that have been derived specifically for cycletracks.

The process for defect maintenance for cycle infrastructure is outside the scope of this report, but an analysis of the numbers and types of defects identified from safety inspections and other sources might provide a useful supplementary indicator of level of service. Moreover, a hierarchy that has been developed on the basis of the level of risk presented by each part of the network will be useful to authorities in carrying out risk assessment and determining actions and timescales, as well as for determining inspection frequencies.

Service Levels Reporting

There appear to be very few examples of local authorities routinely reporting network-wide cycling infrastructure-specific level of service indicators, related to asset management. Although the Cycle Level of Service (CLoS) tool that appears in the LCDS (Transport for London, 2014), and similar approaches applied by others including the Cycling Route Audit tool in the Welsh Active Travel Design Guidance (Welsh Government, 2014), does include an element related to cycletrack condition, as a minor component of a wider assessment of cycleability of cycle infrastructure. This approach, however, is designed for application to individual schemes and there does not appear to be examples of highway authorities assessing and reporting on the performance of their cycleway network as a whole using the CLoS or similar.

For the pavement condition element of cycleways, many highway authorities do report on the condition of carriageways and footways using UKPMS surveys or similar assessments, and these would include some locations where cycleways are included, either as shared or dedicated areas, but there appear to be no examples of authorities using this data to report on the condition of their cycleway network separately.

DfT have proposed two objectives and supporting metrics/performance measures for cycling as part of the Cycling and Walking Investment Strategy (Department for Transport, 2017) (Objectives 2 and 4 relate to walking):

Objective	*Supporting Metrics*
1. Increase cycling activity, where cycling activity is measured as the estimated total number of cycle stages made.	▪ Frequency of activity ▪ Urban / rural split ▪ Geographical breakdown ▪ Trip purpose breakdown ▪ Breakdown by age, gender, ethnicity and mobility
3. Reduce the rate of cyclists killed or seriously injured on England's roads, measured as the number of fatalities and serious injuries per billion miles cycled.	▪ Rate of cyclists killed / seriously injured / slightly injured on England's roads ▪ Urban / rural split ▪ Regional split ▪ Proportion of cyclists/ drivers stating that cycling is unsafe

Table 5: Cycling and Walking Investment Strategy Objectives and Supporting Metrics

Although much of the attention and investment at a strategic level is on the provision of new infrastructure, as well as on cycling and behaviour, effective asset management and risk management on the part of highway authorities is key to meeting and maintaining these objectives.

User Attitudes and Satisfaction Reporting

There are some examples of user attitudes and satisfaction reporting on cycle networks:

1. TfL have carried out annual *Attitudes Towards Cycling* (Transport for London, 2016) surveys which provides useful information on levels of cycling and the profile of cyclists in London, and allows the progress in increasing cycle levels in London to be tracked.
2. DfT produce regular statistics on levels of walking and cycling in England (Department for Transport, 2018), based on the Active Lives Survey (Sport England, 2017), an annual household survey which is administered by Sport England, and on its own National Travel Survey.

3. Transport Scotland report on levels of cycling (Transport Scotland, 2018), derived from the Scottish Household Survey, and Cycling Scotland produce an Annual Cycling Monitoring Report (Cycling Scotland, 2017) which covers level of cycling and, journey purposes and reasons preventing cycling.

4. In Wales, data is published on levels of cycling and cycling injuries based on the National Survey for Wales (Welsh Government, 2017).

5. The National Highways and Transport Network Survey (NHT) (NHT Network, 2017) is an elective national user satisfaction survey for local highway authorities, with 112 authorities participating in the most recent 2017 survey. The survey includes a number of questions related to cycling and cycling routes:

   ▪ Q1. Importance of cycle routes/lanes/facilities
   ▪ Q2. Satisfaction with cycle routes
   ▪ Q3. Whether it is acceptable to reduce level of service for management and maintenance of cycle paths/facilities (interestingly, this is scored highly in relation to other service areas in the most recent survey, perhaps reflecting that the participants in the survey are drawn from the general population and may include a high proportion of non-cyclists)
   ▪ Q10. Specifically covers satisfaction levels relating to various aspects of cycle route provision and maintenance, including quality of signing and condition
   ▪ Q15 Information about frequency of cycling, showing relatively small numbers of regular cyclists within the survey sample

The survey reports a range of benchmark indicators BI under the category of Walking and Cycling which allows participating authorities to compare performance for their authority against regional, national and similar authority averages and highest and lowest values including some related to asset management of cycle infrastructure:

   ▪ WCBI 10 - Condition of Cycle Routes
   ▪ WCBI 13 - Direction signing for cycle routes

For authorities that participate in the survey over a number of years, reporting on trends in performance is also possible.

Identification, Prioritisation and Programming of Planned Maintenance Schemes

Typical current practice adopted by local authorities managing planned maintenance of cycle infrastructure generally adopts practices used for footways and carriageways. In the case of dedicated cycle lanes that form part of a carriageway, maintenance would generally be carried out as part of the maintenance of the carriageway as a whole; in such cases the need for maintenance would usually be determined as part of the assessment of the overall condition of the carriageway, drawing in upon the results of UKPMS surveys (SCANNER, CVI, DVI etc.) as well as local engineering knowledge and reports from the public and from elected members. Those authorities who are more advanced in their implementation of asset management planning may also carry out interventions as a planned lifecycle intervention in order to achieve planned service life for a carriageway. The adoption of a separate approach for the cycle lane, independently of the carriageway is relatively rare, as is the definition of separate level of service standards for the cycle lane within a carriageway.

For off-carriageway cycle tracks, both those shared with pedestrians and those dedicated for cycling, a similar process applies, usually as part of a process for the identification of footway schemes, and using CVI, DVI, FNS or locally developed surveys as well as input from maintenance engineers and local reports.

Note that much cycle infrastructure in the UK is relatively new construction, and therefore has yet reached a point where major planned maintenance interventions are to be expected. There does not appear to be any comprehensive and reliable national statistics available on the lengths and age of cycle infrastructure; it would be desirable in future for such information to be added to national statistics on road length for use in planning for future investment in asset management of cycling infrastructure.

Summary and Recommendations: Review of Current Cycleway Asset Management Regime

- Asset Management has a key role to play in supporting strategic objectives of increasing cycling, but current approaches are limited, with surveys concentrating on condition rather than on wider aspects of user focused serviceability, a focus on new provision and design rather than maintenance of existing infrastructure and a limited approach to network hierarchy
- As the cycling infrastructure develops there will increasingly be a need for an approach to network hierarchy that reflects volume and type of use beyond that in Well Managed Highway Infrastructure
- Whilst there is a role for existing condition surveys in reporting on the surface condition of cycle infrastructure there is need for a survey that considers the wider aspects of asset management related serviceability of cycleways and reflects user priorities
- Where cycleways are associated with a footway or carriageway, the inspection frequency should not, by default, be determined by the frequency of footway or carriageway inspection since there may be instances where risk assessment determines that a higher frequency is appropriate
- As cycleway networks develop highway authorities may find it useful to report cycle infrastructure measures of serviceability and condition and to monitor and set targets for these over time, as part of their asset management plans

3. Previous Research, Development and Guidance

Whilst there has been considerable research and guidance produced related to planning, design and provision and construction of cycle infrastructure, there has been relatively little activity concerned with the ongoing maintenance and asset management of cycle infrastructure.

There are a number of methods described both in the UK and internationally for assessing the level of service provided by cycle infrastructure; by and large these are:

- Focused on the design and capacity of cycle infrastructure (although most also have a condition and maintenance component)
- In the UK, designed to be applied at the street/project level rather than on a cyclical basis to assess the whole network

FCMG Research and Guidance

Most of the historic research work undertaken on behalf of the FCMG has concentrated on the footways part of its remit, with consideration of cycling only taking place in recent years, a period during which – for the most part – research activity was severely limited due to lack of funding. Two exceptions to this are:

1. *Application Guide 26(v2) Footways and cycle route design, construction and maintenance guide* (TRL, 2003), updated in 2003 which includes *Part 4: Cycle route maintenance* covering maintenance categories and inspection methods as well as defects, primarily for determining maintenance and treatment options.
2. *Cycletrack Maintenance Issues* (Benton, 2012) which covers hierarchy and inspection frequencies and proposes a 5-category hierarchy of cycle routes based on numbers of users, recommends frequencies of safety inspections for those categories and suggests inspecting of cycleways separately from inspections of footways and carriages, preferable from a cycle. The release of the risk-based *Well Managed Highway Infrastructure* (UKRLG, 2016) means that this report requires updating to reflect the need for a risk-based approach.

Other UK Research and Guidance

Aside from the FCMG, there has been significant development of guidance specifically for cycle infrastructure throughout the UK; although most of this is concerned with new provision some consideration is given to ongoing management and maintenance. These include, with the key points related to asset management and maintenance considerations:

3. *London Cycling Design Standards* (Transport for London, 2014) which identifies six desired outcomes for cycle infrastructure:
    i.   Safety
    ii. Directness
    iii. Comfort
    iv. Coherence
    v.   Attractiveness
    vi. Adaptability

    The LCDS acknowledge the importance of proper maintenance over the whole lifecycle of new cycle infrastructure *"As important as building a route itself is maintaining it properly afterwards"*.

9 different street types are identified to which informs cycle infrastructure provision in London based on a combination of "Movement" function and "Place" function and a 4-level level maintenance hierarchy for cycle routes is described based on volume and importance of cycling:

i. Prestige
ii. Primary
iii. Secondary
iv. Cyclists included

 The LCDS include a Cycling Level of Service assessment, supported by tools, to determine 'rideability'. This approach is primarily for network planning and for assessing the success of cycle infrastructure improvements, through a "before" and "after" assessment. The tool combines the 6 desired outcomes (above), each if which has a number of indicators which have criteria for Critical, Basic, Good and Highest Levels of Service and which are combined into an overall CLoS score. Whilst most of the criteria considered relate to the design and layout of the location, cycleway defects/condition are considered as part of the "Comfort" factor.

4. *Cycling UK: Highway Maintenance Briefing Note* (Cycling UK, 2017)
The Cycling UK (formerly the Cyclist Touring Club or CTC) briefing note examines the main impacts of road conditions on cycling use (not specifically dedicated or shared cycle infrastructure), and makes the case for improved funding of maintenance and maintenance practices, including recommendations for preventative maintenance activities. It discusses the defects that are a particular issue for cyclists and examines the particular configurations and locations of defects that affect the level of risk presented to cyclists. It makes the case for a lifecycle approach to maintenance, recommends that highway authorities ensure the cost of ongoing maintenance is budgeted for when planning new cycle infrastructure, including the need to invest in appropriate maintenance equipment (e.g. narrow sweepers). It recommends taking the opportunity to "cycle proof" roads as part of planned maintenance schemes.

5. *Draft Sustrans Design Manual Chapter 15: Maintenance and management of routes for cyclists)* (Sustrans, 2014) also considers the role of maintenance and management in facilitating and encouraging cycling, again including cycling within the carriageway as well as on dedicated and shared cycle infrastructure. The document recommends a range of maintenance policy provisions, including carrying out inspections on bikes, and encouraging reporting of defects. The guidance emphasises the need for knowledge of what assets are held and their condition.

6. *Sustrans Handbook for cycle-friendly design* (Sustrans, 2014) provides guidance on use-focused design and provision for cycling. It provides guidance on the development of a cycle route network, giving an example of a 3-category hierarchy and gives broad guidance on maintenance and management of cycle routes, including recommending carrying out frequent inspections form a bike.

7. *Local Transport Note 2/08: Cycle Infrastructure Design* (Department for Transport, 2008). This document is primarily concerned with design and provision of cycle infrastructure although there are references to the need to consider the maintenance implications when planning new cycle infrastructure. At the time of writing, DfT is planning a refresh of LTN 2/08 which is likely to include references to guidance on maintenance and management of cycle infrastructure.

Innovation in Condition Assessment

Outside of the standard UKPMS surveys, there are a number of other proprietary and locally developed approaches to condition assessment, that although not widely adopted may have the potential to supplement or replace standard surveys. These include:

Machine surveys developed specifically for cycle infrastructure, including:

WDM's "Cyclopath" (WDM Limited, 2016) vehicle, is small enough to be driven on cycle lanes and cycle paths, recording rutting, texture, transverse profile and cracking and forward facing images

Impulse Geophysics' SCVS (Safer Cycling Video Survey) (Impulse Geophysics, 2018) is a tricycle-mounted video survey, allowing a "cyclist's eye" view of the network.

Bicycle-mounted instrumentation

There have been various projects using instrumentation mounted to bicycles to assess condition and ride quality, including:

Edinburgh Napier University's "Intellibike research" project (J.C. Calvey, 2015), which used an accelerometer mounted to a bicycle to measure vibrations in order to categorise surface roughness, and assess how this these correlate to user perceptions of ride quality and comfort.

SeeSense (See.Sense, 2018) has been working with a number of cities including Milton Keynes, Dublin and Belfast to deploy bicycle lights with built-in accelerometers which record information on road condition.

"Crowd-sourced" condition data

"Crowdsourced" data derived from Cyclist's mobile phones and GPS devices is already providing useful in determining patterns of riding, for example through "Strava" heat maps. There have been various studies assessing the potential for using data from mobile phone accelerometers to derive indications of road surface condition. In future, cycle-specific data derived could be a very useful indicator of network condition in particular ride quality, although application into this capability has been limited to date; international examples of such an approach are cited below. Although the accelerometer and GPS data that is used in this analysis is relatively inaccurate compared to the commercial equivalents used by survey companies, the large volume of such "crowd sourced" data can compensate for this.

In the UK and Internationally, most examples of crowdsourced smartphone data are focused on enabling users to report defects that they have themselves identified, and to supplement this with data recorded from the phone (photo, GPS location, etc.).

As the capabilities of smartphones develop, with more accurate GPS, orientation and accelerometer data, and larger number of users with such types of phone, the potential for and the likely accuracy of the assessment of condition and ride quality from such sources can only improve, although there are significant challenges to overcome, not least resulting from variations in the capabilities of different phones.

Cycling UK's "Fill That Hole" initiative (Cycling UK, n.d.) which allows highway defects to be reported through a website or using a GPS-enabled smartphone app is the best known national initiative for gathering information on road conditions from users. Whilst Fill That Hole is a very useful tool for identifying individual defects and for reporting them to highway authorities for risk assessment and action, since it is not recorded in a consistent or universal way, it is very limited in use for determining overall levels of service and condition for cycleway network. That said, authorities may be able to derive some useful indicators of user satisfaction and their effectiveness in dealing with reports from this data.

International Practice

There are some examples of research and development into condition, serviceably and maintenance of cycle infrastructure outside of the UK including:

1. *Evaluating The Use Of Crowdsourcing As A Data Collection Method For Bicycle Performance Measures And Identification Of Facility Improvement Needs* (M Figliozzi, 2015) which describes the development and use of a smartphone application (ORcycle) to gather data on cycle journeys, users and comfort levels, as well as providing a comprehensive assessment of previous work in the area of cycle level of service assessment, including smartphone apps. Examples of smartphone apps use in relation to surface condition were generally apps to facilitate user reporting of defects, although the city of Boston "Street Bump" app, which derives information on ride quality from mobile phone accelerometers are also discussed. In this context the level of service encompasses design, environmental and traffic factors as well as condition on other asset management related aspects. The ORcycle app collected comprehensive information on user types and journeys; the condition aspects are limited to user reports of specific incidents.

2. University of California Pavement Research Centre for Caltrans research project *Bicycle Vibration and Pavement Ride Quality for Cyclists* (R Wy, 2015) also used accelerometers mounted to various points of a bicycle to assess vibration as an indication of ride quality.

There are also international examples of apps that use mobile phone accelerometer data to assess ride quality, including;

3. The City of Boston's StreetBump (Street Bump, n.d.) app crowdsources data from an app that locates "bumps" from a mobile phone placed in a car; whilst not specifically for cycle infrastructure, there is potential for the technology to be adapted and applied to these locations.

4. RoadRoid (Roadroid, 2013-18) captures video and GPS data in addition to vibration from the mobile phones accelerometer. It has been used in Sweden and other international locations for the assessment of road conditions, and has been used for assessment of cycletracks and lanes using a dedicated bicycle trailer

> **Summary: Previous Research, Development and Guidance**
> - Whilst there are well established approaches to determining level of service focused on the design and provision of new cycle infrastructure, there is a need for a method of assessing level of service of the network as a whole, focused on those aspects that can be influenced by asset management interventions
> - Condition of infrastructure is clearly of concern to cyclists and asset managers need tools and approaches, based on an evidence based understanding of cyclists' needs and priorities, for managing cycleway networks
> - The progress made in design and provision of cycle infrastructure in recent years, needs to be accompanied by good quality guidance and approaches to the ongoing maintenance and asset management of that infrastructure
> - New technology and sources of data are becoming available that authorities should be prepared to make use of in future; the FCMG has a role to play in monitoring and evaluating those sources.

4.   Cycle User Survey

The aim of this *Cycleway Condition Assessment and Service Levels* task as determined by the FCMG is;

> *To determine whether current methods of assessing and determining levels of service for cycling infrastructure (both dedicated and shared) are most appropriate and reflect aspects of condition and usability that are important to cyclists, and which impact on safety and take up of cycling.*

Given this, a key element of the project was the user survey, undertaken with cyclists in London[5] that is intended to determine those aspects of condition and serviceability that are important to cyclists, to ensure that their priorities and requirements are reflected in:

- Performance/Level of Service Reporting
- Network Condition Assessment
- Maintenance Regimes, and
- Risk Assessments

By identifying those aspects of maintenance and asset management that are a priority for cyclists, the user survey will help us in identifying gaps in current practice, and to prioritise asset management activities as part of a user-focused asset management regime.

Although London was chosen as the location for the survey, for reasons of practicality and cost, the survey sites were selected to be as representative as possible of the full range of types of cycleway. They were chosen based on the categorisation described below in the proposed approach to cycleway hierarchy.

Appendix 1 details the methodology for and the results of the Cycleway User Survey. In additional to background information about the cyclist, their cycling experience, the reason for the journey, and their bicycle, participants were asked to give their perception of the condition of the cycleway that they had been cycling for a range of defects, their satisfaction with those defects and give their views on the general importance of those defects and their priority for improvement. The defects that were considered in the survey were:

- Longitudinal gaps
- Surface fretting
- Potholes
- Surface cracking
- Worn surface
- Quality and condition of signage
- Grass-ingress or verge creep
- Ride quality – reinstatement related
- Ride quality – condition related
- Ride quality – ironwork related
- Standing water
- Cleanliness
- Overhanging vegetation/ obstructions/width restrictions
- Quality of lighting
- Worn lines and other road markings

---

[5] Forty eight recruitment shifts were undertaken on 12 sites between 8 July and 6 September 2017 with 794 recruitment questionnaires undertaken which yielded 228 main stage interviews.

The sample was largely composed of experienced cyclists, undertaking a relatively high frequency of trips and with a high proportion being commuter cyclists. Caution should therefore be exercised when applying the findings of the survey to other parts of the country, which may have a higher proportion of inexperienced cyclists, or where leisure cycling is more prevalent, and therefore user expectations of speed and comfort may be different.

Defect Importance Ratings

Figure 3, below, summarises the scores for "importance" of the various defects, to cyclists (i.e. how important, in a general sense is it to cyclists that cycleways don't have these defects).
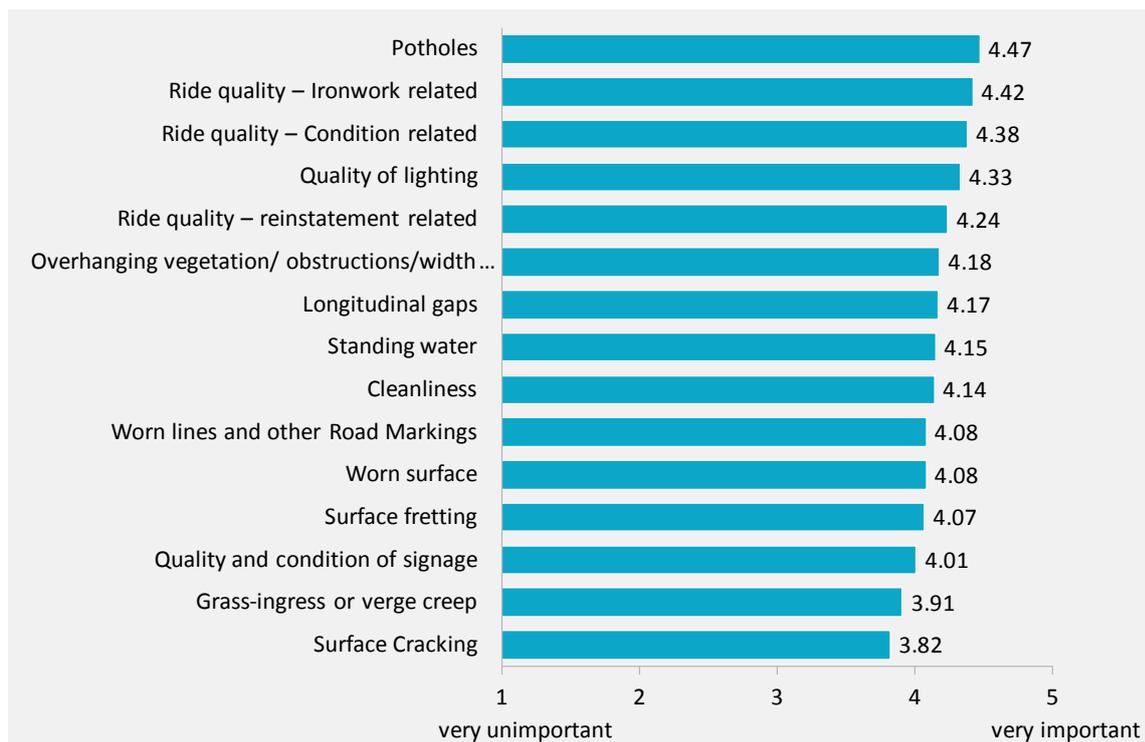
Figure 3: Defect Importance Ratings

Defect Satisfactions Scores

The mean satisfaction scores for all the defects in order of satisfaction are shown in figure 4 below.
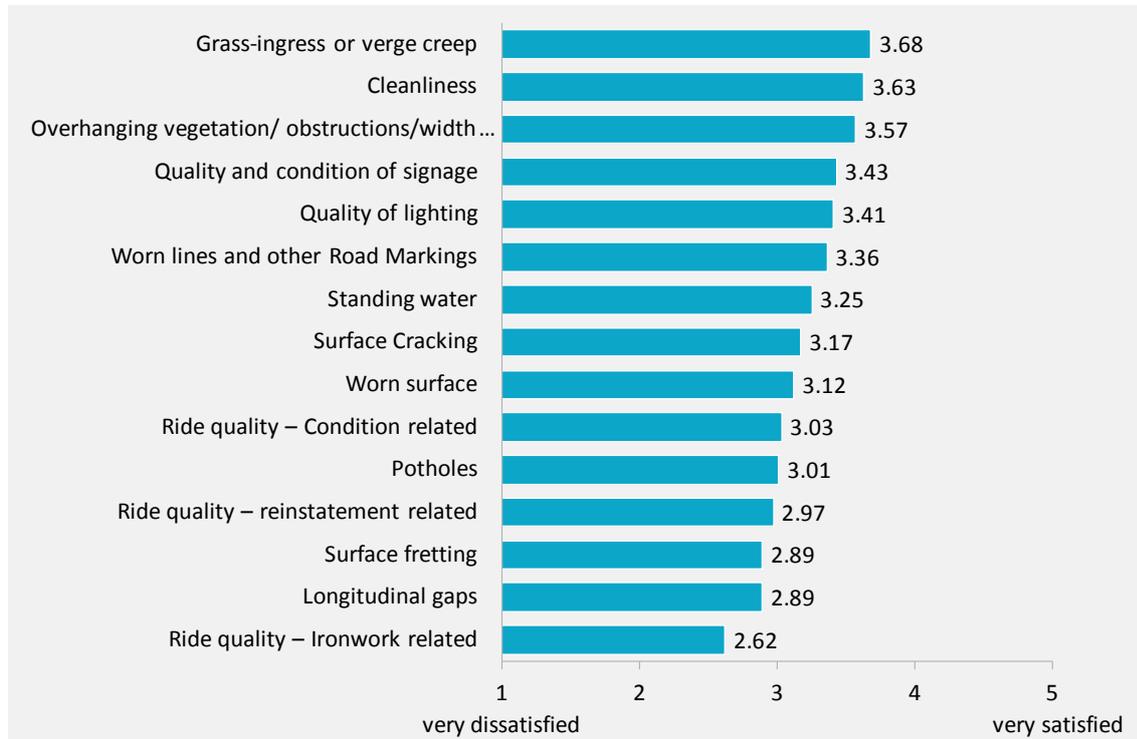
Figure 4: Mean Defect Satisfaction Scores

Ride quality – Ironwork related, longitudinal gaps and surface fretting are the defects that the cyclists in the survey were most dissatisfied with.

Defect Priorities

Plotting levels of satisfaction against importance for each defect shows that the priority areas for improvement are:

- Ride quality – ironwork related
- Potholes
- Ride quality – condition related
- Ride quality – reinstatement related
- Surface fretting
- Longitudinal gaps

Cyclists were also asked to rank the top nine aspects in terms of priority for improvement, see Figure 5.

The priorities were similar to those shown from the analysis of importance by satisfaction although standing water and quality of lighting are given higher priority and surface fretting lower priority. Potholes, ride quality (both ironwork and condition related) are the top three priorities. The mean priority scores are:

Category	% participants
Potholes	55
Ride quality – Ironwork related	46
Ride quality – Condition related	42
Ride quality – reinstatement related	37
Standing water	33
Quality of lighting	30
Longitudinal gaps	29
Quality and condition of signage	28
Surface Cracking	28
Worn surface	27
Cleanliness	26
Surface fretting	26
Worn lines and other Road Markings	21
Overhanging vegetation/ obstructions/width …	19
Grass-ingress or verge creep	15
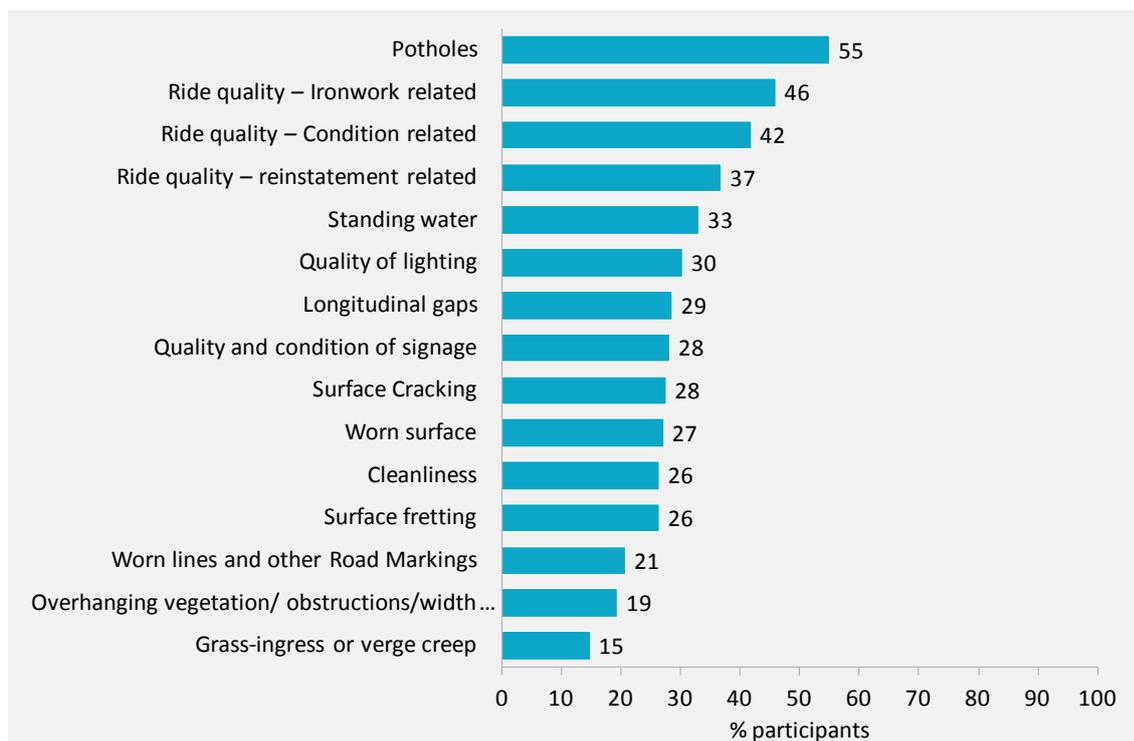
Figure 5: Priority for Improvement Scores

Findings from User Survey

The main findings of from the survey are:

- Cyclists were generally satisfied with journey time reliability;
- On balance, cyclists rated the overall condition of the cycleway as good;
- Although there was some variation in the rating of condition by cycleway volume (4 categories from low/medium/high/very high cycle traffic) this was not statistically significant;
- Users were most satisfied with aspects of the cycleway related to vegetation and cleanliness, and least satisfied with those aspects related to surface condition and ride quality;
- The most important defects were related to ride quality, including potholes, quality of lighting and defects related to maintenance of capacity (obstructions, standing water); and
- The defects with the highest priority as ranked by the cyclists in the survey were those related to ride quality, including potholes.

Application to Asset Management of Cycle Infrastructure

In addition to being a useful overview of attitudes of cyclists to the condition of cycleways, the results of the user survey have potential for specific application to the asset management of cycling infrastructure in a number of respects:

1.   Asset Management Priorities

In general terms, if authorities wish to reflect the concerns and priorities of cyclists in directing maintenance and determining priorities for asset management of cycle infrastructure, they should focus on the condition of the surface, and in particular how it affects ride quality, including potholes. They should also concentrate on the maintenance of width and capacity e.g. by ensuring that cycletracks are free from vegetation, other obstructions and standing water.

2. *Performance and Serviceability Reporting*

In reporting on performance of cycle infrastructure, the survey provides three measures that could be applied to defects derived from condition and serviceability surveys to reflect their importance to users as part of a weighted performance indicator:

1. The "importance" rating
2. The "importance by satisfaction" measure
3. The "priority for improvement" scores

It is suggested that the "importance" rating is the most appropriate for this application. This approach is discussed in more detail in section 5 in relation to existing UKPMS condition surveys and to the proposed cycle serviceability assessment.

3. *Information and Survey Needs*

When considering the level of service provided by a cycletrack or cycle lane, simply reporting on the condition of the surveyed area, as determined by established condition surveys, does not give the complete picture, as far as determining the quality of the user experience of using that facility. In particular, some key aspects will not be represented, such as cleanliness, obstructions due to vegetation and standing water and quality of lighting, whereas others such as surfacing cracking, whilst important form a maintenance engineer's perspective may be weighted too highly as part of a user-focused measure, since they do not have a major impact upon the user experience of using that facility. Section 5, below therefore proposes a new network cycle service levels survey that assesses the quality of the experience of using the cycle infrastructure network, and which considers a wider range of defects and performance than just surface condition.

4. *Defect Risk Assessment*

In assessing risk and priority for remedial action for individual defects reported on their cycleway network, highway authorities may wish to consider using the importance weightings as an input to their risk assessment and prioritisation process, particularly for those defects that do not represent an immediate safety risk but which require action to maintain serviceability.

5. *Applying and Using Cycleway Hierarchies*

Section 5, below discusses a possible approach to the definition of cycle network hierarchies.

An analysis of the results for the "volume" dimension (Low, Medium, High and Very High volumes) indicates a large proportion of cycling journeys being made for the purposes of commuting to work, across all volume categories. There was no clear pattern in the satisfaction ratings by volume. Moreover, it was difficult to discern a pattern in the importance allocated to the quality of the cycleway between volume categories. For the priority scores (condition and importance) for defect types, the priorities tended to be consistent across the volume categories with the exception of:

- Cleanliness was a much lower priority on the lowest volume category
- Grass ingress or verge creep was a lower priority on lowest volume categories

The implication of these results is that, with the exception of cleanliness and vegetation, there appears to be limited desire on the part of users for variation in standards of maintenance between different categories of cycleway. It should be noted, however, that since all of the user survey sites were drawn from locations in London, where there are relatively high levels of cycling generally, the conclusions might be different were the survey to be repeated in other parts of the country.

6.   Ongoing Application of the Survey

Whilst the cycle user survey was intended to be a one-off exercise, as part of this research task, it would be possible to repeat the survey periodically to assess changes in user attitudes, priorities and satisfaction with cycleway condition and serviceability. It would also be useful to repeat the survey in locations outside of London or on other types of network, such as Trunk roads, to assess whether the findings are more widely applicable.

Summary and Recommendations: Cycle User Survey

- The cycle user survey consulted 228 cyclists in 12 sites in London to determine which aspects of condition and serviceability are important to them, covering both the surface condition and other factors such as cleansing, drainage, vegetation and lighting
- The most important defects were related to ride quality, including potholes, quality of lighting and defects related to maintenance of capacity
- Users were most satisfied with aspects of the cycleway related to vegetation and cleanliness, and least satisfied with those aspects related to surface condition and ride quality
- There are a number of ways that the results of the survey can be used in asset management regimes for cycleways, including determining priorities for maintenance, reporting on service levels using both existing data sources and a for reporting the proposed new cycle infrastructure network level of service assessment
- There appeared to be limited desire for different standards of service between different types of cycleway, but given that the survey was carried out in London where levels of cycling are relatively high, this may not be representative of attitudes in other locations
- The user survey could be applied on a periodic basis to assess changes in user perceptions over time

5. Cycle Infrastructure Asset Management Framework

The *Highway Infrastructure Asset Management – Guidance Document* (UKRLG/HMEP, 2013) gives comprehensive advice to highway authorities and describes a framework for asset management of highway infrastructure. This section is intended to complement that guidance, by suggesting an approach to the management of cycling infrastructure that can be adapted by highway authorities for their own asset management plans, particularly in respect of service level and condition assessment, and in the definition of a cycling network hierarchy, drawing upon the outputs of the user survey described in the previous section and in Appendix 1.

Figure 6, below shows a possible approach to the asset management of cycle infrastructure, identifying those elements that can be provided/supported by the outputs of this research task (white boxes). These various elements are described in more detail below.

Data	Risks, User Needs and Priorities	Assessment and Analysis	Service Level Reporting	Decisions and Actions	Outcomes	Benefits
Safety and Service Inspections	*Defect and Serviceabilty Weightings*	UKPMS or other PMS	*Cycling Infastructure Pavement Condition*	*Planned Maintenance Interventions*	Increased Cycling	Improved Health and Well-Being
Cycle User Survey				Cyclical Maintenance Activities and Frequencies	Reduced Congestion	
UKPMS Condition Surveys DVI/CVI/FNS/AEI		Other Asset Management Tools	*Weighted Network Level of Service*	Winter Service		Economic Benefits
Network Level of Service Assessment					Reduced Noise and Air Pollution	
Machine Surveys, Crowdsourced Data, Cycle			*Reactive Maintenance*			
Cycling Statistics	*Cycle Network Hierarchies*	*Risk Assessment*	*User Percepion Reporting*	Investment and Budget Planning	Reduced Accidents	Environmental Benefits

Key:

FCMG Research Task 3 Outputs	*FCMG Research Task 2 Outputs*	*FCMG Research Task 1 Outputs*

Figure 6: Elements of a Cycle Infrastructure Asset Management Process

Objectives

The objectives of asset management of cycle infrastructure are, ultimately to ensure that the cycling infrastructure is maintained to provide a level of service that encourages cycling, and promotes the benefits associated with increased cycling. Effective asset management of cycling infrastructure has an important role to play in achieving the strategic objectives for promoting and increasing cycling

made by the various national and regional bodies around the UK as described in section 2, including the DfT's *Cycling and Walking Investment Strategy* ambition to double cycling by 2025.

There is a well acknowledged business case for investment in cycling infrastructure[6], based on benefits that include:

- Health
- Journey time, reliability and quality
- Congestion
- Economy
- Environment
- Improved air quality

Effective asset management of cycle infrastructure promotes, protects and maintains the benefits associated with the provision of new cycling infrastructure over the long term.

In determining asset management plans for cycling infrastructure, highway authorities must ensure sure that their maintenance focuses on the needs and priorities of users, in determining a sustainable level of service, and aims to minimise the costs over the life of that asset. The approach described below aims to balance these requirements, and support asset managers in the delivery of sustainable, cost-effective, user-focused assessment and maintenance regimes.

Cycle Network Hierarchy

Well Managed Highway Infrastructure asserts that *"A network hierarchy based on asset function is the foundation of a risk-based maintenance strategy. It is crucial in establishing levels of service and to the statutory network management role for developing co-ordination and regulating occupation."*

A network hierarchy is a categorisation of the network, in this case of cycleways, on the basis of each length of cycleway and "importance". This "importance" category may derived form a number of factors including:

- Volume of traffic
- Strategic importance in the network as a whole
- Type of users/use
    - Leisure
    - Commuter
    - Sports
    - Etc.
- Risk (for example of service failure, to the integrity of a route or a network as a whole)
- Physical characteristics (layout, capacity)

A network hierarchy is a useful element of an asset management regime in that it supports:

- Establishing and weighting of levels of service and associated performance measures
- Prioritising resource allocation to different parts of the network
- Prioritising potential maintenance schemes for programming purposes
- Assessing the risk presented by defects and by the condition of a length of cycleway

---

- [6] *Investing in Cycling & Walking: Rapid Evidence Assessment*, DfT 2016, describes Cycling Investment as typically in the "very high" value for money range (BCR >4:1)

- User consultation and communication to users and the community
- Planning of provision

Well Managed Highway Infrastructure (UKRLG, 2016) recommends (Recommendation 12) that:

> *A network hierarchy, or a series of related hierarchies, should be defined which include all elements of the highway network, including carriageways, footways, cycle routes, structures, lighting and rights of way. The hierarchy should take into account current and expected use, resilience, and local economic and social factors such as industry, schools, hospitals and similar, as well as the desirability of continuity and of a consistent approach for walking and cycling.*

Having set out the likely format and purpose of a network hierarchy, the sections of *Well Managed Highway Infrastructure* (UKRLG, 2016) that covers cycle route hierarchies (sections A.4.3.17/18) propose a categorisation of cycle routes that rather than being based on use or functionality is a categorisation of different types of cycle route, or "factors to consider" as set out in table 2 above.

It is the view of the FCMG that these categorisations are of limited value to highway authorities as part of their asset management regime, in particular supporting those activities listed above; moreover, *Well Managed Highway Infrastructure* (UKRLG, 2016) acknowledges that *"Where the level of use on particular cycle routes is significant and <u>relevant to maintenance need</u>, for example on commuter cycle routes, authorities may choose to establish categories based on use." (*A.4.3.18).

With this is in mind, a part of this research task is to consider an appropriate approach to network hierarchy for cycle infrastructure that supports risk based asset management. It is stressed that the approach to cycle hierarchy described below should be treated as advisory and can be adapted by authorities for their own local needs.

Existing Approaches to Cycle Route Categorisation

In addition to the Cycle Route categories/factors to consider in *Well Managed Highway Infrastructure* (UKRLG, 2016), there are a number of other examples of categorisation of cycle route networks including:

1. The London Cycling Design Standards defines 9 street types based on a 3*3 matrix combining 3 categories of "movement" function and 3 categories of "place" function. Although this categorisation is applied to the street as a whole rather than the cycleways within a street, it is used to inform design of cycle infrastructure.
2. The Sustrans *Handbook for Cycle Friendly Design* suggests a 3-level hierarchy of cycle routes, comprising:
   - Main routes
   - Secondary routes
   - Access routes

Proposed Cycleway Hierarchy Framework

Whilst the Sustrans hierarchy or routes would provide a simple approach to hierarchy, it is suggested that a more flexible approach would be to categorise cycletracks on the basis of both the "importance" of a cycleway within the network as a whole and the volume of use.

This approach could be used to derive a matrix of categories combining both importance and volume dimensions, similar to the street categorisations in the LCDS and could be adapted by local authorities for their own local asset management planning needs by varying:

1. The number of categories used for each dimension

2. The factors that are taken into account in determining the importance of a cycleway, including risk factors (this is discussed in the guidance produced for of Task 2 of the FCMG Research – *Asset Management Guidance for Footways and Cycle Routes: An Approach to Risk Based Maintenance Management)*
3. The criteria and the cycle traffic flows used for each of the volume categories

Table 6, below, sets out a starting point for a cycleway hierarchy for a local authority, with tables 7 and 8 suggesting criteria for allocating a cycleway to the importance and volume categories. Note that if such an approach is adopted as part of a highway authority's asset management planning for cycle infrastructure it would not preclude the categorisation from a single dimension being used for a particular application. For example, the volume of cycle traffic categorisation could be used on its own for risk assessment of safety defects.

Cycleway Importance	Cycle Traffic Volume			
	4. Low	**3. Medium**	**2. High**	**1. Very High**
A High Importance	4a	3a	2a	1a
B Medium Importance	4b	3b	2b	1b
C Low Importance	4c	3c	2c	1c

Table 6: Example Cycle Route Hierarchy

Category	Typical Traffic Volume Per Day	Description
Very high	>2500/day	Prestige/priority routes such as cycle superhighways in London, or equivalent urban commuter routes
High	>1000/day	High traffic flow routes
Medium	>250/day	Local access and link routes
Low	<250/day	Low user rural cycletracks

Table 7: Cycle Route Hierarchy – Example of Volume Categories

Note that the volume categories will need to be tailored for the level of use in each area. Most authorities will not have comprehensive cycle traffic count information on the whole of their network and may need to rely on a combination of information in categorisation their network:

- Cycle counts
- Local knowledge and judgement
- Strava heat map data or similar

Category	Description/Examples
High	City shopping destination, strategic commuter route
Medium	Town shopping destination, seafront cycletrack
Low	Little or no leisure or place function

Table 8: Cycle Route Hierarchy – Example of Volume Categories

Other factors that may be taken into account when determining the strategic importance of a cycleway within the network as a whole might include:

- Leisure function
- Designation as a strategic commuter route or as part of the national cycle network
- Risk factors such as proximity to motor traffic
- In a location designated as a significant destination/place, or with high specification materials
- Part of a resilient cycleway network

Condition Assessment

An important element of assessing and reporting on serviceability of cycle infrastructure are the tools and sources of information for assessing condition of assets. Good quality, up to date condition data is an essential part of an effective asset management regime and supports:

- Identification of locations where maintenance interventions are required
- Reporting on performance and level of service
- Lifecycle and investment planning
- Asset valuation

Pavement Surface Condition – UKPMS Surveys

For cycleways, there are existing UKPMS surveys that provide information on the condition of pavement surfaces; table 3 lists existing surveys that provide information on cycletracks and cycle lanes, specifically:

- DVI (Detailed Visual Inspection)
- CVI (Coarse Visual Inspection)
- FNS (Footways Network Survey)

Authorities wishing to report separately on the surface condition of their cycleway network are advised to make use of these UKPMS surveys; if possible this will be as part of a survey regime that is already in place, making use of existing data.

For off-carriageway surveys, if simple cross-section position referencing has been adopted, it is still possible to analyse and report on data specifically for cycle tracks, since this is identified as a separate feature, with defects specifically for cycletracks.

For surveys on the carriageway (DVI or CVI) it will only be possible to report separately on the condition of cycle lanes if:

a. "Full" cross-section position referencing has been used which identifies and records data for each lane separately, as opposed to the "simple" method which considers the carriageway as a whole, including cycle lanes, and
b. An inventory has been recorded using full-cross section position referencing, which identifies lanes specifically as cycle lanes. Note that this is not currently catered for as part of the UKPMS data model and would require either local customisation of an authority's UKPMS system or a change to the national UKPMS rules and parameters.

Appendix 2 details the defects for cycle tracks that are recorded as part of DVI, CVI and FNS surveys. Since cycle lanes are not identified as a separate feature, they are assessed as carriageway, applying – for CVI and DVI – carriageway defects.

It is recommended that "cycle lane" is added as a feature to the UKPMS rules and parameters, to facilitate future reporting on surface condition of cycle lanes separately from carriageways (note that this would also allow reporting on the condition of the cycle lane network even if "simple" cross section position referencing were used, although it wouldn't allow cycle tracks on opposing sides of a carriageway to be distinguished).

Pavement Surface Condition – Other Sources of Information

In addition to the existing regime of national standard UKPMS surveys, there are a range of other surveys and data sources that are available, or are likely to be available in the near future that will

support reporting and assessment of maintenance need for the surfaces of cycleways. These are described in section 3, above, and include:

1. Proprietary machine surveys

Various proprietary machine surveys are designed for application to cycle infrastructure, either as on a small vehicle or attached to a bicycle. Such surveys may have the potential to provide useful information on cycleway surface condition in future, although they do not record the full range of information provided by a visual inspection, and may be best used in a complementary role. That said, where such surveys also include image/video data there may also be potential to record other defects and information on other aspects of cycleway serviceability, such as drainage issues, obstructions and restrictions from vegetation, etc.

2. User/crowd sourced data

It is likely that either data collected from instrumentation attached to user cycles, crowd sourced data from mobile phones or repurposed data collected for other purposes will increasingly provide useful information on the condition of the cycleway network. Some useful research has already taken place in this area, and has demonstrated potential. Although there are technological, cultural, commercial and legal issues that may need to be addressed before such data is widely used, one can envisage that it will become an increasingly important tool for asset managers of cycle infrastructure in the coming years.

Cycleway Level of Service Assessment

The HMEP Highway Infrastructure Asset Management Guidance suggests that *authorities should establish levels of service with their stakeholders. Performance measures and targets should also be set in order to determine whether these are being delivered.* The guidance describes levels of service thus:

> *Levels of service are broad statements that describe the performance of highway infrastructure assets in terms that stakeholders can understand. They should relate to outcomes and cover key aspects of asset performance such as safety, serviceability and sustainability. They should consider the performance of the whole network rather than that of individual assets.*

Whilst the condition of the pavement surface is an important element of the level of service provided by a cycleway, and it is important information for asset management purposes when planning for future maintenance, it is not the only factor, as evidenced by the results of the user survey. In order to assess the quality of the user experience of using a cycleway, only those surface defects that impact upon that experience and other aspects of serviceability need to be considered. To this end there is a need for means of assessing cycleway serviceability that:

- Can provide information on the quality of service for the network as a whole
- Can be repeated on a periodic basis to assess trends in the quality of service
- Can be used to derive performance measures of the quality of service provided by the cycleway network
- Covers all aspects of cycleway serviceability that are relevant to the user's experience of using that cycleway, and that can be influenced by asset management interventions
- Records those aspects of serviceability that have been identified as important to cyclists from the cycle user survey (described above)

It is therefore proposed that a new *Cycle Infrastructure Network Level of Service Assessment (CINLoS)* be developed that meets these requirements. This assessment would be modelled upon the CLoS tools in the LCDS, and similar tools, but would differ in a number of respects:

- Only cover those aspects contributing the overall level of service of a cycleway that are related to and can be influenced by asset management interventions, and would exclude other factors such as the design of the cycleway and environmental factors such as gradient
- Be sufficiently coarse and rapid to allow it to be applied at network level, periodically, to support regular reporting
- Support reporting of service levels and aggregate measures of serviceability from a user perspective

The methodology for the CINLoS assessment is as follows:

- It is carried out by an inspector on a bicycle, to ensure that the inspector has a true perception of the experience of using a cycletrack or cycle lane.
- The cycleway network would be divided up into lengths of cycletrack of like condition/age/construction and other characteristics. These would typically be of between 100 to 500m meters in length and could be referenced in advance or by the inspector the first time that the survey is carried out.
- The Inspector cycles each of these lengths and then records an assessment of various aspects of performance and condition including those aspects not included in pavement condition surveys (weed ingress, obstructions, standing water, etc.).
- Each "defect" or condition aspect would be rated in terms of a level of service provided as either 0 (Basic LoS), 1 (Satisfactory LoS) or 2 (High LoS).
- There would also be scope for addition of machine/automatic enhancement of the survey to provide additional information through the application of technology such GPS, video, automatic ride quality, speed, profile etc. either through instrumentation attached to the bicycle, or recorded using a smartphone.

It is stressed that the survey is not recorded whilst cycling, but that the surveyor stops at the end of each length, where it is safe to do so, and records ratings for the length that has just been inspected. The inspector may deem it necessary to ride a length more than once to get a true indication of the level of service provided by that length.

Appendix 3 details various factors that can be assessed as part of the CINLoS assessment; these have been derived from the aspects of condition that were considered as part of the user survey, described above, in order that the "importance" ratings derived from the user survey can be applied as weightings in determining an overall level of service score. Note that this methodology can be adapted as required by local highway authorities to meet their own requirements, by changing the defects that are recorded or the weightings assigned to the defects.

The defects that are recorded as part of the assessment are listed in table 9 below. Each defect has an assessed level of service as basic, satisfactory or high, and a respective score of 0, 1 or 2 assigned. The criteria for assessing the level of service for each defect as basic, satisfactory or high are detailed in Appendix 3.

Defect	Description
Longitudinal gaps	Longitudinal gaps are gaps in the surface of the cycleway (e.g. between a kerb and edge of a cycleway, or where paving has opened up) running in the direction of cycling.
Surface fretting	Fretting is where the cycleway surface breaks up and surface material has been lost.
Potholes	Potholes are where the whole surface of the cycleway has broken away to cause a hole.
Surface cracking	Surface cracking is where there are cracks on the cycleway surface.
Worn surface	Worn surfaces are where the original surface is worn smooth to the point where it may be slippery when ridden on.
Quality and condition of signage	This concerns whether appropriate signs have been provided and if so, whether their condition is satisfactory.
Grass-ingress or verge creep	Grass-ingress or verge creep is where grass grows onto the cycle path track, from an adjacent verge or properties, or where grass is growing through the surface of the cycleway.
Ride quality – reinstatement related	This concerns the quality of ride after parts of the cycleway have been resurfaced, such as repairs after utility (gas, water, communications etc.) works or small area repairs of defects.
Ride quality – condition related	This concerns the quality of ride on the cycleway in terms of how smooth or bumpy it is.
Ride quality – ironwork related	This concerns the quality of ride on the cycleway where there is ironwork.
Standing water	Standing water is where parts of the cycleway remain under water after rain.
Cleanliness	Cleanliness refers to the cycleway being free of litter, leaves, mud and other detritus etc.
Overhanging vegetation/ obstructions/width restrictions	Overhanging vegetation, obstructions and width restrictions may reduce the usable width of the cycleway, causing cyclists to swerve or to move out of the cycleway into the footway or the road.
Quality of lighting	Quality of lighting refers to the brightness and evenness of lighting on the cycleway when it is dark.
Worn lines and other road markings	Worn lines are where road markings on the cycleway such as white lines or cycle marking have partially or completely worn away.

Table 9: CINLoS Defects

Reporting on the CINLoS

The purpose of the CINLoS is to derive an asset management level of service score for each length of cycleway.

For reporting purposes a weighting is applied to each defect and the weighted scores totalled to give a score for each the length of cycleway. The weightings are derived from the importance weightings from the user survey, but scaled so that the total LoS is on a 0 to 100 scale, with a higher score indicating a higher level of service, so that a "perfect" cycleway would score 100 and a cycleway where all defects exist at their worst level would score zero.

Reporting on the overall level of service provided by the cycle network as a whole (or a sub-network, for example by a geographical area or class of road) is then simply a question of deriving a length-weighted average of the individual scores for all of the assessed lengths of cycleway.

Interpretation of the CINLoS

The results of the CINLoS have the potential to provide useful information to support various aspects of asset management planning.

At the network level, authorities can assess trends in the quality of service provided by existing cycle infrastructure, and can establish a target level of service for the network as a whole. This target can be used for assessing and making a case for forward investment in maintenance and asset management in the cycleway network. It may also, depending upon the extent to which the survey is adopted by other authorities, be used to compare performance between authorities and nationally.

By considering the LoS scores for individual lengths of cycleway, the results could also be used in:

- Triggering reactive maintenance (e.g. where one particular aspect, such as vegetation or signs is showing a poor level of service)
- Development of forward work programmes where the overall level service is poor
- Life cycle planning and assessment of future investment need, by deriving forward programmes of work based on the distribution of levels of service across the cycleway network

The results may also be combined with the outputs from other data sources, such as UKPMS condition surveys for a more detailed assessment of condition and maintenance need.

Implementation of the CINLoS

The CINLoS is designed to be capable of being carried out by inspectors without specialist knowledge of highway engineering or maintenance, although it is advised that the assessment be carried out by a relatively experienced cyclist.

The concept of the CINLoS has been discussed with both the FCMG and the RCMG Visual Surveys Sub-Group, the reaction being generally positive. That said, it is recommended that trials of the survey take place before the details of the survey are finalised. Moreover, it is suggested that there is scope for innovation, particularly in the application of technology to enhance the survey and in recording the assessment, and that the FCMG should encourage the visual survey industry to develop their own enhanced implementation.

One key area to be investigated and where technology may provide benefit is the productivity and cost of the survey, which in turn will determine the frequency that it can reasonably be applied. It is suggested that depending upon the length of an authority's cycleway network, a 2 year cycle of surveys would be reasonable.

Further discussion is recommended on the part of the FCMG and more widely, as to whether there is a need for the CINLoS to be applied consistently between authorities in order to facilitate comparisons between the cycle network level of service of authorities and reporting on level of service at a regional and/or national level. This will determine whether some aspects of the survey should be treated as standard and not to be adapted or customised, or whether authorities are free to adapt any aspect of the survey for their own local needs.

It is not envisaged at this stage that the CINLoS would implemented as a survey within UKPMS, for data management, analysis and reporting purposes, since the assessment is not limited to pavements, although this could be considered in future.

Service Level Assessment and Reporting

Whilst the CINLoS assessment would provide one source of reporting on the asset management level of service provided by the cycleway network, as does UKPMS condition data, there are a range other sources of data that could provide the basis for reporting on the quality of service provided by the cycleway network, including:

- User reports of defects
- Crowdsourced user data from smartphones and other sources
- Ad-hoc reports of defects from routine safety and serviceability assessments
- Results of public satisfaction surveys such as the NHT or similar local surveys

Safety Inspections and Reactive Maintenance

Whilst not directly within the scope of this report, an important element of an asset management regime for cycle infrastructure is the regime for identifying defects through routine safety inspections, and for assessing risk and responding to defects identified through these surveys and from other sources, including reports from cyclists and other users. Both *Well Managed Highway Infrastructure,* and the report on Task 2 of the FCMG research *Asset Management Guidance for Footways and Cycle Routes: An Approach to Risk Based Maintenance Management* address the need for a risk based defect maintenance regime. When defining an inspection and reactive maintenance regime for cycleways the following considerations apply:

- Safety inspection frequencies for cycleways should reflect the needs and the level of risk for the cyclists using that infrastructure rather than adopting the frequency for the associated footway or cycleway. The proposed approach to network hierarchy for cycle infrastructure described above supports this risk based approach.
- Risk assessments and responses to defects should also be determined by the needs and priorities of cyclists, and the more detailed approach to hierarchy as described above will assist in this respect.
- Inspectors should be aware of the risks faced by cyclists and should be provided with appropriate training and guidance to ensure that they fully understand these and are able to assess and prioritise responses.

Maintenance and Restoration of Levels of Service

An important element of any asset management plan are the options for maintenance interventions to maintain serviceability over the life of the asset, whilst minimising lifecycle costs. These include localised defect repairs as part of the reactive maintenance regime, cyclical maintenance such as cleansing and maintenance of vegetation and planned maintenance works. The guidance produced as part of Task 1 of the FCMG research *Asset Management Guidance for Footways and Cycle Routes: Pavement Design and Maintenance* covers the options available for maintenance of cycleways in detail.

The tools described above for assessing condition and serviceability of cycleways and the suggested approach to maintenance hierarchy for cycle infrastructure will assist asset managers in:

- Determining when condition and service standards are at risk of falling below acceptable standards
- Determining appropriate responses to restore condition
- Prioritising maintenance schemes and making the case for funding of cycleway maintenance schemes

Winter Service Regimes for Cycleways

Whilst it is outside the scope of this research, when planning their winter service regimes, authorities are encouraged to consider the needs of cyclists when assessing risks, both for routine and reactive maintenance.

Summary and Recommendations: Proposed Cycle Infrastructure Asset Management Framework

- This section describes various elements of an asset management framework for cycle infrastructure that can bet adapted by highway authorities in developing their own asset management plans
- Asset management plans for cycle infrastructure should encourage cycling and promote and maintain the benefits associated with increased cycling
- Asset management plans for cycle infrastructure should reflect the needs and priorities of users, as well as support the management of risk and the promotion of whole-life value
- Existing UKPMS surveys have a role to play in reporting on surface condition, but there is scope to report on data to provide cycleway-specific measures of condition and performance
- As and when UKPMS surveys are reviewed and updated, the FCMG should seek to ensure that they meet the information needs for asset management of cycleways, independently of footways and carriageways
- It is recommended that a separate "cycle lane" feature is added to UKPMS to facilitate reporting on surface condition of cycle lanes separately from carriageways
- A new *Cycle Infrastructure Network Level of Service Assessment (CINLoS)* is proposed to support reporting on all aspects of asset management related cycleway serviceability
- It is recommended that trials of the Cycle Infrastructure Network Level of Service assessment take place before the details of the survey are finalised.
- It is recommended that the FCMG encourage commercial survey and data collection providers to develop innovative tools to facilitate the rapid execution of the CINLoS and the application of complementation measures of condition and serviceability
- That the FCMG encourage commercial survey and data collection providers to develop innovative tools to facilitate the rapid execution of the CINLoS and the application and complementation of measures of condition and serviceability
- A proposed approach to cycle infrastructure hierarchy is described that reflects both the "importance" and the volume of use of cycleways

6. Conclusions and Recommendations

User focused asset management has an important role to play in promoting cycling and in securing the benefits associated with increased levels of cycling. Through an understanding of those aspects of condition and serviceability that are important to users, and which influence the quality of cycling journeys and ultimately the decision whether or not to cycle, asset managers can develop maintenance regimes that make the best use of limited resources. Drawing upon the results of the user survey, this report proposes a number of improvements for assessment of service levels and asset management of cycle infrastructure; highway authorities can adapt these for their own asset management plans.

Recommendations

- Where cycleways are associated with a footway or carriageway, the inspection frequency should not, by default, be determined by the frequency of footway or carriageway inspection since there may be instances where risk assessment determines that a higher frequency is appropriate
- As cycleway networks develop, highway authorities may find it useful to report cycle infrastructure measures of serviceability and condition and to monitor and set targets for these over time, as part of their asset management plans
- That highway authorities make use of the findings of the cycle user survey in determining priorities and assessing risk for cycle infrastructure as part of their asset management regime
- That "Cycle Lane" is added as a feature to the UKPMS rules and parameters, to facilitate future reporting on surface condition of cycle lanes separately from carriageways
- As and when UKPMS surveys are reviewed and updated, the FCMG should seek to ensure that they meet the information needs of asset management of cycleways, independently of footways and carriageways
- That highway authorities consider carrying out the Cycle Infrastructure Network Level of Service assessment on a periodic basis in order to determine and report upon the quality of service provided by their cycleway network and to support asset management planning
- That the FCMG encourage commercial survey and data collection providers to develop innovative tools to facilitate the rapid execution of the CINLoS and the application of complementation measures of condition and serviceability
- That highway authorities adopt the approach to cycle infrastructure hierarchy described above, reflecting both "importance" and volume of use in their asset and maintenance management of cycleways
- That the FCMG keep innovative developments in the assessment of cycleway serviceability and condition under review and engage with data providers to determine the value of new data sources in supporting cycleway asset management and complementing existing sources of condition and serviceability data

7.   References

Benton, M. (2012). *Cycletrack Maintenance Issues.* FCMG/TRL.

Brook Lyndhurst. (2016). *Investing in Cycling & Walking: Rapid Evidence Assessment.* Department for Transport.

C Hölzel, F. H. (2012). Cycling comfort on different road surfaces. *Procedia Engineering*, 479-484.

Cycling Scotland. (2017). *Annual Cycling Monitoring Report 2017.* Cycling Scotland.

Cycling UK. (2017). *Highway Maintenance Briefing Note.* Cycling UK.

Cycling UK. (n.d.). *FillThatHole*. Retrieved from FillThatHole: https://www.fillthathole.org.uk/

Department for Regional Development . (2015). *A Bicycle Strategy for Northern Ireland.* Department for Regional Development .

Department for Transport. (2008). *Local Transport Note 2/08: Cycle Infrastructure Design (DfT, October 2008). .* Department for Transport.

Department for Transport. (2017). *Cycling and Walking Investment Strategy.* Department for Tranpsport.

Department for Transport. (2018). *Walking and Cycling Statistics, England: 2016.* Department for Transport.

FCMG. (2017). *Cycle and Pedestrian Infrastructure Definitions.* FCMG.

FCMG. (2018). *Asset Management for Footways and Cycle Routes: Pavement Design and maintenance (Task 1).* UKRLG.

FCMG. (2018). *Asset Management Guidance for Footways and Cycle Routes: An Approach to Risk Based Maintenance Management (Task 2).* UKRLG.

Highways England. (2016). *Cycling Strategy.* Highways England.

Impulse Geophysics. (2018). *Cycle Lane/Footway Surveys*. Retrieved from Impulse Geophysics: https://www.impulsegeophysics.com/footway-surveys

J.C. Calvey, J. S. (2015). Engineering condition assessment of cycling infrastructure: Cyclists' perceptions of satisfaction and comfort. *Transportation Research*.

M Figliozzi, B. B. (2015). *Evaluating the use of Crowdsourcing as a Data Collection Method for Bicycle Performance Measures and Identification of Facility Improvement Needs.* Oregon Department of Transpsortation.

M Taylor, A. E. (2017). Cyclist exposure to hand-arm vibration and pavement surface improvement in the City of Edinburgh. *Scottish Transport Applications Research.*

NHT Network. (2017). *NHT Public Satisfaction Survey - Key Results*. Retrieved from NHT Public Satisfaction Survey: http://www.nhtnetwork.org/nht-public-satisfaction-survey/findings/

R Wy, S. L. (2015). Bicycle Vibration and Pavement Ride Quality for Cyclists. *TRB.* Caltrans.

Roadroid. (2013-18). *Roadroid*. Retrieved from Roadroid: https://www.roadroid.com/

Roads Liaison Group. (2005 (updated 2013)). *Well-maintained Highways: Code of Practice for Highway Maintenance Management.* The Stationary Office.

See.Sense. (2018). *Lighting the Way for Safer and Smarter Cities*. Retrieved from See.Sense: https://seesense.cc/pages/smart-cities

Sport England. (2017). *Active Lives Adult Survey.* Sport England.

Street Bump. (n.d.). *Street Bump*. Retrieved from Street Bump: http://www.streetbump.org/

Sustrans. (2014). *Design Manual Chapter 15 - Maintenance and management of routes for cyclists (draft).* Sustrans.

Sustrans. (2014). *Handbook for Cycle-Friendly Design.* Sustrans.

Tansport Scotland. (2017). *Cycling Action Plan for Scotland 2017 - 2020.* Transport Scotland.

Transport for Greater Manchester. (2014). *Greater Manchester Cycling Strategy .* Transport for Greater Manchester.

Transport for London. (2014). *London Cycling Design Standards.* TfL.

Transport for London. (2016). *Attitudes towards cycling.* Transport for London.

Transport Scotland. (2018). *Scottish Transport Statistics, No 36, 2017.* Transport Scotland.

TRL. (2003). *AG26 (v2)Footways and cycle route design, construction and maintenance guide.* TRL.

UKRLG. (2016). *Well Managed Highway Infrastucture.* UKRLG.

UKRLG/HMEP. (2013). *HIghway Infrastructure Asset Management Guidance.* UKRLG/HMEP.

WDM Limited. (2016). *Keeping Cyclists Safer With Cyclopath*. Retrieved from WDM: https://www.wdm.co.uk/news/keeping-cyclists-safer-with-cyclopath

Welsh Government. (2014). *Design Guidance: Active Travel (Wales) Act 2013.* Welsh Government.

Welsh Government. (2016). *An Active Travel Action Plan for Wales.* Welsh Government.

Welsh Government. (2017). *National Survey for Waltes.* Welsh Government.

Appendix 1: Cycle User Survey Report

Footway and Cycle Track Research:

Task 3: Cycleway Condition Assessment and Service Levels

Revised Draft Report

November 2017

Prepared by:

Accent
Chiswick Gate
598-608 Chiswick High Road
London
W4 5RT

Prepared for:

Transport for London

Contact:	Chris Heywood	Contact:	Herbert Micallef
E-mail:	chris.heywood@accent-mr.com		
Tel:	020 8742 2211		
Fax:	020 8 742 1991		

File name: J:\2998 Footway & Cycle Track Research\WP\2998rep1v5.docx

CONTENTS

Executive Summary

Introduction

The user consultation survey is an important part of the Cycleway Condition Assessment and Service Levels task, and is aimed at identifying those aspects of condition and serviceability that are important to cyclists, to ensure that their priorities and requirements are reflected in:

- Performance/Level of Service Reporting
- Network Condition Assessment
- Maintenance regimes
- Risk assessments.

The research aimed to relate user perceptions of cycleway condition and serviceability with technical measures such as those from technical surveys (e.g. DVI or FNS).

Method

The method was recruiting cyclists during their journey on a specific cycleway for a follow up online interview.

A sample of 12 sites was selected to reflect, as far as possible, the range of cycleway types, based on a cycleway network hierarchy and distributions of user types.

Forty eight recruitment shifts were undertaken between 8 July and 6 September 2017 with 794 recruitment questionnaires undertaken which yielded 228 Main stage interviews.

Findings

The following summarises the main cycle trip details:

- 57% of cycle trips were work commuting (57%) and 15% cycled for exercise or fitness training
- There was a high frequency of trips with 85% making the trip once a week or more including 37% who made the journey five or more days a week
- The average cycle trip time was 32 minutes with a wide range of times (11% less than 10 minutes and 12% over 50 minutes)
- 47% said they felt safe for most of the journey, 21% throughout the journey and 32% felt safe through some of the journey, but there were a number of occasions where they didn't feel safe
- 65% first started making the journey by bicycle more than a year ago.

Cyclists were asked how satisfied or dissatisfied they were with some aspects of the cycleway overall:

- The highest level of satisfaction were for the reliability of the cycle journey (73% satisfied or very satisfied) and the time it took to make the journey by cycle (73%)
- The lowest levels of satisfaction were for the quality of road surface (36% satisfied or very satisfied) and the space for cyclists (41%)

On balance, cyclists rated the overall condition of the cycleway as good: 49% said it was good or very good and 22% said it was poor or very poor.

The importance of the quality of the cycleway to the cyclist was probed: 87% of cyclists thought it was important: 60% very important and 27% important.

Rating of cycleway defects

The research explored the following cycleway defects:

- Longitudinal gaps
- Surface fretting
- Potholes
- Surface Cracking
- Worn surface
- Quality and condition of signage
- Grass-ingress or verge creep
- Ride quality – reinstatement related
- Ride quality – Condition related
- Ride quality – Ironwork related
- Standing water
- Cleanliness
- Overhanging vegetation/ obstructions/width restrictions
- Quality of lighting
- Worn lines and other Road Markings

For each defect, participants were shown an introduction and between one and three photos to illustrate the defect. Then, for each defect, participants were asked about their satisfaction with the cycleway with respect to the defect and then they were asked how important it was that the cycleway did not have that defect.

Ride quality – Ironwork related, longitudinal gaps and surface fretting are the three worst rated defects.

The mean satisfaction scores for all the defects in order of satisfaction are shown below.

Chart 1: Mean satisfaction

Defect	Value
Grass-ingress or verge creep	3.68
Cleanliness	3.63
Overhanging vegetation/ obstructions/width …	3.57
Quality and condition of signage	3.43
Quality of lighting	3.41
Worn lines and other Road Markings	3.36
Standing water	3.25
Surface Cracking	3.17
Worn surface	3.12
Ride quality – Condition related	3.03
Potholes	3.01
Ride quality – reinstatement related	2.97
Surface fretting	2.89
Longitudinal gaps	2.89
Ride quality – Ironwork related	2.62

Scale: 1 = very dissatisfied, 5 = very satisfied

The mean importance that the cycleway does not have each defect are shown below:
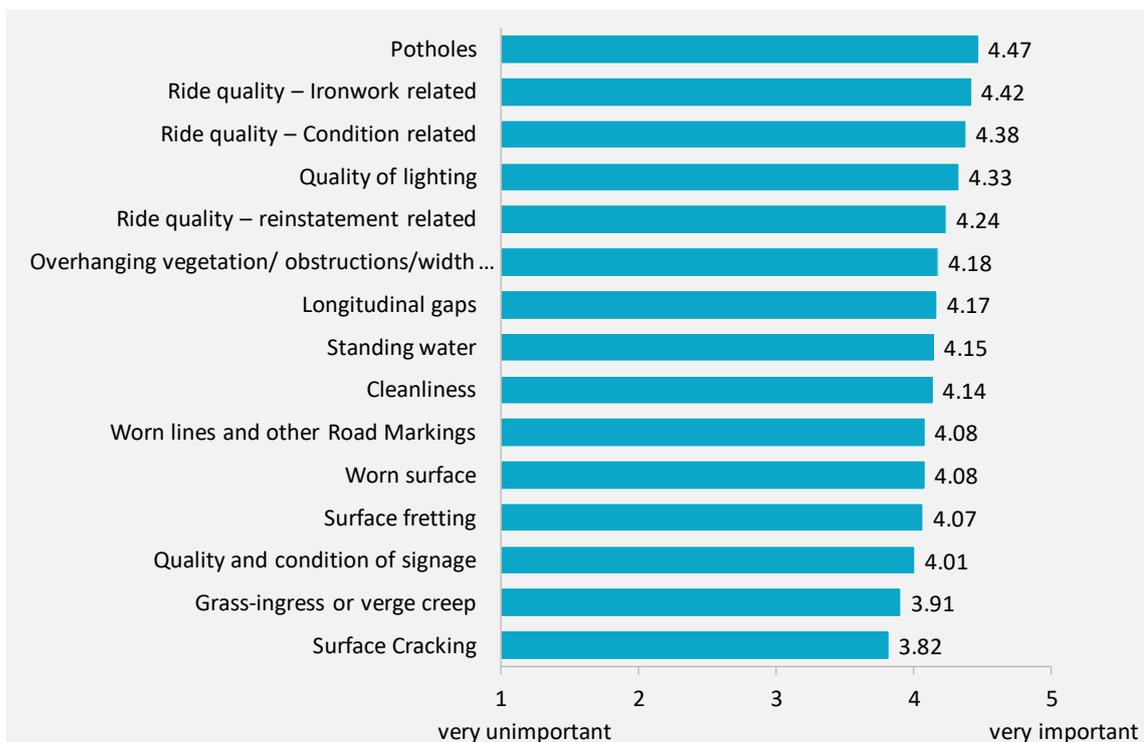
Chart 2: Mean importance

Defect	Value
Potholes	4.47
Ride quality – Ironwork related	4.42
Ride quality – Condition related	4.38
Quality of lighting	4.33
Ride quality – reinstatement related	4.24
Overhanging vegetation/ obstructions/width …	4.18
Longitudinal gaps	4.17
Standing water	4.15
Cleanliness	4.14
Worn lines and other Road Markings	4.08
Worn surface	4.08
Surface fretting	4.07
Quality and condition of signage	4.01
Grass-ingress or verge creep	3.91
Surface Cracking	3.82

Scale: 1 = very unimportant, 5 = very important

Plotting levels of satisfaction against importance for each defect shows that the priority areas for improvement are:

- ride quality – ironwork related
- potholes
- ride quality – condition related

- ride quality – reinstatement related
- surface fretting
- longitudinal gaps.

Priorities

Cyclists were asked to rank the top nine aspects in terms of priority for improvement.

The priorities were similar to those shown from the analysis of importance by satisfaction although standing water and quality of lighting are given higher priority and surface fretting lower priority. Potholes, ride quality – ironwork related and ride quality – condition related are the top three priorities. The mean priority scores are:

Aspect	% participants
Potholes	55
Ride quality – Ironwork related	46
Ride quality – Condition related	42
Ride quality – reinstatement related	37
Standing water	33
Quality of lighting	30
Longitudinal gaps	29
Quality and condition of signage	28
Surface Cracking	28
Worn surface	27
Cleanliness	26
Surface fretting	26
Worn lines and other Road Markings	21
Overhanging vegetation/ obstructions/width…	19
Grass-ingress or verge creep	15
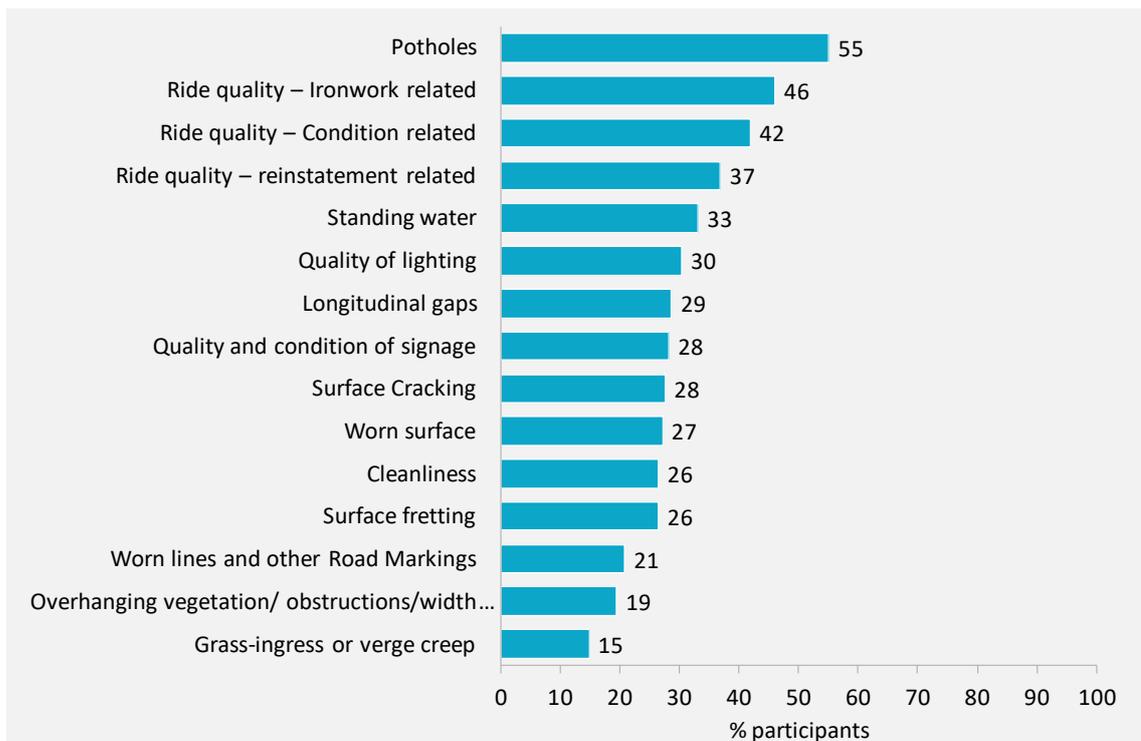
1. INTRODUCTION

1.1 Background

The user consultation survey is an important part of the Cycleway Condition Assessment and Service Levels task, and is aimed at identifying those aspects of condition and serviceability that are important to cyclists, to ensure that their priorities and requirements are reflected in:

- Performance/Level of Service Reporting
- Network Condition Assessment
- Maintenance regimes
- Risk assessments.

The research aimed to relate user perceptions of cycleway condition and serviceability with technical measures such as those from technical surveys (e.g. DVI or FNS).

2. METHODOLOGY

2.1 Introduction

The method was recruiting cyclists during their journey on a specific cycleway for a follow up online interview. We intercepted cyclists who were using a cycleway at junctions or traffic lights (where possible), and administered a short CAPI recruitment questionnaire on tablets.

Cyclists were invited to undertake a follow-up survey on-line. We collected name and email addresses and automatically sent an e-mail with a unique web-link to the survey at the end of the shift. There was a £5 incentive (Amazon or M&S voucher or charity donation).

Interviewers wore hi visibility vests with an A4 sized label emblazoned on the front making it very clear they are undertaking a market research survey.

2.2 Questionnaire

The questionnaire measured attitudes towards cycleway condition with respect to:

- Longitudinal gaps
- Potholes and
- Surface fretting
- Surface cracking
- Worn surface
- Quality and condition of signage
- Grass-ingress/verge creep
- Ride quality – Reinstatement related
- Ride quality – Condition related
- Ride quality – Ironwork related
- Standing Water
- Cleanliness
- Overhanging vegetation/ obstructions/width restrictions
- Quality of lighting
- Worn lines and road markings

For the trip origin and destination we collected OD data using Google mapping software integrated within our questionnaire software so that a respondent could just click on the map and this recorded the coordinates of the location.

A copy of the questionnaire is included as Appendix A.

2.3   Sampling Specification

A sample of 12 sites was selected to reflect, as far as possible, the range of cycleway types, based on a cycleway network hierarchy and distributions of user types.

Destination	Cycle Traffic Volume			
A High Importance	4a	3a	2a	1a
B Medium Importance	4b	3b	2b	1b
C Low Importance	4c	3c	2c	1c
	4. Low	3. Medium	2. High	1. Very High

The following 12 locations were selected:

Table 1: Sample locations

	Road Name	Area	Volume Category	Destination Category	Site Type
1	Mepham Street	Waterloo	4	a	Off Carriageway Shared Footway/Cycletrack
2	Welling High Street		4	b	Advisory segregated on carriageway
6	Wemborough Road	Stanmore/ Belmont	4	c	Advisory segregated on carriageway
7	Trafalgar Rd	Greenwich	3	a	Advisory segregated on carriageway
8	Petty France		3	b	Segregated, dedicated one way
14	Uxbridge Road	Yeading	3	c	Mandatory off carriageway alongside major road
16	Bermondsey Street	London Bridge	2	a	Mandatory segregated on carriageway
19	Upper Tooting Road		2	b	Cycle Superhighway 7 on major road
21	Borough Road	Elephant	2	c	Advisory segregated on carriageway
23	Whitechapel High Street		1	a	Segregated and advisory superhighway
25	Putney Bridge		1	b	Advisory segregated on carriageway
26	Kings Road	Chelsea	1	c	Advisory segregated on carriageway

Maps and photos of the sites are included as Appendix B.

Anyone who cycled on the cycleway marked on the map was in scope.

2.4 Fieldwork

Thirty six shifts were undertaken between 8 and 22 July as shown below.

Table 2: Fieldwork schedule

Site	Date	Time
Mepham Street	Monday, 17-Jul-17	7-1pm
	Tuesday, 11-Jul-17	1-7pm
	Saturday, 15-Jul-17	10-4pm
Welling High Street	Tuesday, 11-Jul-17	7-1pm
	Friday, 14-Jul-17	1-7pm
	Saturday, 15-Jul-17	10-4pm
Wemborough Road	Monday, 10-Jul-17	7-1pm
	Thursday, 13-Jul-17	1-7pm
	Saturday, 08-Jul-17	10-4pm
Trafalgar Road	Wednesday, 12-Jul-17	7-1pm
	Tuesday, 18-Jul-17	1-7pm
	Saturday, 22-Jul-17	10-4pm
Petty France	Monday, 10-Jul-17	7-1pm
	Wednesday, 12-Jul-17	1-7pm
	Sunday, 16-Jul-17	10-4pm
Uxbridge Road	Friday, 14-Jul-17	7-1pm
	Monday, 10-Jul-17	1-7pm
	Saturday, 15-Jul-17	10-4pm
Bermondsey Street	Wednesday, 12-Jul-17	8-2pm
	Tuesday, 11-Jul-17	1-7pm
	Saturday, 22-Jul-17	10-4pm
Upper Tooting Road	Thursday, 13-Jul-17	7-1pm
	Tuesday, 11-Jul-17	1-7pm
	Sunday, 09-Jul-17	10-4pm
Borough Road	Tuesday, 11-Jul-17	7-1pm
	Wednesday, 12-Jul-17	1-7pm
	Saturday, 15-Jul-17	10-4pm
Whitechapel High Street	Tuesday, 11-Jul-17	8-2pm
	Wednesday, 12-Jul-17	1-7pm
	Saturday, 22-Jul-17	10-4pm
Putney Bridge	Monday, 10-Jul-17	7-1pm
	Thursday, 13-Jul-17	1-7pm
	Sunday, 16-Jul-17	10-4pm
Kings Road	Tuesday, 11-Jul-17	7-1pm
	Wednesday, 12-Jul-17	1-7pm
	Saturday, 08-Jul-17	10-4pm

576 recruitment questionnaires were undertaken which yielded 146 Main stage interviews.

A further 12 shifts were undertaken (as shown below) from which 218 recruitment questionnaires were undertaken. This yielded a further 72 interviews.

Table 3: Additional fieldwork schedule

Site	Date	Time
Mepham Street	Friday, 08-Sep-17	1-7pm
Welling High Street	Friday, 08-Sep-17	7-1pm
Wemborough Road	Wednesday, 06-Sep-17	1-7pm
Trafalgar Road	Thursday, 07-Sep-17	1-7pm
Petty France	Thursday, 07-Sep-17	1-7pm
Uxbridge Road	Friday, 08-Sep-17	1-7pm
Bermondsey Street	Friday, 08-Sep-17	7-1pm
Upper Tooting Road	Thursday, 07-Sep-17	7-1pm
Borough Road	Friday, 08-Sep-17	7-1pm
Whitechapel High Street	Wednesday, 06-Sep-17	7-1pm
Putney Bridge	Wednesday, 06-Sep-17	7-1pm
Kings Road	Wednesday, 06-Sep-17	1-7pm

In total 774 email invites were sent out, 283 (37%) entered the survey and 228 (29%) completed the survey.

The average interview completion length was 18 minutes.

2.5   Pilot

A pilot was undertaken at two sites, Welling High Street and Putney Bridge to cover a broad range of volume.

The pilot took place on the following dates:

- Welling High Street: Tuesday 20 and Wednesday 21 June
- Putney Bridge: Wednesday 21 June

There were 20 recruits from the two shifts at Welling High Street (10 each day) and 20 from the one shift at Putney Bridge, the number of recruits reflecting the relative cycle volume of the two sites.

The feedback from the interviewers was that it was difficult to stop cyclists but otherwise all fine. At Putney Bridge there was little time for cyclists to respond because the traffic lights changed quickly and the ones that did want to respond did not want to come out of the traffic.

There were five bounce backs from the 40 emails sent out (incorrect email addresses), so 35 email invites were successfully sent. Nineteen (54%) clicked on the link and 12 completed the online questionnaire (34%). This was considered a good response rate although it varied notably by location: 19% Welling High Street, 47% Putney Bridge.

The questionnaire took 14 minutes to complete on average and there were no problems found with it (such as routeing errors).

3. FINDINGS

3.1 Introduction

We have included the 12 pilot interviews with the 228 main stage interviews as there were no substantive changes to the questionnaire following the pilot.

This chapter reports on the data for the whole sample. As the sample sizes for many of the 12 sampling locations are low (three below 10) we have not reported on them individually:

- Mepham Street   38
- Welling High Street   7
- Wemborough Road   19
- Trafalgar Road   24
- Petty France   18
- Uxbridge Road   6
- Bermondsey Street   8
- Upper Tooting Road   19
- Borough Road   25
- Whitechapel High Street   16
- Putney Bridge   28
- Kings Road   32

For some questions we have grouped the locations by cycle volumes with the following locations in each.

Low	Medium	High	Very High
Mepham Street	Trafalgar Rd	Bermondsey Street	Whitechapel High Street
Welling High Street	Petty France	Upper Tooting Road	Putney Bridge
Wemborough Road	Uxbridge Road	Borough Road	Kings Road

3.2 Cycle Trip Details

This section sets out information collected about the cyclists' trip.

Journey Purpose

For over half the main purpose of the cycle trip was work commuting (57%). A sixth cycled for exercise or fitness training. See Figure 1 for the whole sample and Table 4 for analysis by cycleway volume.

Exercise or fitness training was lowest at low volume cycleways (11% compared to between 16% and 19% at higher volume cycleways).

Figure 1: Main journey purpose
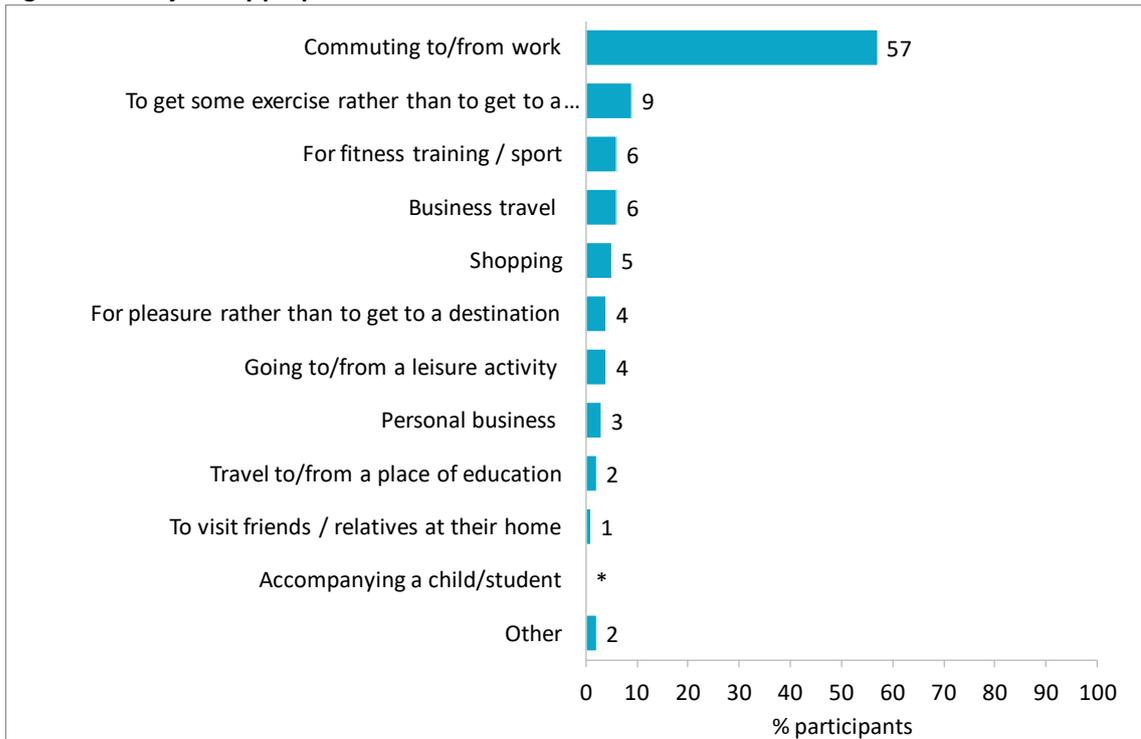
Base: 240
* = less than 0.5%

Table 4: Main journey purpose by cycleway volume

	Low volume %	Medium volume %	High volume %	Very high volume %
Commuting to/from work	58	56	60	54
To get some exercise rather than to get a destination	5	15	15	5
For fitness training / sport	6	4	2	11
Business travel	6	10		7
Shopping	3	4	8	7
For pleasure rather than to get to a destination	9		2	4
Going to/from a leisure activity	3	2	6	5
Personal business	3	4		5
Travel to/from a place of education	2	2	4	
To visit friends / relatives at their home	2	2	2	
Accompanying a child/student				1
Other	3		2	1
Base	**64**	**48**	**52**	**76**

Frequency of travel

The frequency of the cycle trip was probed. In general there was a high frequency of trips with 85% making the trip once a week or more including 37% who made the journey five or more days a week. This correlates with the large proportion of commuting trips.

Figure 2: Frequency of cycle journey
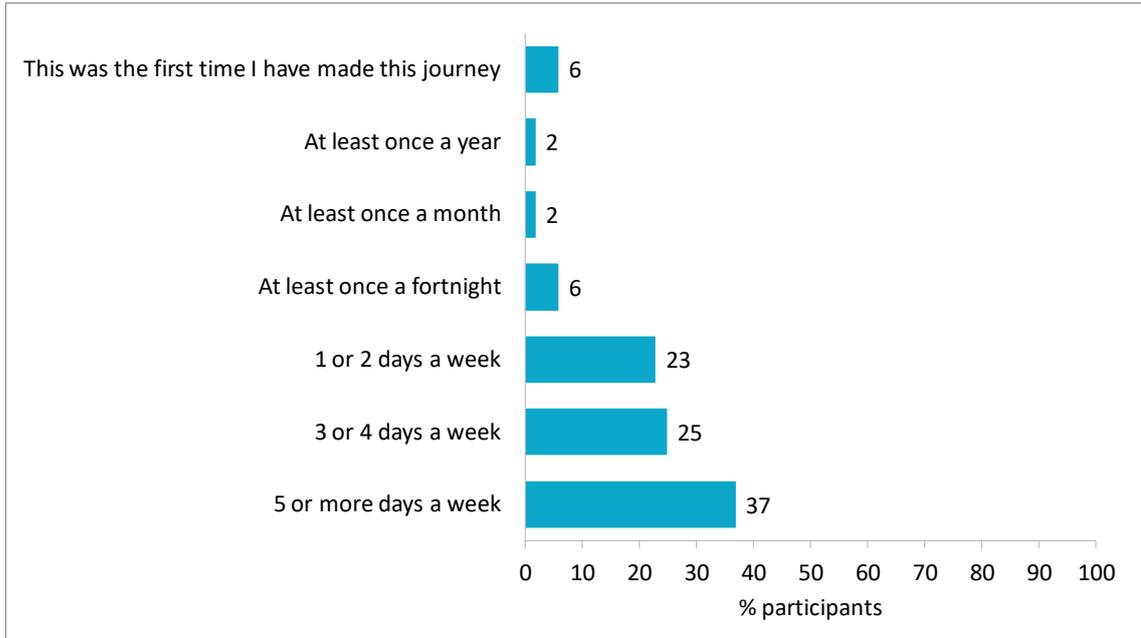
Base: 240

Cyclists at the medium volume sites were the most frequent cyclists: 69% three or more days a week compared to between 57% and 61% for other volumes.

Table 5: Frequency of cycle journey by cycleway volume

	Low volume %	Medium volume %	High volume %	Very high volume %
5 or more days a week	34	50	48	22
3 or 4 days a week	23	19	13	38
1 or 2 days a week	23	17	25	24
At least once a fortnight	5	6	8	5
At least once a month	3	2		3
At least once a year	3		2	3
This was the first time I have made this journey	8	6	4	5
Base	**64**	**48**	**52**	**76**

Group size

Ninety six per cent made the cycle journey alone. Of the four per cent who cycled with others, all but one cycled with other adults.

	n
• One other adult	6
• Two other adults	4
• One child	1

Trip duration

Cyclists were asked approximately how long it took them to make the cycle part of the journey.

There was a wide range of trip durations with 11% cycling less than 10 minutes at one extreme and 12% over 50 minutes at the other. The average time was 32 minutes.

Figure 3 shows the distribution of times and the mean times for the whole sample and for the different cycleway volume bands.

The mean cycle time on high volume cycleways were longest and on low volume cycleways was lowest: 35 minutes compared to 26 minutes respectively.

Figure 3: Duration of cycle part of journey by cycleway volume
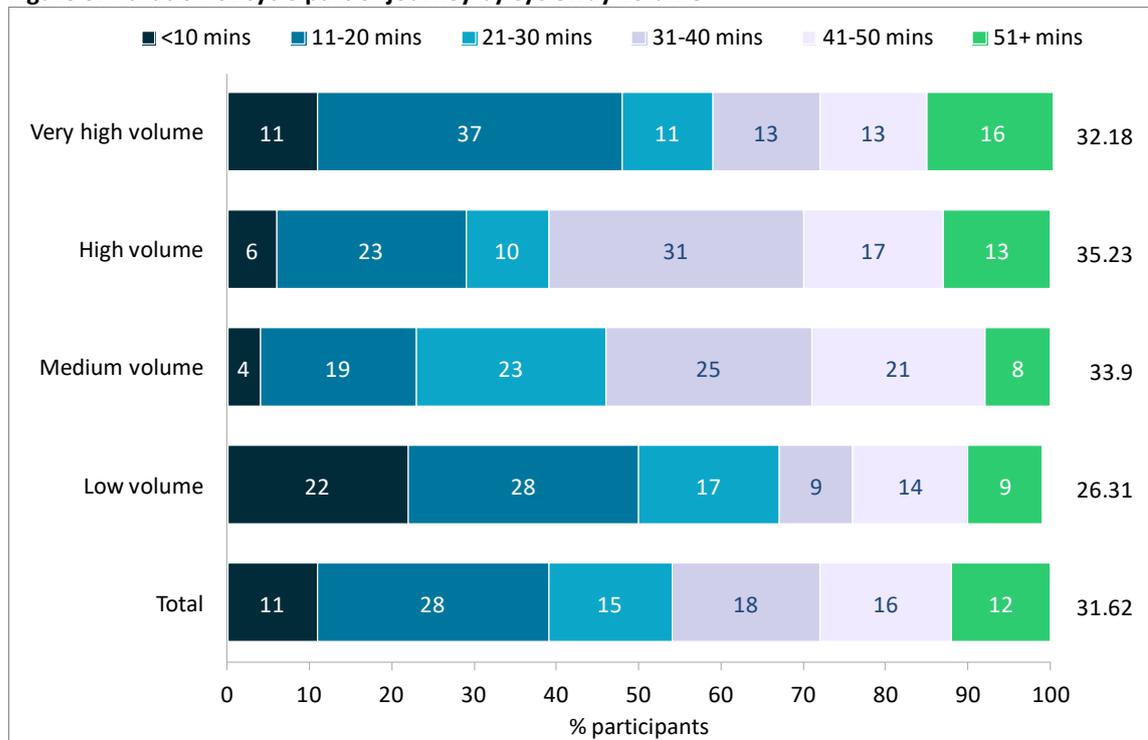
Base: Total 240, Low volume 64, Medium volume 48, High volume 52, Very high volume 76

Safety

The sample was asked how safe they felt when cycling on the cycleway.

Nearly half (47%) said they felt safe for most of the journey and 21% throughout the journey. Nearly a third (32%). felt safe through some of the journey, but there were a number of occasions where they didn't feel safe.

Figure 4: How safe feel when cycling on the cycleway


I felt safe throughout this journey 21%

I felt safe for most of this journey 47%

I felt safe for some of this journey, but there were a number of occasions where I didn't feel safe 32%
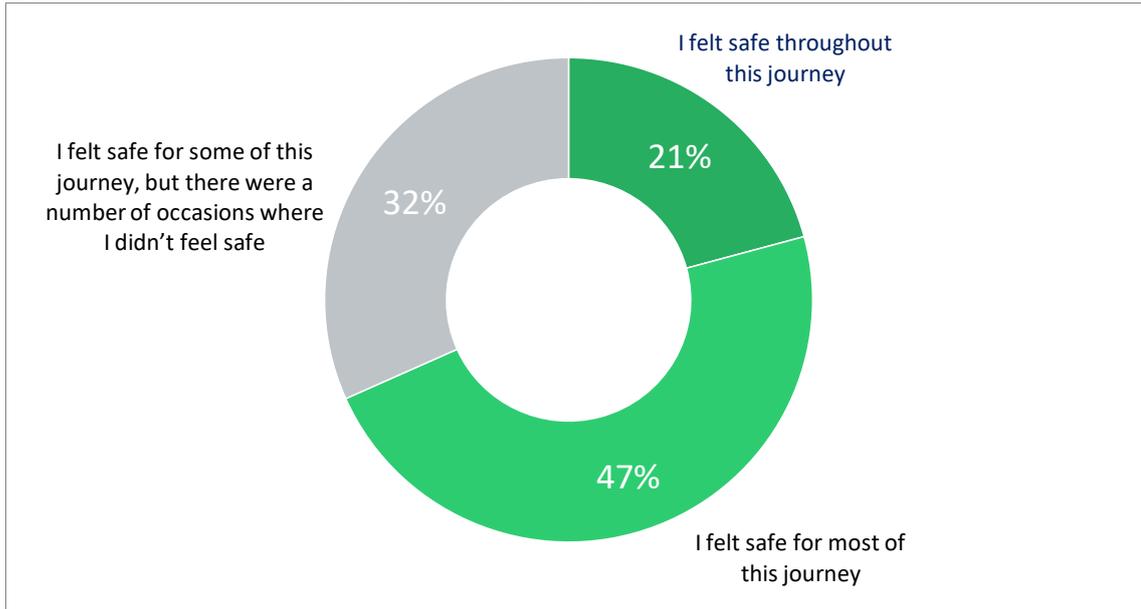
Base: 240

A similar question was asked, but this time about cycling in general in London. Participants were asked how safe they felt generally as a cyclist in London.

The perceived safety was much lower than for the routes which included the cycleway. Only 12% said they felt safe cycling on all roads in London. 58% felt safe on most roads, 23% felt safe on quieter roads in London, but not on roads where there is lots of traffic and 7% said they generally did not feel very safe cycling in London.

Figure 5: How safe do you feel generally as a cyclist in London

I generally don't feel very safe cycling in London 7%

I feel safe cycling on all roads in London 12%

I feel safe cycling on quieter roads in London, but not on roads where there is lots of traffic 23%

I feel safe cycling on most roads in London, but there are a few roads or junctions where I don't feel safe 58%
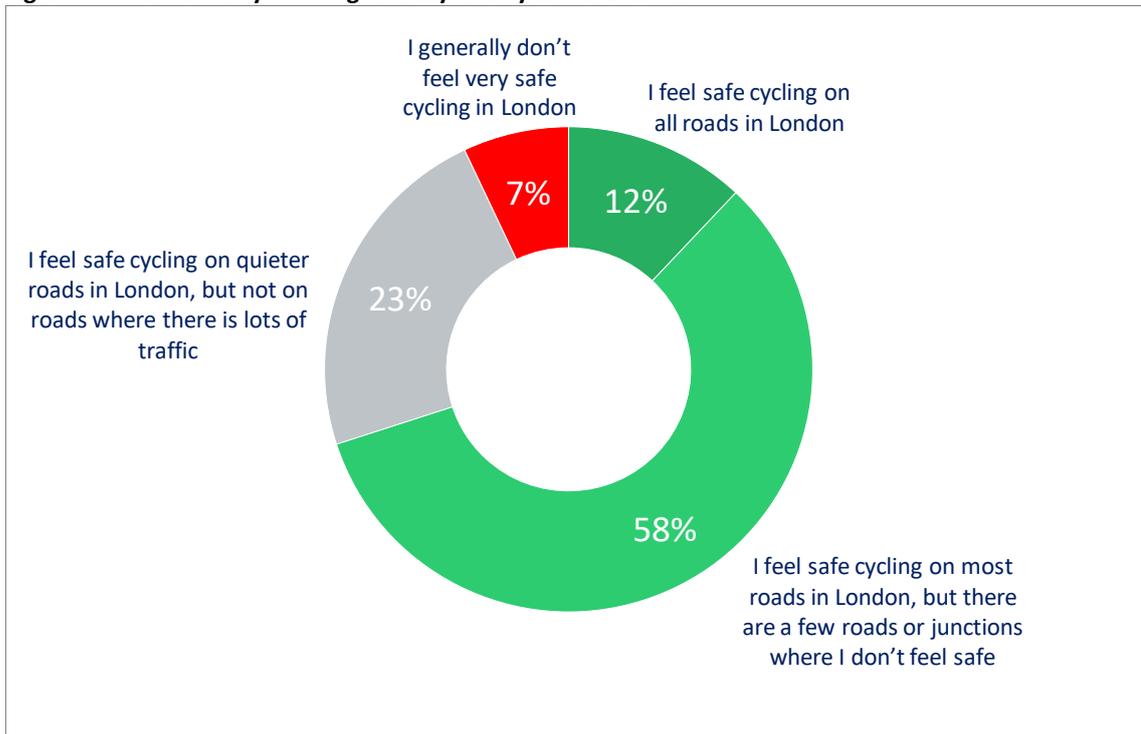
Base: 240

Overall, 65% of participants first started making the journey by bicycle more than a year ago.

Figure 6: When first started making this journey by bicycle
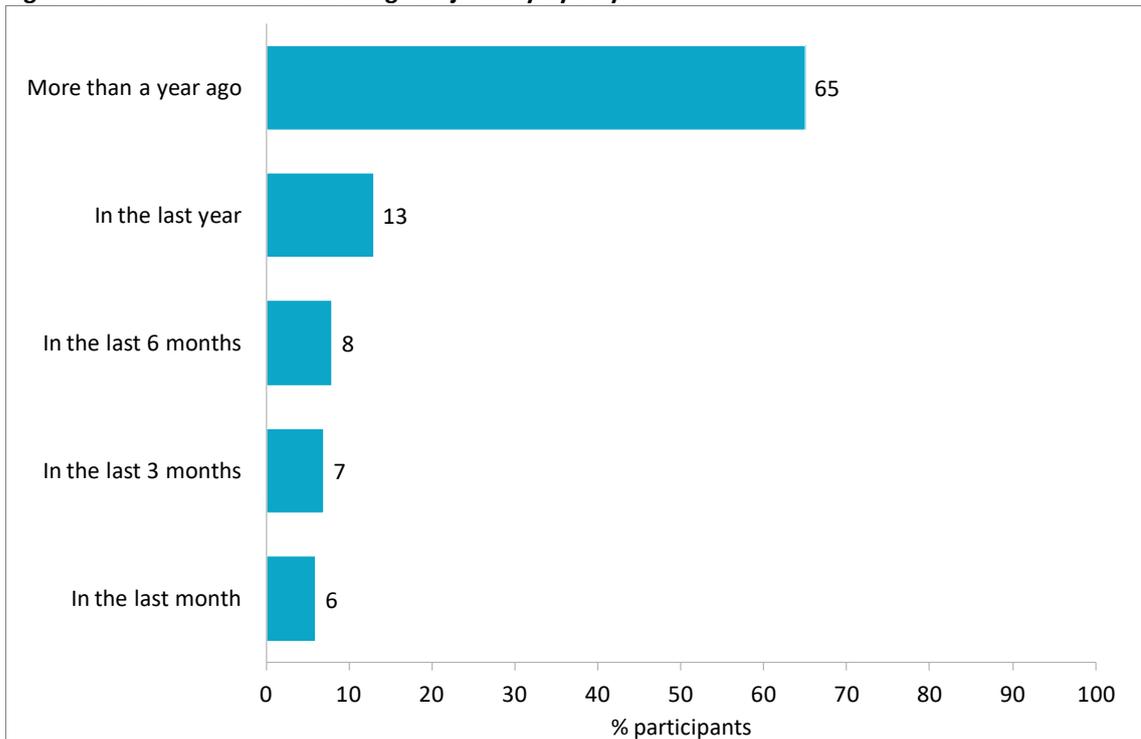
Base: 240

3.3 Attitudes to Cycleway

Cyclists were asked how satisfied or dissatisfied they were with the following aspects of the cycleway overall:

- Volume of traffic
- Space for cyclists
- Quality of road surface
- Helpfulness of signs and markings for cyclists
- The time it took to make the journey by cycle
- The reliability of the cycle journey

The highest level of satisfaction were for the reliability of the cycle journey and the time it took to make the journey by cycle with almost three quarters being satisfied or very satisfied with each.

The lowest levels of satisfaction were for the quality of road surface and the space for cyclists with similar proportions satisfied and dissatisfied with each. See Figure 7.

Figure 7: Mean satisfaction ratings

Legend: ■ Very dissatisfied ■ Dissatisfied ■ Neither satisfied nor dissatisfied ■ Satisfied ■ Very satisfied

| Category	Very dissatisfied	Dissatisfied	Neither	Satisfied	Very satisfied	Mean
The reliability of the cycle journey		5	22	59	14	3.81
The time it took to make the journey by cycle	1	5	21	62	12	3.79
Helpfulness of signs and markings for cyclists	3	13	30	49	6	3.43
Volume of traffic	4	17	27	44	9	3.36
Space for cyclists	7	29	22	36	5	3.04
Quality of road surface	7	27	30	30	6	3.02

% participants

Base: 240

Analysis of satisfaction by cycleway volume is shown in Figure 8. There was no clear pattern in the satisfaction ratings by volume:

- Low volume sites had highest satisfaction scores for the time it took to make the journey and the reliability of the cycle journey but also the worst satisfaction scores for the quality of the road surface and the space for cyclists

- Medium volume sites had the highest satisfaction score for volume of traffic and the worst satisfaction score for the time it took to make the journey by cycle

- High volume sites had the highest satisfaction scores for helpfulness of signs and markings for cyclists and space for cyclists and the worst satisfaction score for the reliability of the cycle journey

- Very high volume sites had the highest satisfaction score for quality of road surface and the worst satisfaction scores for volume of traffic and helpfulness of signs and markings for cyclists.

Figure 8: Mean satisfaction ratings by cycleway volume

The reliability of the cycle journey
- Low volume: 4.03
- Medium volume: 3.73
- High volume: 3.67
- Very high volume: 3.78

The time it took to make the journey by cycle
- Low volume: 3.98
- Medium volume: 3.58
- High volume: 3.77
- Very high volume: 3.78

Helpfulness of signs and markings for cyclists
- Low volume: 3.39
- Medium volume: 3.4
- High volume: 3.6
- Very high volume: 3.37

Volume of traffic
- Low volume: 3.42
- Medium volume: 3.46
- High volume: 3.42
- Very high volume: 3.21

Space for cyclists
- Low volume: 2.98
- Medium volume: 3.02
- High volume: 3.13
- Very high volume: 3.03

Quality of road surface
- Low volume: 2.92
- Medium volume: 2.98
- High volume: 2.87
- Very high volume: 3.24

Legend:
- Low volume
- Medium volume
- High volume
- Very high volume

Scale: 1 very dissatisfied — 5 very satisfied

Base: Low volume 64, Medium volume 48, High volume 52, Very high volume 76

3.4 Cycling in general

Frequency of cycling

The frequency of cycling on the cycleway in London was probed.

Over a third (34%) of the sample cycled on it five days a week or more with a further 46% doing so between one and four times a week. The frequency of cycling in London was higher: 48% five days a week or more and a 42% between one and four times a week. See Figure 9.

Figure 9: Frequency of cycling on cycleway and in London
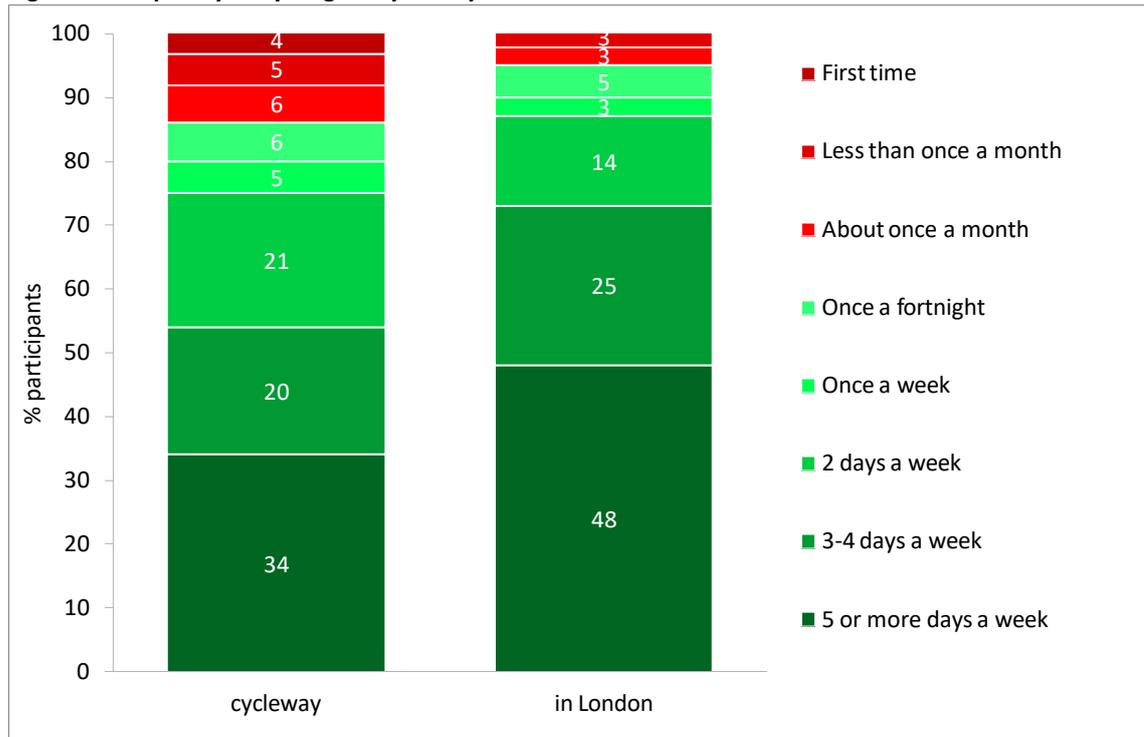
Base: Total 240

The frequency of cycling on the cycleway was lowest on the **very** high volume sites and highest on the high volume sites.

Figure 10: Frequency of cycling on cycleway by cycleway volume
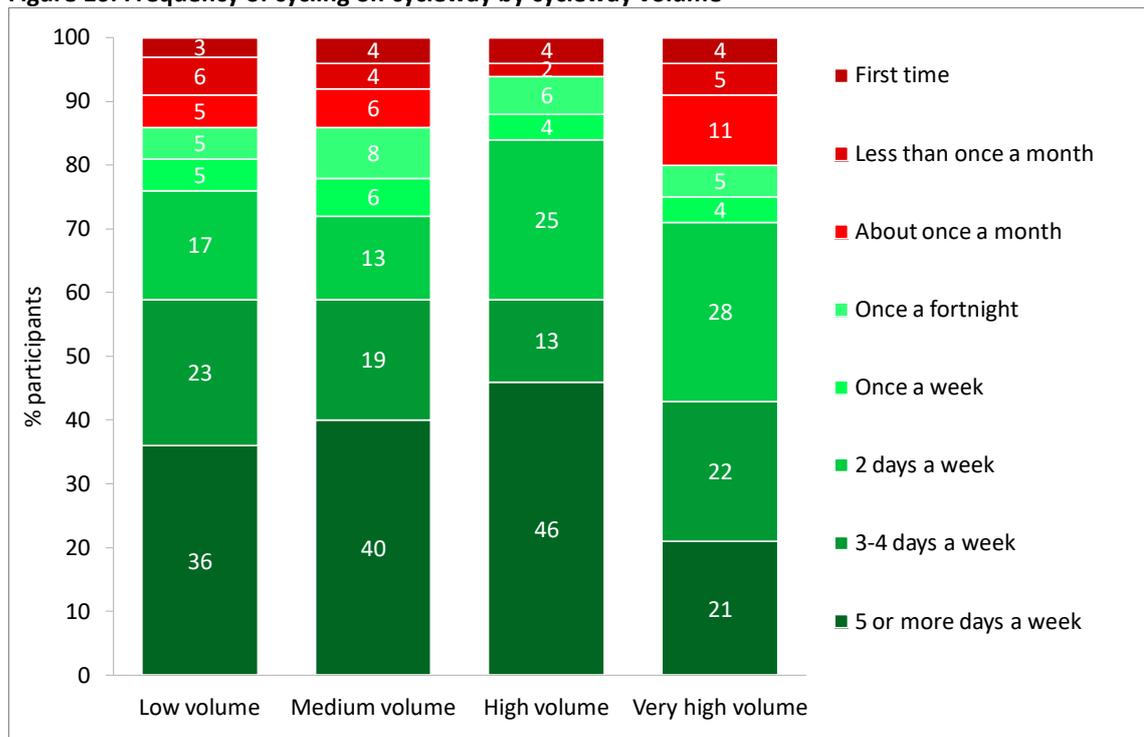

Base: Low volume 64, Medium volume 48, High volume 52, Very high volume 76

Similarly, the frequency of cycling in London was lowest for cyclists at the **very** high volume sites and highest on the high volume sites.

This implies that very high volume sites are used more by cyclists who are less frequent cyclists than other types of site.

Figure 11: Frequency of cycling in London by cycleway volume
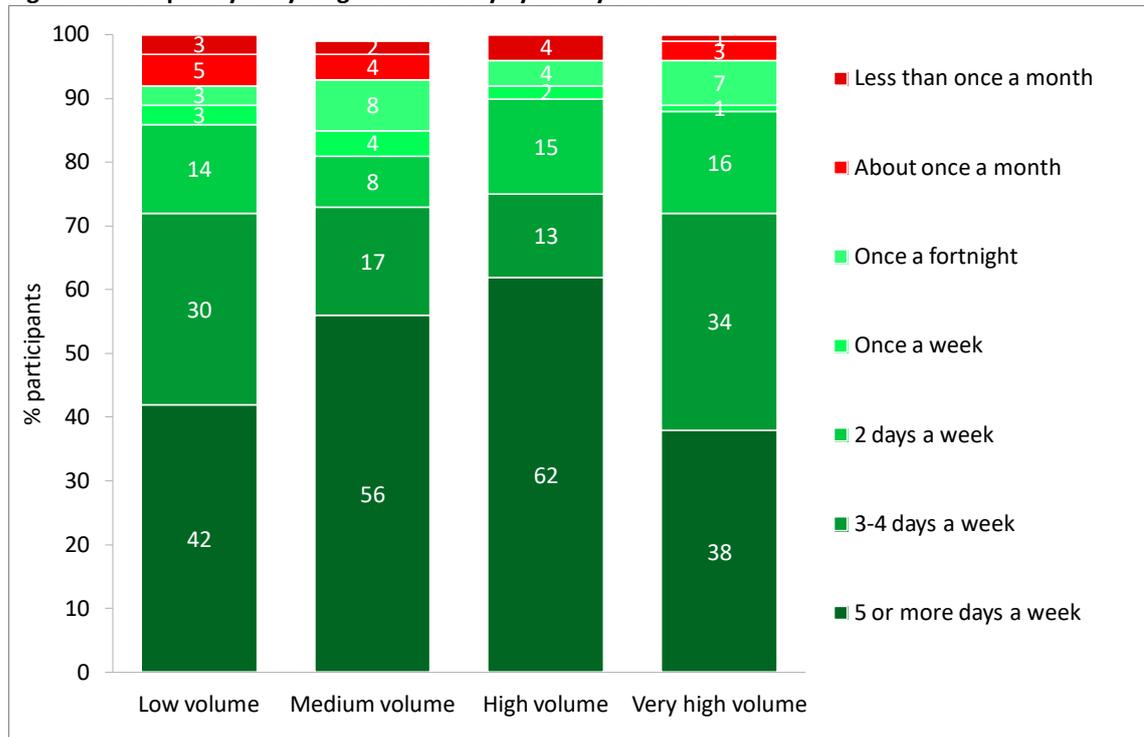
Base: Low volume 64, Medium volume 48, High volume 52, Very high volume 76

Types of cycling trips made

There was a very wide range of trips that participants currently make by bicycle.

Commuting was mentioned by three quarters.

Other important reasons were:

- To get some exercise (45%)
- For fitness training / sport (41%)
- Shopping (41%)
- Going to/from a leisure activity (39%)
- For pleasure rather than to get to a destination (38%)
- Personal business (35%).

Figure 12: Purposes of trips made by cycle

Purpose	% participants
Commuting to/from work	75
To get some exercise rather than to get to a…	45
For fitness training / sport	41
Shopping	41
Going to/from a leisure activity	39
For pleasure rather than to get to a destination	38
Personal business	35
To visit friends / relatives at their home	30
Business travel	25
Travel to/from a place of education	7
Accompanying a child/student	6
Other	1

Base: 240

Confidence

Participants were asked how they would describe themselves as a cyclist with answers ranging from complete beginner to very confident.

Figure 13: How participants describe their level of cycle confidence

Novice 3%
Quite confident 22%
Very confident 75%
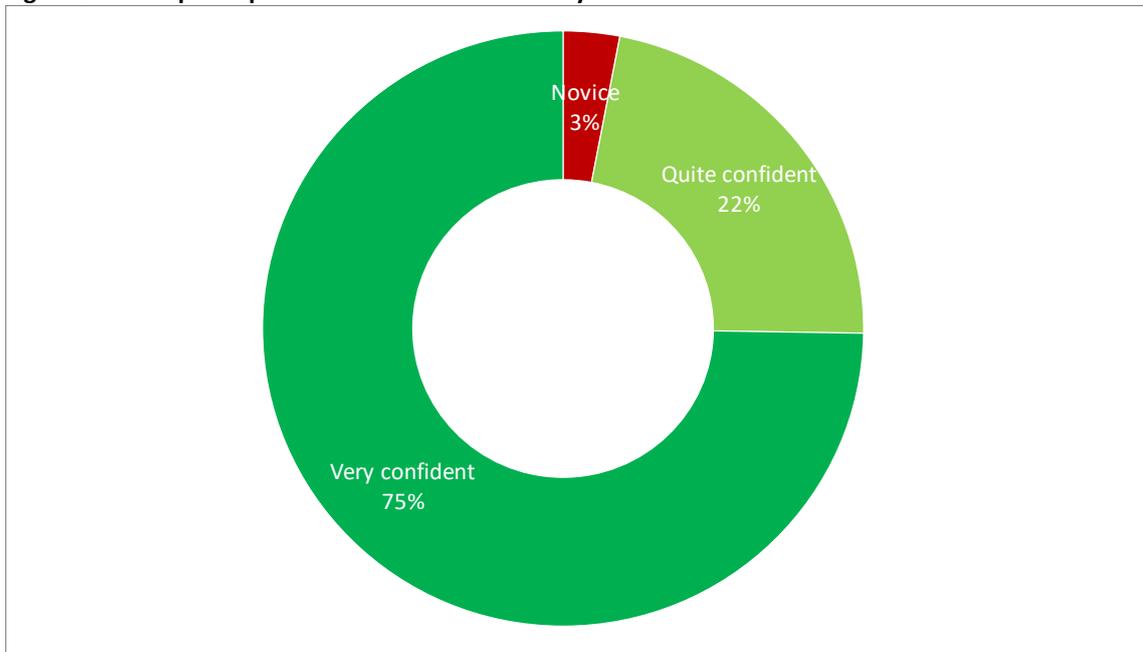
Base: 240

Women and younger cyclists felt less confident than men and older cyclists. Nine per cent of female cyclists described themselves as novices compared to 1% for males.

Table 6: How participants describe their level of cycle confidence by age and gender

	Age			Gender	
	18-34 years %	35-54 years %	55+ years %	male %	female %
Complete beginner	1	0	0	1	0
Novice	4	3	0	1	9
Quite confident	21	22	22	22	21
Very confident	73	75	78	76	69
Other	1	0	0	0	1
Base	**95**	**118**	**27**	**173**	**67**

Cycle type

There was a wide range of cycle types used: 28% used a racing/road bike, 21% a hybrid bike, 17% a Dutch/traditional bike and 16% a folding bike. The type of cycle used is shown in Figure 14.

Figure 14: Type of bike used
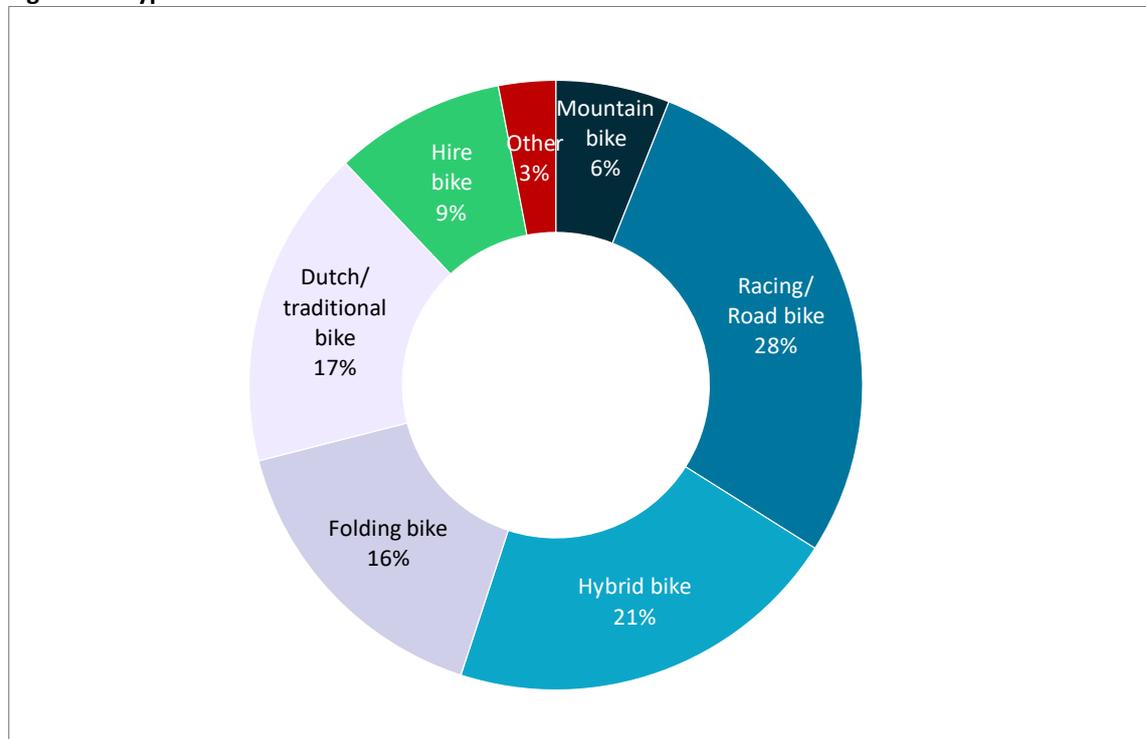
Base: 240

3.5   Current perceptions of cycleway condition

On balance, cyclists rated the overall condition of the cycleway as good: 49% said it was good or very good and 22% said it was poor or very poor.

Figure 15: Overall condition of the cycleway

Don't know 1%
Very poor 2%
Poor 20%
Very good 5%
Good 44%
Neither poor nor good 28%
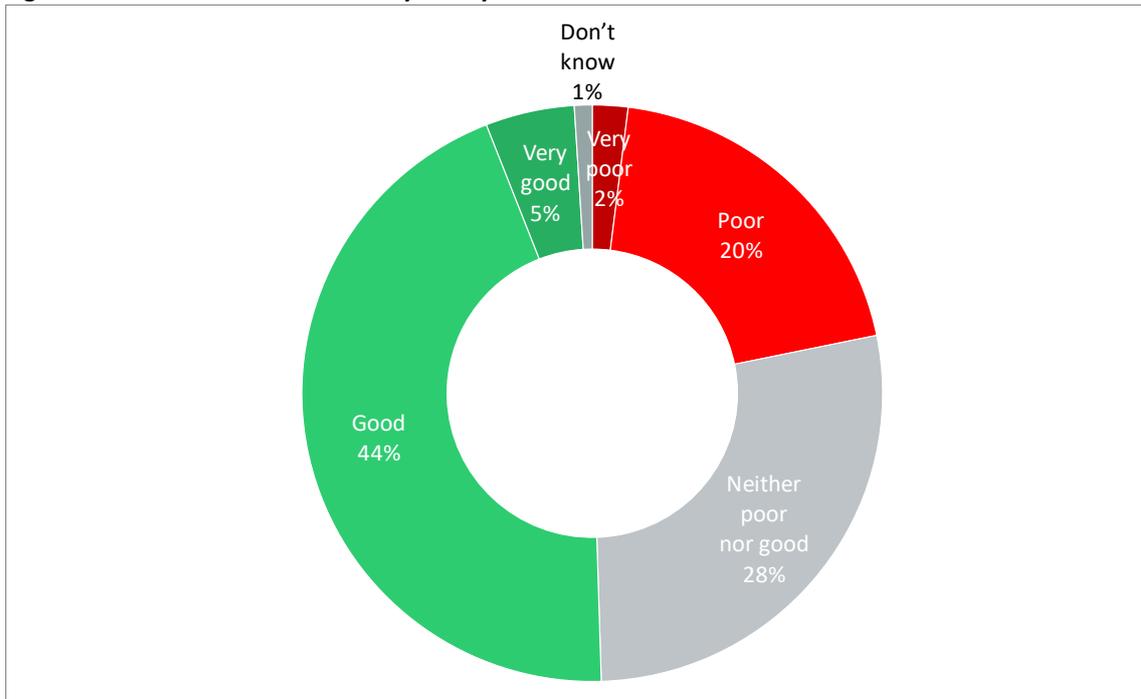
Base: 240

Mean rating scores were calculated on the basis of 1 = very poor and 5 = very good. The mean rating was 3.22, higher than the mid point of 3.

Very high volume sites were rated best and medium volume worst although there was little difference between the site types. The differences were not significant at the 95% confidence level.

Figure 16: Overall condition of the cycleway by cycleway volume

Legend: Very poor | Poor | Neither poor nor good | Good | Very good | Don't know

Volume	Very poor	Poor	Neither poor nor good	Good	Very good	Don't know	Mean
Very high volume	4	18	20	45	11	3	3.41
High volume		19	33	44	4		3.33
Medium volume	2	21	31	44		2	3.19
Low volume		20	30	48	2		3.31

% participants
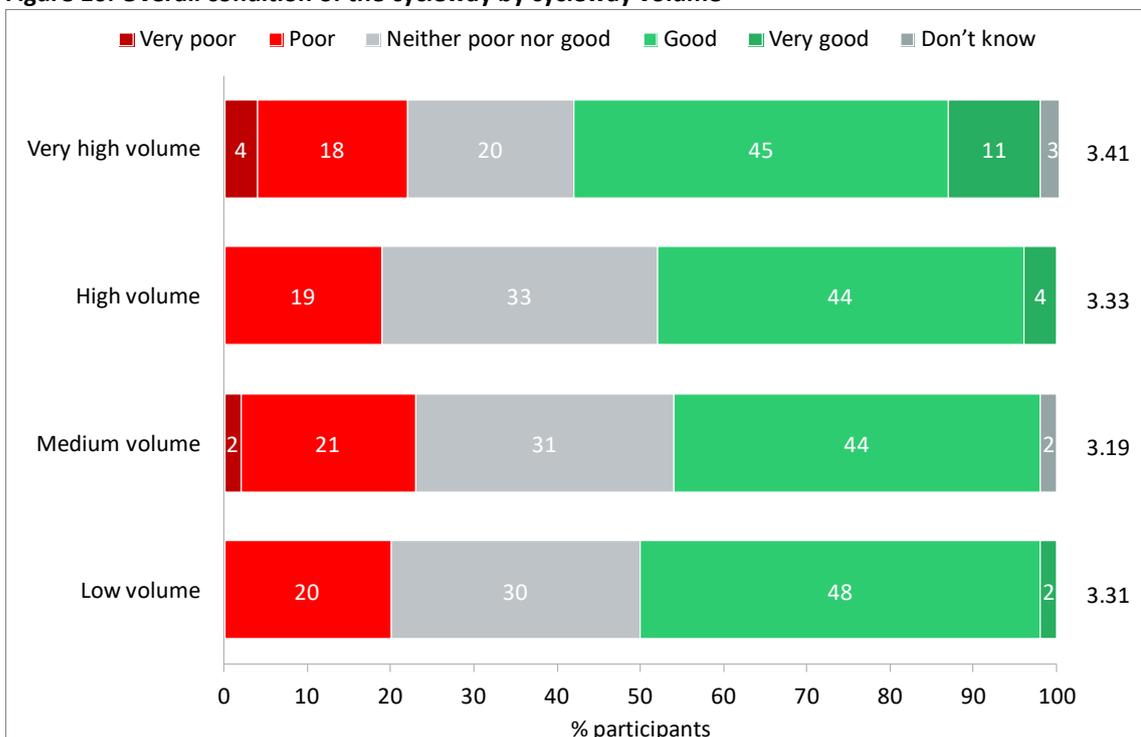
Base: Low volume 64, Medium volume 48, High volume 52, Very high volume 76

The importance of the quality of the cycleway to the cyclist was probed. As can be seen from Figure 17, 87% of cyclists thought it was important: 60% very important and 27% important.

**Figure 17: Importance of quality of the cycleway**
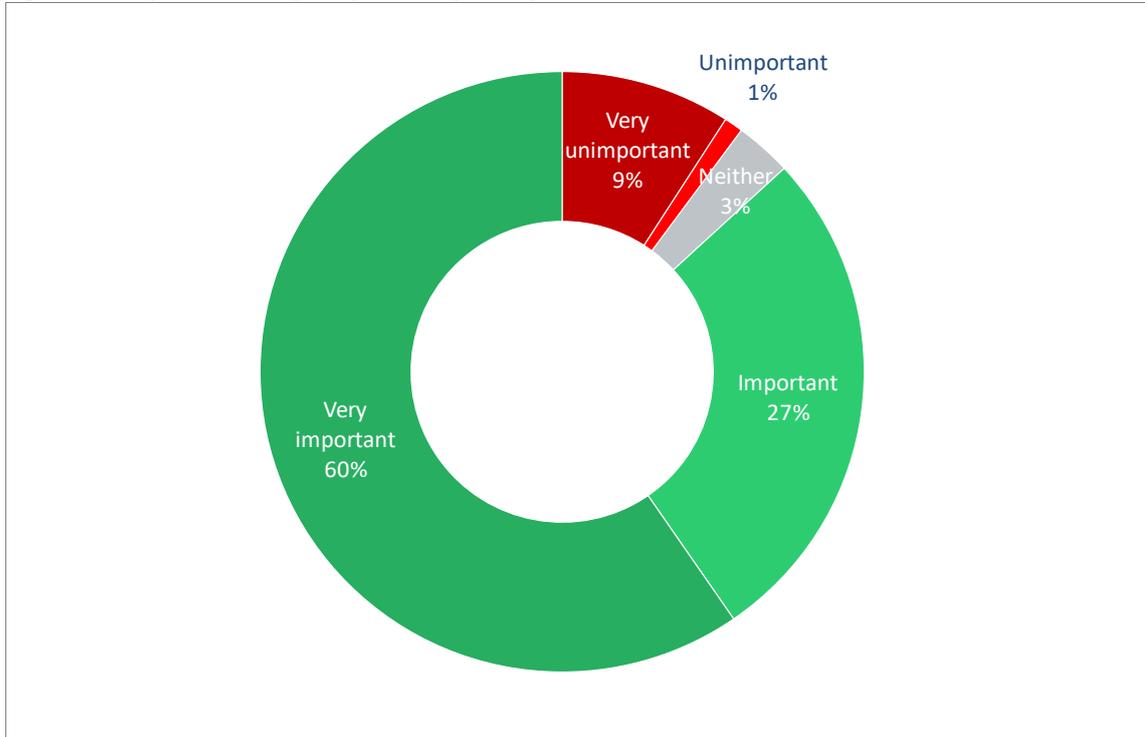
Base: 240

Mean rating scores were calculated on the basis of 1 = very unimportant and 5 = very important. The mean rating was 4.27.

The importance ratings by cycleway volume are shown in Figure 18.

Cyclists on high volume sites gave the highest importance scores and those on medium volume sites the lowest although there was little difference between the site types. The differences were not significant at the 95% confidence level.

Figure 18 Importance of quality of the cycleway by cycleway volume

Legend: ■ Very unimportant ■ Unimportant ■ Neither ■ Important ■ Very important ■ Don't know

Volume	Very unimportant	Unimportant	Neither	Important	Very important	Don't know	Mean
Very high volume	11	1	4	30	54		4.16
High volume	4		4	19	73		4.58
Medium volume	13	4	4	25	54		4.04
Low volume	8		2	31	58	2	4.33

% participants
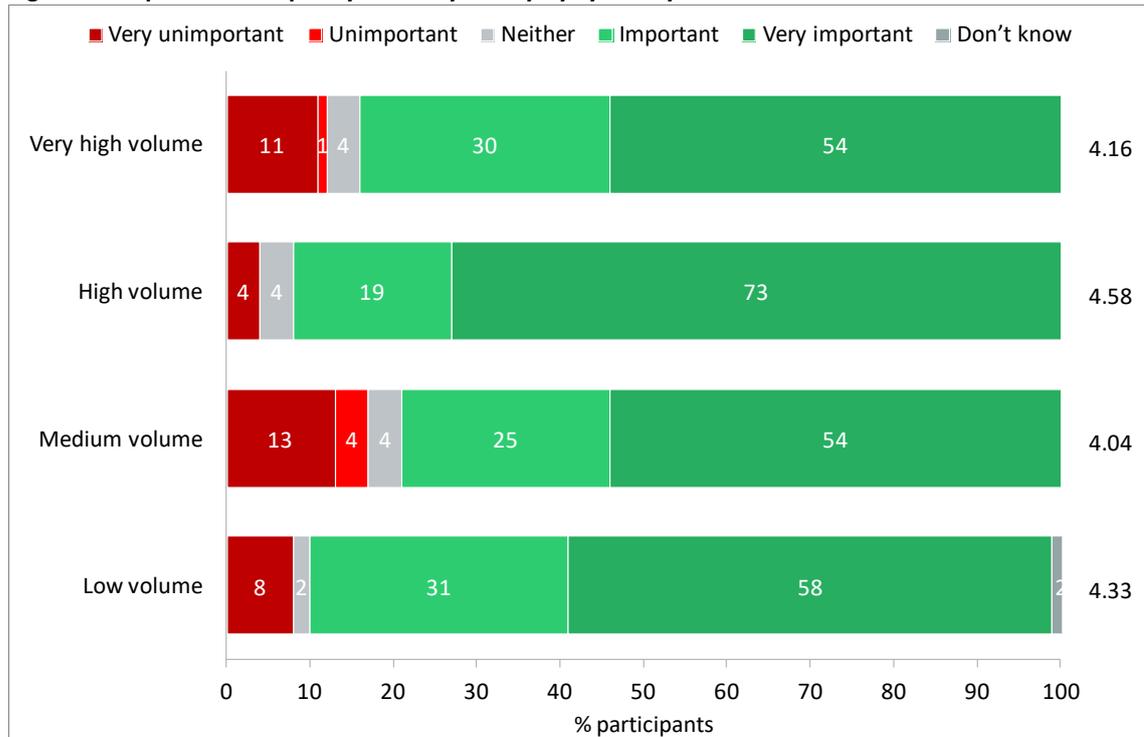
Base: Total 240, Low volume 64, Medium volume 48, High volume 52, Very high volume 76

3.6   Rating of cycleway defects

The research explored the following cycleway defects:

- Longitudinal gaps
- Surface fretting
- Potholes
- Surface Cracking
- Worn surface
- Quality and condition of signage
- Grass-ingress or verge creep
- Ride quality – reinstatement related
- Ride quality – Condition related
- Ride quality – Ironwork related
- Standing water
- Cleanliness
- Overhanging vegetation/ obstructions/width restrictions
- Quality of lighting
- Worn lines and other Road Markings

Participants were shown the following as context to the questions asked about each:

"Each of these defects may occur to different degrees and over varying parts of the cycleway. They may also occur separately or together.

For this research we will deal with each of them separately.

This research is seeking to capture **your opinions** on these defects; **your opinions** will be used to inform TfLs maintenance plans.

It is, of course, not feasible or necessary to maintain all cycleways in perfect condition. Therefore TfL would like you to consider each defect type, with regard to its impact on your experience of using a cycleway."

For each defect, participants were shown an introduction and between one and three photos to illustrate the defect, for example:

Surface fretting

Fretting is where the cycleway surface breaks up and surface material has been lost.

Then, for each defect, participants were asked about their satisfaction with the cycleway with respect to the defect and then they were asked how important it was that the cycleway did not have that defect.

Five point scales were used. Mean ratings have been calculated where 1 = very dissatisfied and 5 = very satisfied and where 1 = very unimportant and 5 = very important.

The satisfaction scores for all the defects in order of satisfaction are shown in Figure 19 and the mean satisfaction scores are shown in Figure 20. The lower the level the worse the condition defect.

Ride quality – Ironwork related, longitudinal gaps and surface fretting are the three worst rated defects.

**Figure 19: Satisfaction ratings with defects**
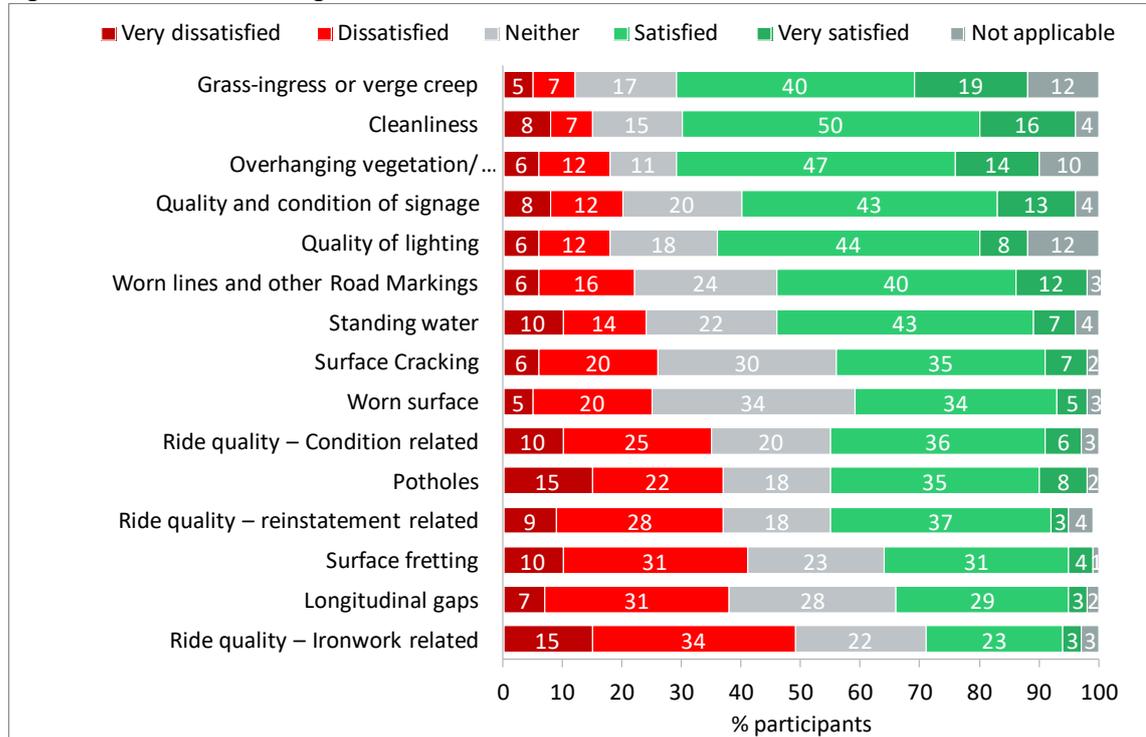
Base: 240

Figure 20: Mean satisfaction ratings with defects
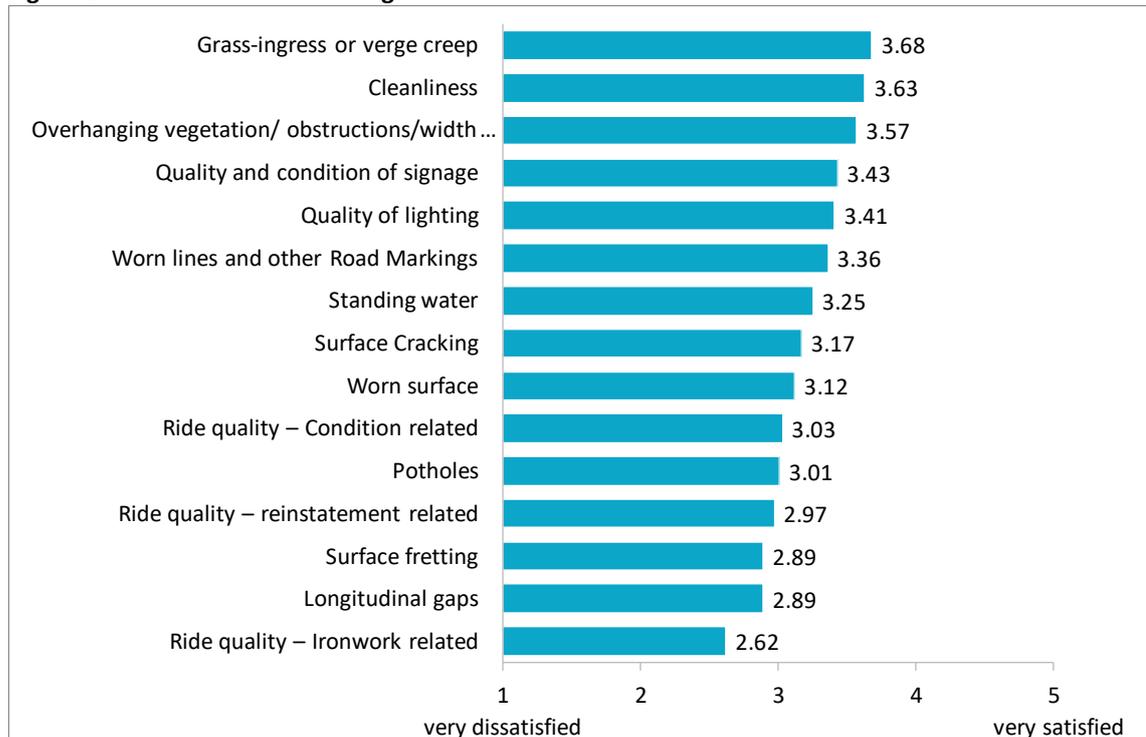

Base: 240

The importance that the cycleway does not have each defect, for all the defects in order of importance are shown in Figure 19 and the mean importance scores are shown in Figure 22. The higher the score the more important it is that the cycleway does not have that defect.

Figure 21: Importance that the cycleway does not have that defect
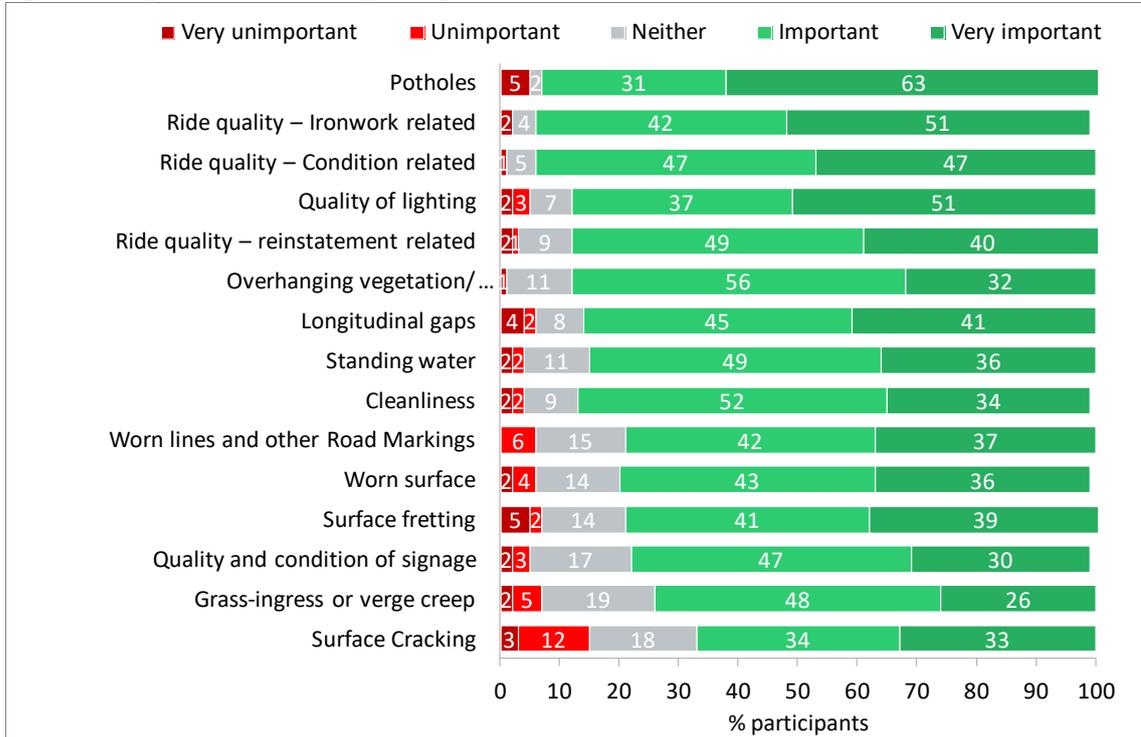
Base: 240

Figure 22: Mean importance that the cycleway does not have that defect
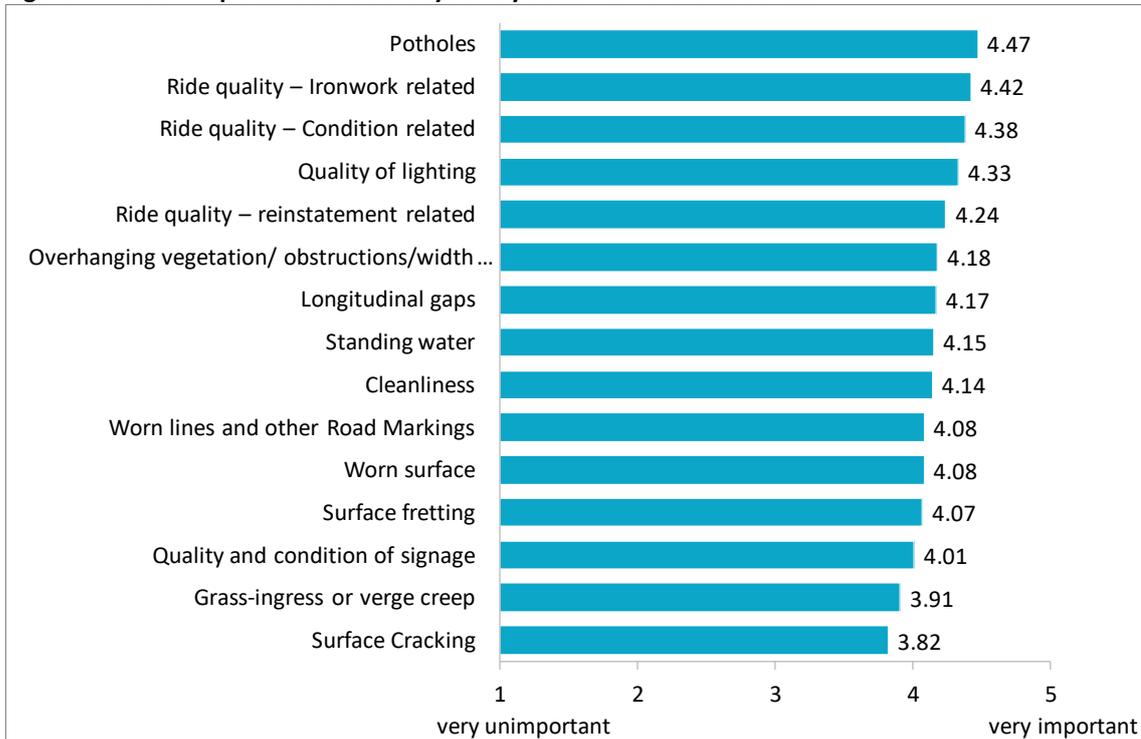
Base: 240

In Figure 23 we present a matrix plotting levels of satisfaction against importance for each defect. The defects which have relatively low satisfaction but are relatively important are in the top left of the chart.

From this we can see that the priority areas for improvement are:

- ride quality – ironwork related
- potholes
- ride quality – condition related
- ride quality – reinstatement related
- surface fretting
- longitudinal gaps.

Figure 23: Importance by satisfaction (means)
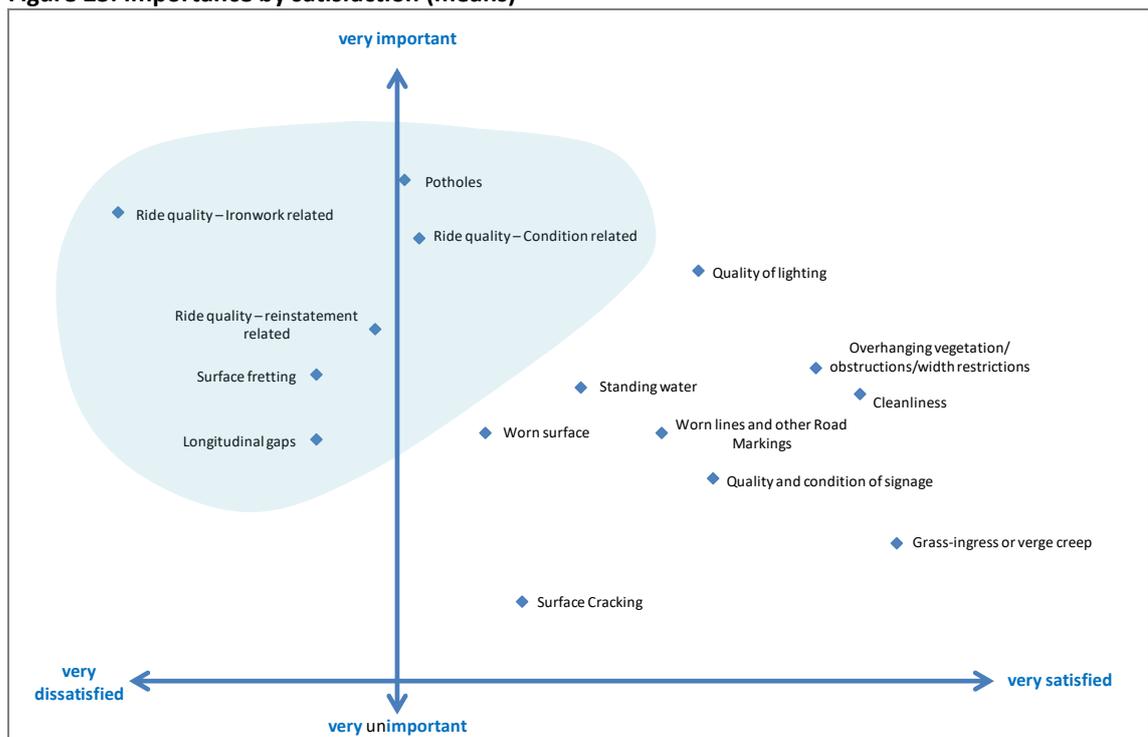
Base: 240

Matrices of satisfaction against importance for the sites by volume are shown in Figure 24 to Figure 27 below.

For low volume sites the priority areas for improvement are:

- ride quality – ironwork related
- potholes
- ride quality – reinstatement related

Figure 24: Importance by satisfaction for low volume sites (means)
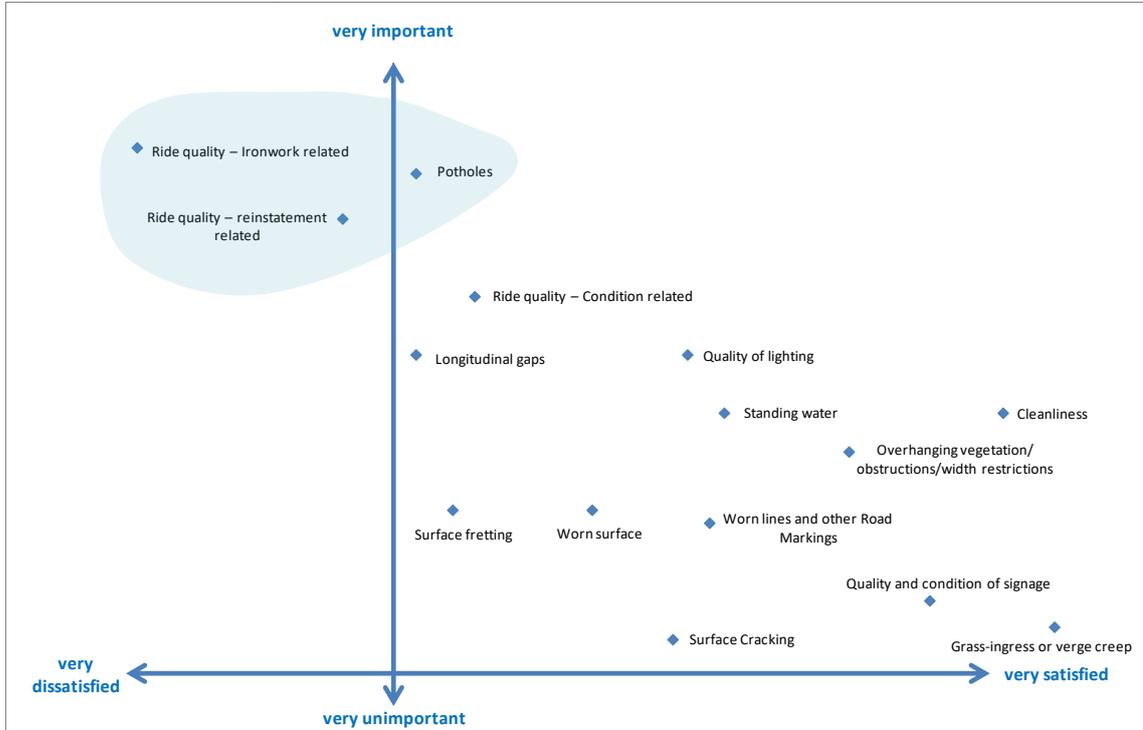
Base: Low volume 64

For medium volume sites the priority areas for improvement are:

- ride quality – condition related
- potholes
- ride quality – ironwork related
- surface fretting
- standing water
- ride quality – reinstatement related
- worn surface.

Figure 25: Importance by satisfaction for medium volume sites (means)
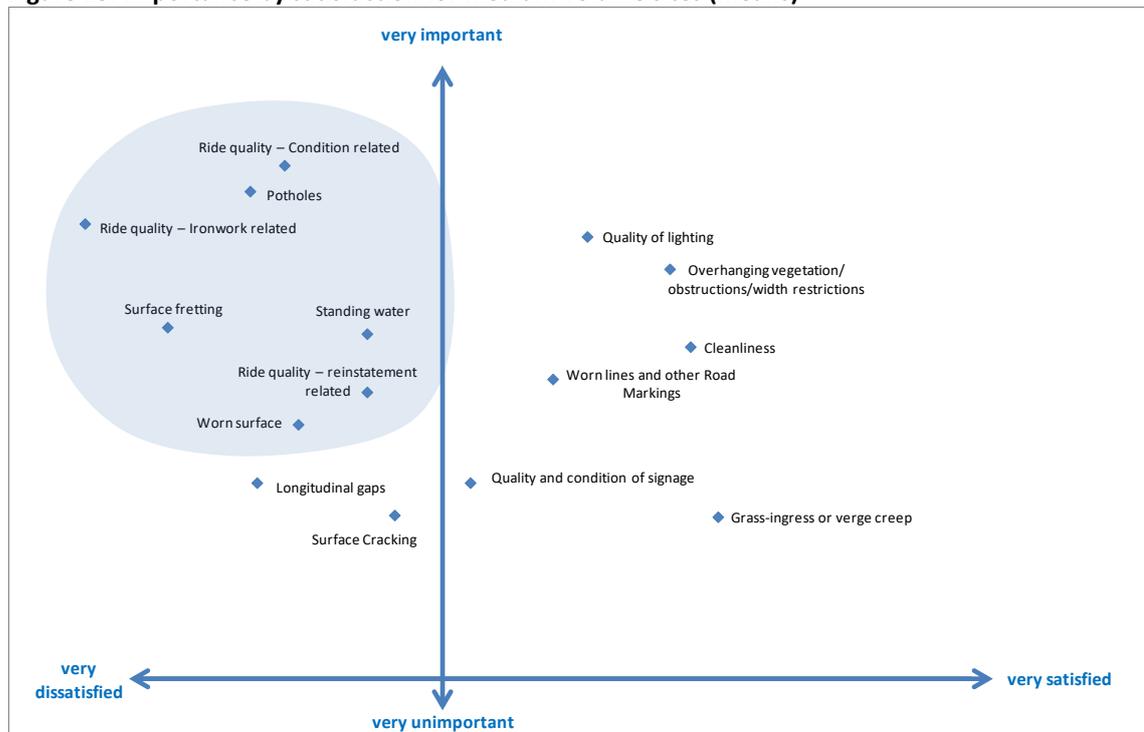
Base: Medium volume 48

For high volume sites the priority areas for improvement are:

- ride quality – condition related
- ride quality – ironwork related
- potholes
- longitudinal gaps.
- ride quality – reinstatement related
- surface fretting
- worn surface.

Figure 26: Importance by satisfaction for high volume sites (means)
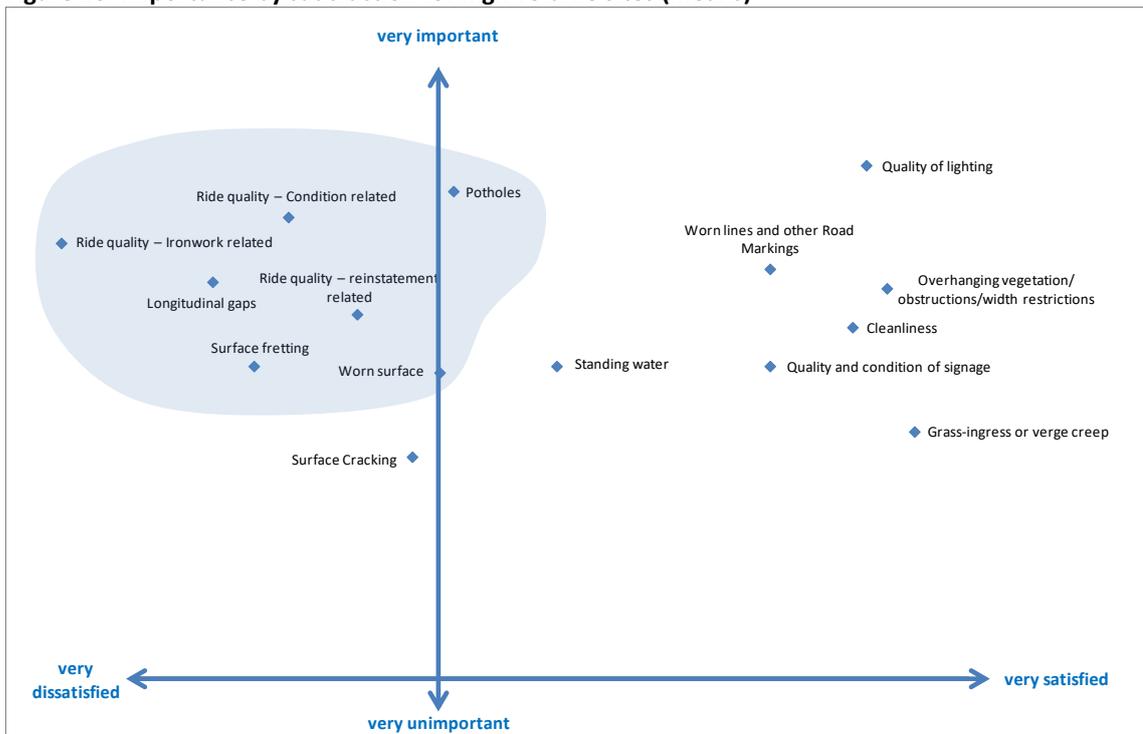

Base: High volume 52

For very high volume sites there are higher levels of satisfaction for almost all defects so the only priority area for improvement is ride quality – ironwork related.

Figure 27: Importance by satisfaction for very high volume sites (means)
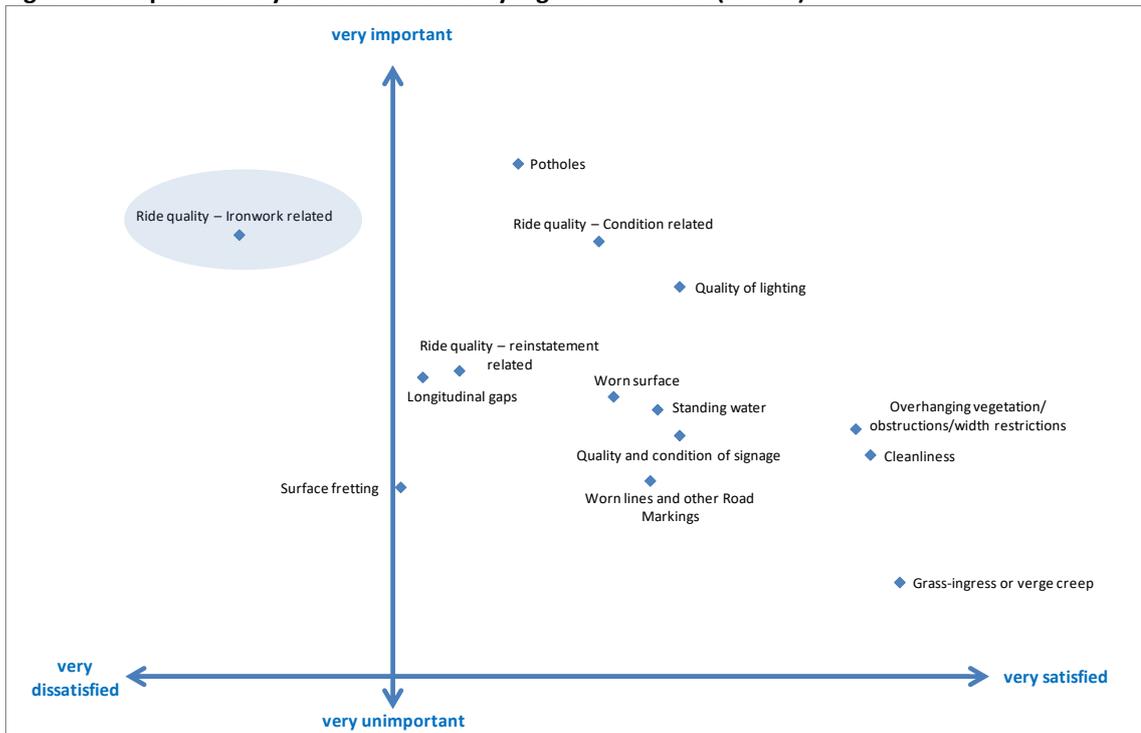
Base: Very high volume 76

3.7   Priorities

Cyclists were asked to rank the top nine aspects in terms of priority for improvement. There are 15 aspects so many were not ranked (participants could code don't know or just leave blank).

Table 7 and Figure 28 shows the scores and Figure 29 shows the mean priorities (where 9 = highest priority and 1 = lowest priority). The ranking for the figures are based on the means.

The priorities are similar to those shown from the analysis of importance by satisfaction although standing water and quality of lighting are given higher priority and surface fretting lower priority. Potholes, ride quality – ironwork related and ride quality – condition related are the top three priorities:

- potholes
- ride quality – ironwork related
- ride quality – condition related
- ride quality – reinstatement related
- standing water
- quality of lighting
- longitudinal gaps

Table 7: Priority scores

	% Grass-ingress or verge creep	% Overhanging vegetation/ obstructions/width restrictions	% Worn lines and other Road Markings	% Surface fretting	% Cleanliness	% Worn surface	% Surface Cracking	% Quality and condition of signage	% Longitudinal gaps	% Quality of lighting	% Standing water	% Ride quality – reinstatement related	% Ride quality – Condition related	% Ride quality – Ironwork related	% Potholes
1st	0	1	3	2	7	3	3	6	5	7	5	5	8	8	31
2nd	3	3	5	5	5	4	5	5	4	5	7	6	9	15	13
3rd	3	5	4	4	4	7	5	5	8	3	8	11	10	10	5
4th	4	5	3	10	3	5	6	8	5	7	6	8	10	10	3
5th	3	4	3	7	5	8	8	5	8	6	8	7	9	5	5
6th	4	4	5	5	7	7	8	6	4	10	6	9	6	8	3
7th	5	8	7	6	7	8	8	2	5	6	6	6	7	7	4
8th	5	5	6	7	5	5	4	8	8	8	8	10	3	5	3
9th	8	7	6	5	5	4	6	6	8	3	7	5	7	4	5
Don't know	33	30	34	31	23	30	31	24	26	25	22	20	17	17	22
Not stated	32	28	24	18	29	19	16	25	19	20	17	13	14	11	6

Figure 28: Priority scores
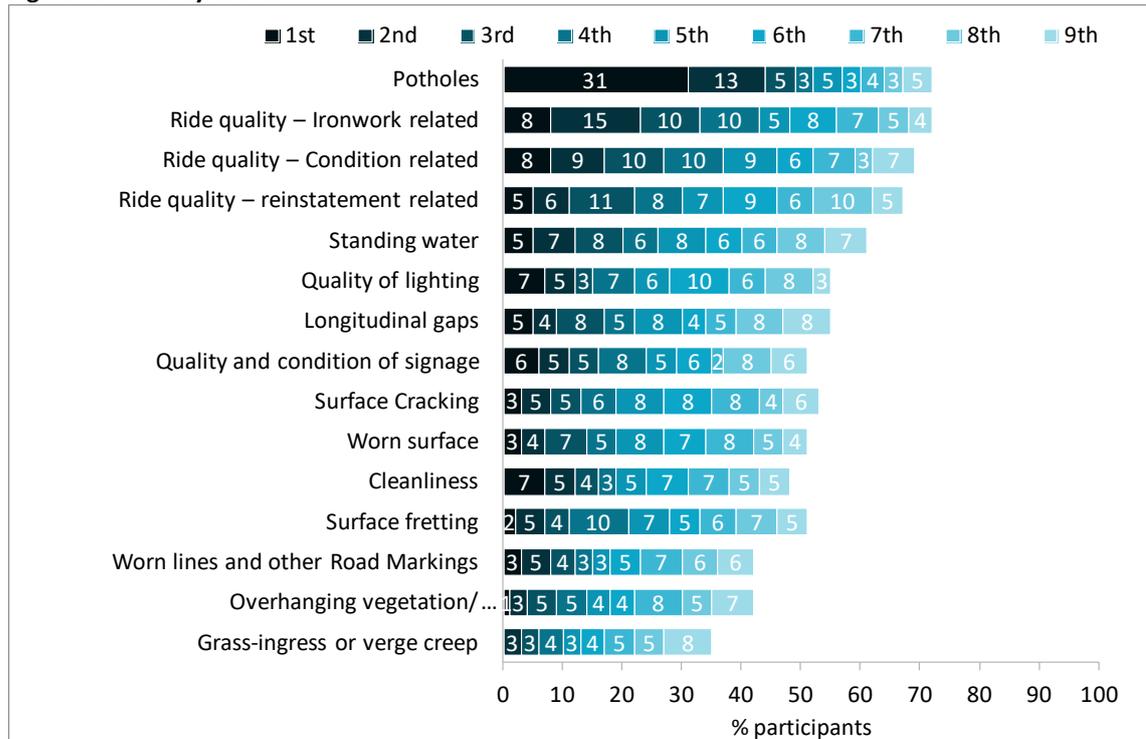
Base: 240

Figure 29: Mean Priority Score

|	% participants
Potholes	55
Ride quality – Ironwork related	46
Ride quality – Condition related	42
Ride quality – reinstatement related	37
Standing water	33
Quality of lighting	30
Longitudinal gaps	29
Quality and condition of signage	28
Surface Cracking	28
Worn surface	27
Cleanliness	26
Surface fretting	26
Worn lines and other Road Markings	21
Overhanging vegetation/ obstructions/width…	19
Grass-ingress or verge creep	15

Base: 240

The priority scores by cycleway volume are shown in Figure 30.

Figure 30: Priority Score by cycleway volume

	Very high volume	High volume	Medium volume	Low volume
Potholes	62	43	51	59
Ride quality – Ironwork related	52	45	42	49
Ride quality – Condition related	38	46	47	42
Ride quality – reinstatement related	32	32	38	46
Standing water	25	53	27	32
Quality of lighting	22	45	27	26
Quality and condition of signage	23	34	31	27
Longitudinal gaps	35	25	23	29
Cleanliness	13	37	26	31
Surface Cracking	35	28	24	20
Worn surface	33	25	27	21
Surface fretting	31	26	30	17
Worn lines and other Road Markings	25	22	13	20
Overhanging vegetation/ obstructions/width restrictions	16	19	19	20
Grass-ingress or verge creep	12	17	16	15

Base: Total 240, Low volume 64, Medium volume 48, High volume 52, Very high volume 76

3.8　Participant Characteristics

Age

There was a fairly young age distribution for the sample, with almost three quarters aged under 44 years old.

The median age band was 35-44 with 34%.

Figure 31: Age group
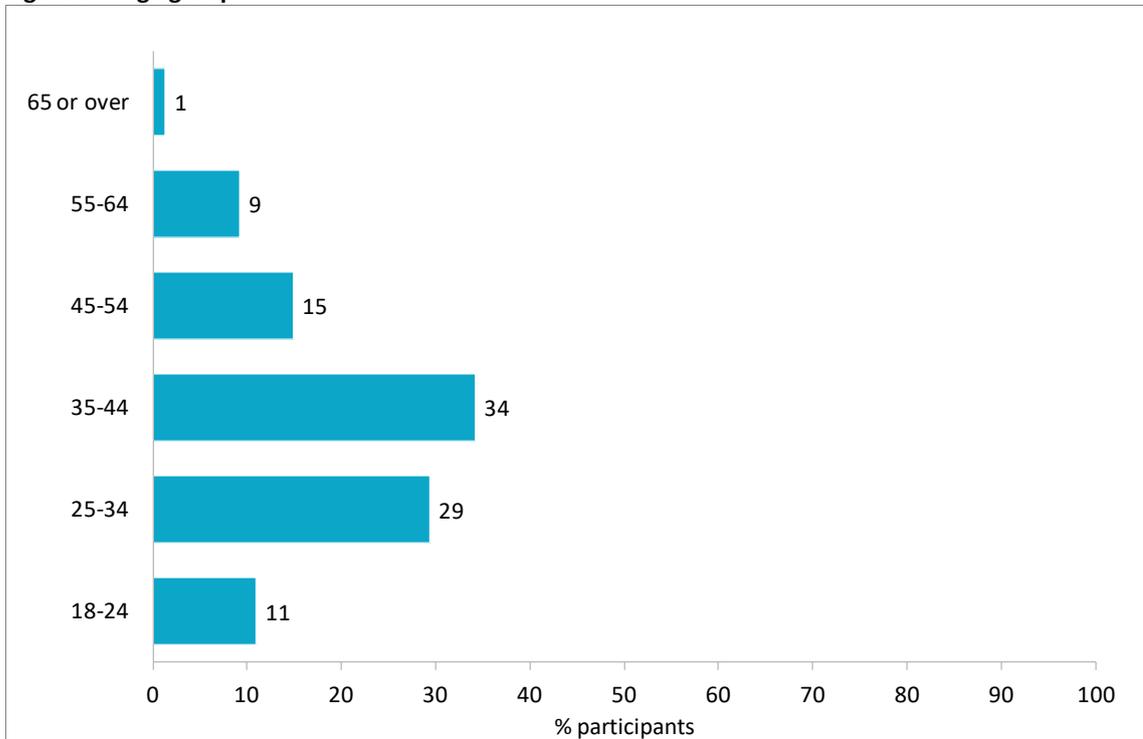
Base: 228

Gender

Overall, the majority of participants were male (72%). There was a larger proportion of males at low and very high volume sites:

- Low volume　　　　　　75%
- Medium volume　　　　69%
- High volume　　　　　69%
- Very high volume　　　74%

Figure 32: Gender
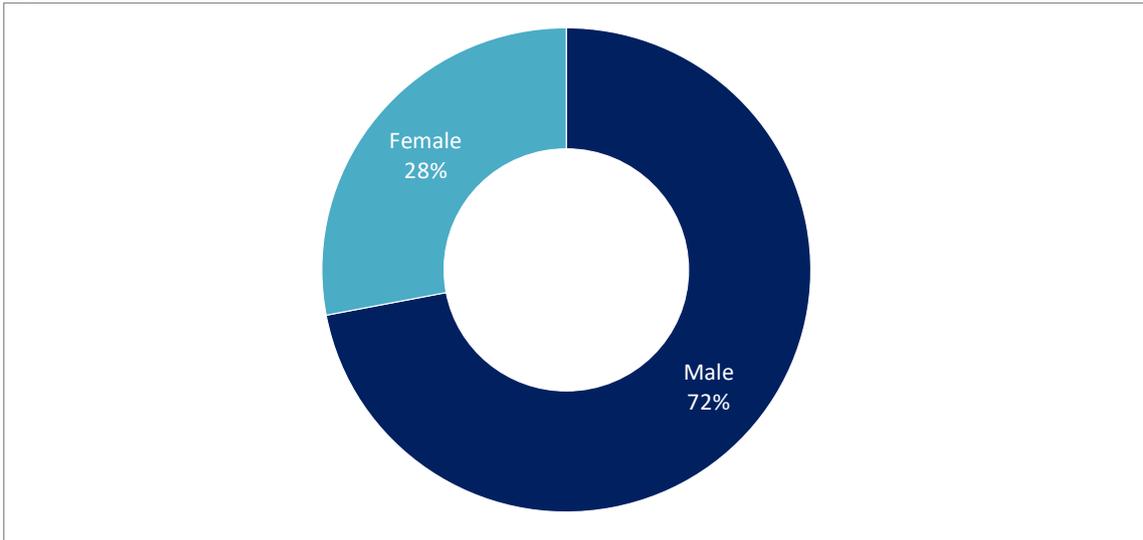
Base: 240

Employment status

Almost all cyclists were employed either full time (83%), or part time (6%). Five per cent were students.

Figure 33: employment status
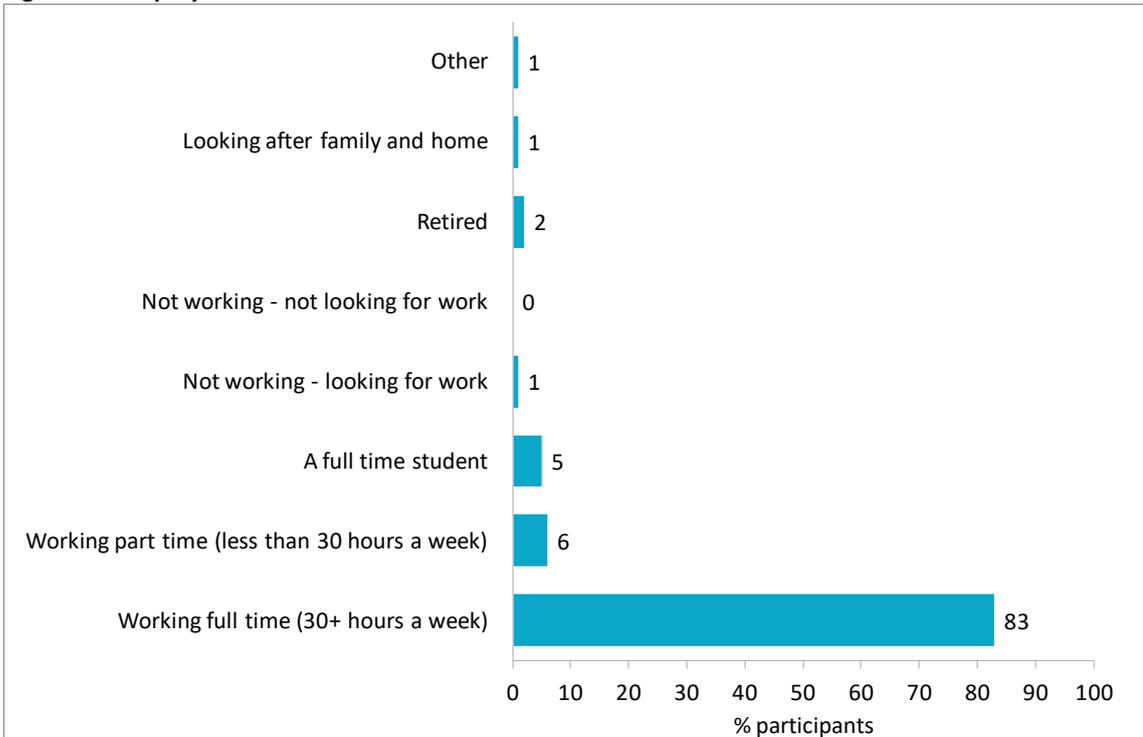
Base: 240

Household Income

Annual household income was probed. Thirty three per cent refused to answer.

Nearly a quarter had household incomes of over £75,000 and there was a fairly even income distribution across the income breaks between £10,000 and £70,000.

Figure 34: Annual household income

| Income band	% participants
Don't know/prefer not to say	33
Over £75,000	22
£50,000 to £75,000	7
£40,000 to £49,999	8
£30,000 to £39,999	9
£20,000 to £29,999	9
£15,000 to £19,999	5
£10,000 to £14,999	6
£5,000 to £9,999	1
Under £4,999	1
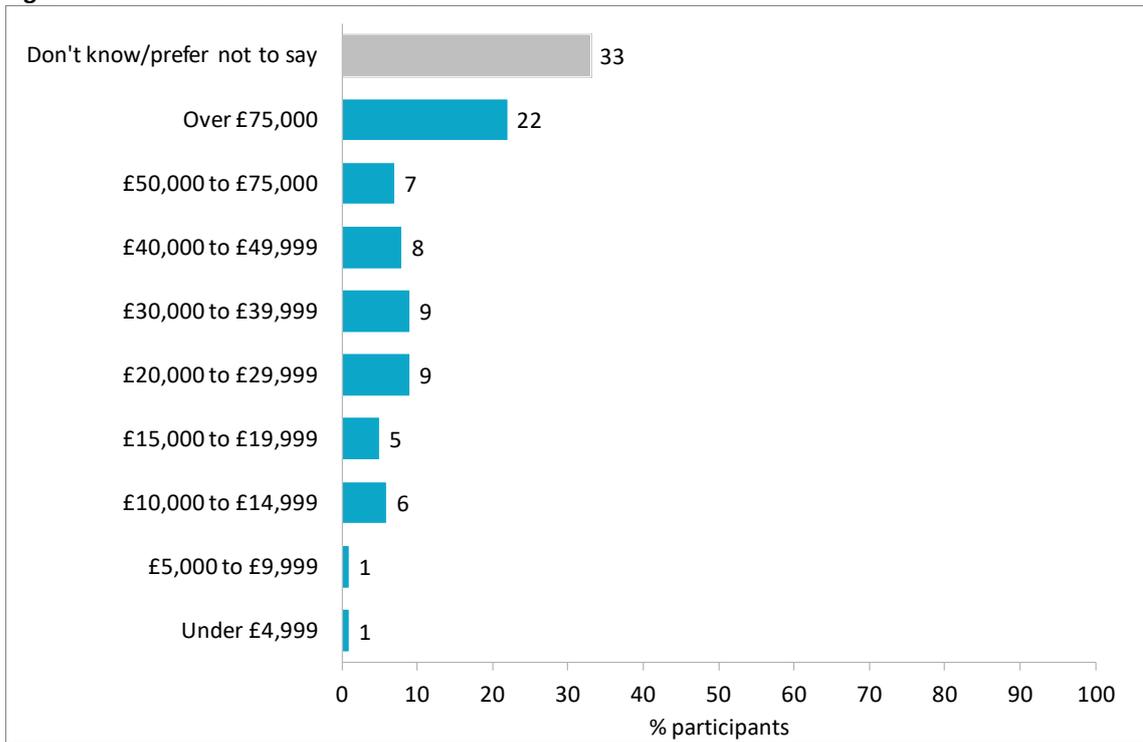
Base: 240

Ethnicity

Over two thirds of the sample was from a White background (68%) with 10% from a Black and 7% from an Asian background, as shown in Figure 35.

Figure 35: Ethnic group

Ethnic group	% participants
Prefer not to say	9
Chinese or other ethnic group	*
Black or Black British	10
Asian or Asian British	7
Mixed or multiple ethnic groups	7
White	68
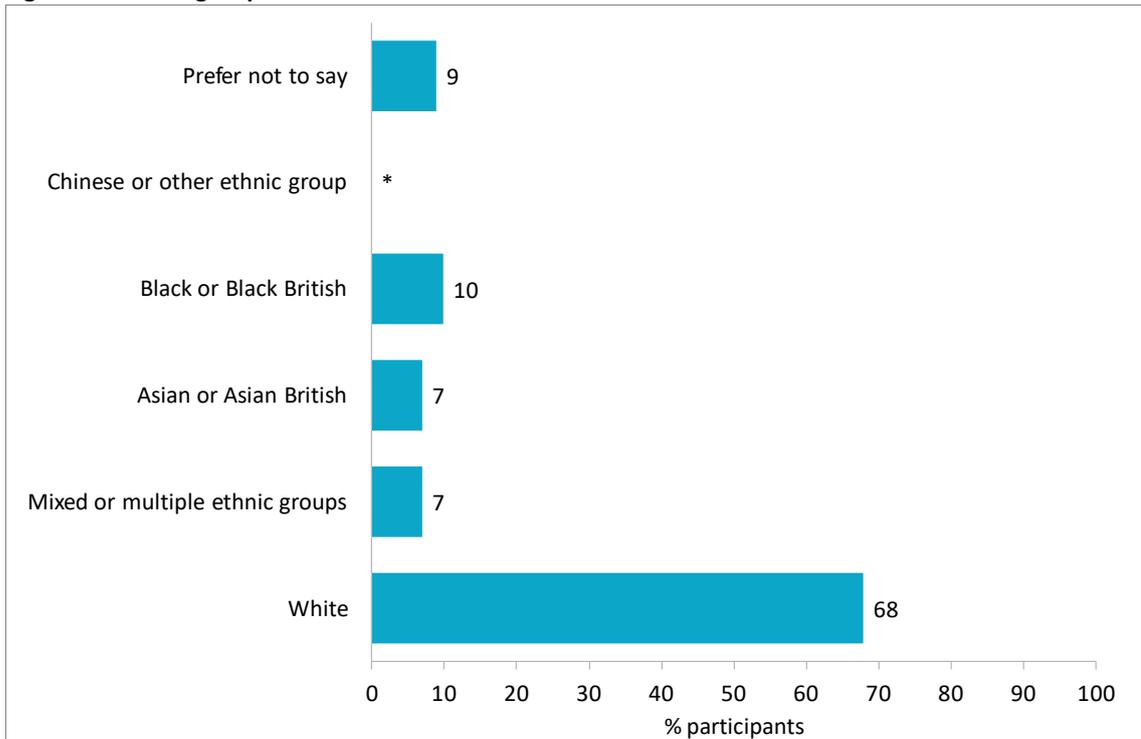
Base: 240

Household Size

The median adult household size was two, representing 62% of households. Thirteen per cent of participants lived as single adults.

Forty seven per cent of households had one or more children.

|	Adults %	Children %
0	-	53
1	13	20
2	62	22
3	15	5
4	5	0
5+	3	0

Postcode

Just over half (53%) gave a home postcode. Those who refused were asked where they lived.

The main postcodes were SW, SE and KT.

Figure 36: Home postcode

Postcode	% participants
SW	25
SE	14
KT	12
TW	6
E	6
GU	6
N	4
DA	4
W	2
NW	2
UB	2
SM	2
RM	2
RG	2
CM	2
Other	10
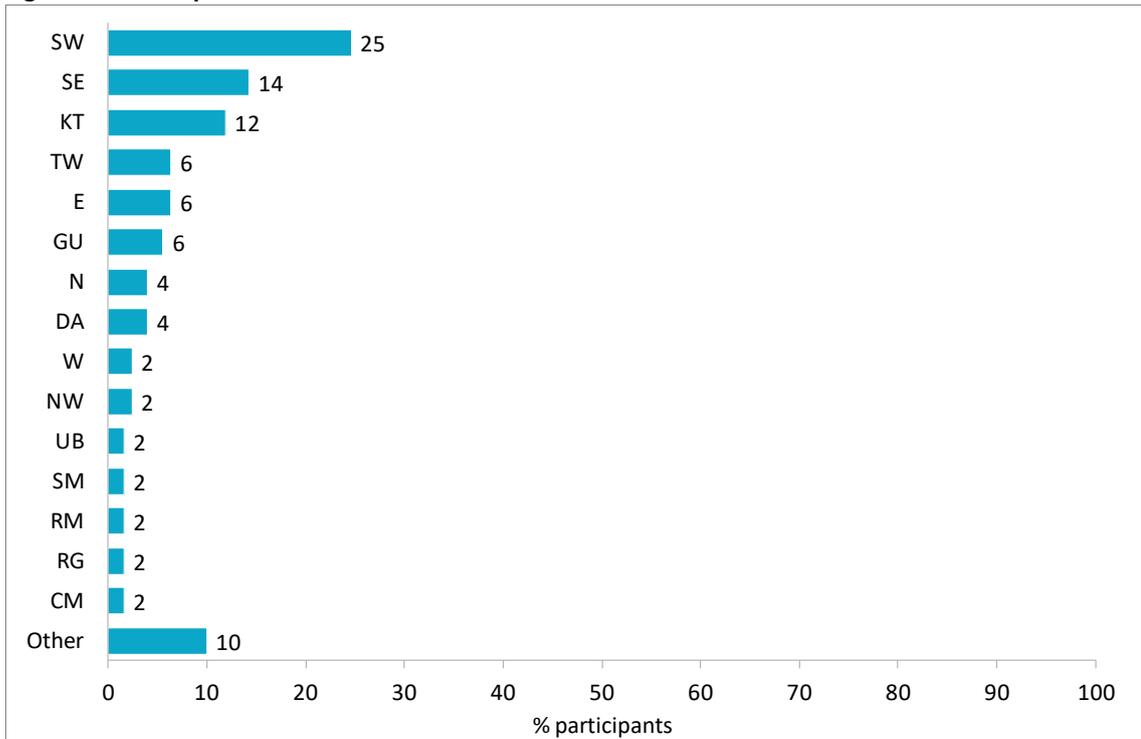
Base: 126

Almost all who did not give a postcode lived in London (93%) with 4% in the UK and 3% outside of the UK.

Figure 37: Where live


Outside London, but in the UK 4%
Outside of the UK 3%
London 93%
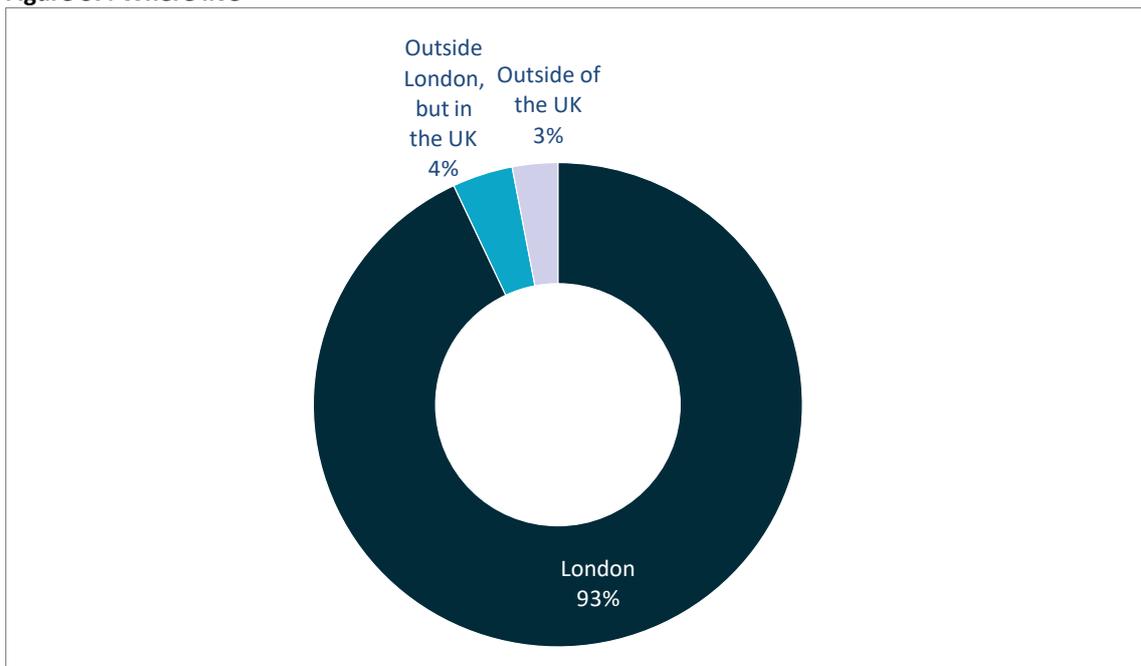
Base: 114

The London sample (93) were asked which borough they live in. The main boroughs were Wandsworth, Harrow, Southwark and Greenwich.

Figure 38: London borough

London borough	% participants
Refused	3
Don't know	1
Wandsworth	23
Harrow	18
Southwark	16
Greenwich	13
Kensington & Chelsea	8
Tower Hamlets	4
Richmond-upon-Thames	3
Hackney Hammersmith & Fulham	3
Lambeth	2
City of Westminster	2
Merton Newham	1
Islington	1
Hillingdon	1
Croydon	1
Brent	1
Bexley	1
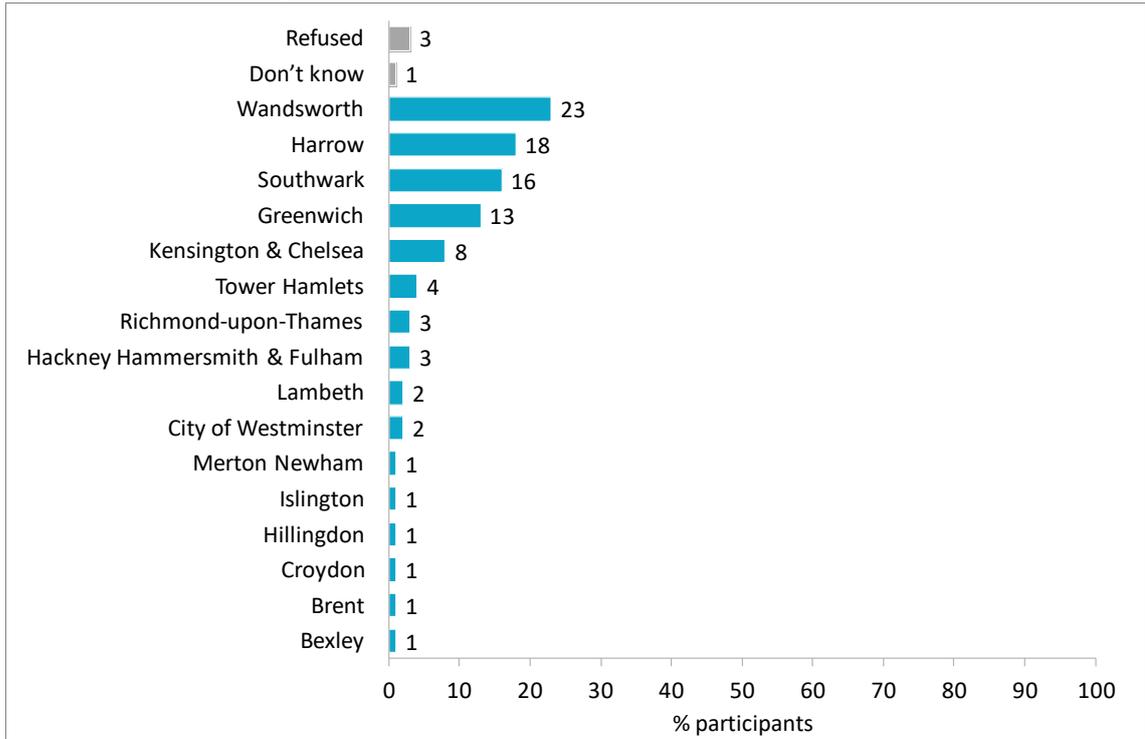
Base: 106

APPENDIX A

Questionnaire

SYSTEM INFORMATION:
Interviewer number
Interviewer name
Date:
Time interview started:

Location :
1   Mepham Street
2   Welling High Street
6   Wemborough Road
7   Trafalgar Road
8   Petty France
14   Uxbridge Road
16   Bermondsey Street
19   Upper Tooting Road
21   Borough Road
23   Whitechapel High Street
25   Putney Bridge
26   Kings Road

Recruitment Questionnaire

Good morning/afternoon/evening. My name is .... from Accent and I am carrying out research for Transport for London into cycleways.

Can I just ask you a couple of questions to check that you are eligible to take part in this research?

Any answer you give will be treated in confidence in accordance with the Code of Conduct of the Market Research Society

---

Q1.   Which of the following age groups do you fall into? **READ OUT**
        17 or under thank & close
        18-34 years
        35-54 years
        55+ years

Q2.   **RECORD GENDER:**
        Male   2.   Female

Thank you. You are on scope for this research.

We will email you a link for the online survey for you to complete. As thank you for your time you will be provided with a £5 voucher or we can make a donation of the same amount to a charity on completion of the online questionnaire. Can I please take a note of your email address? **SHOW SCREEN TO RESPONDENT AND ASK THEM TO CONFIRM THAT THEIR E-MAIL ADDRESS IS CORRECT**

        Email address:

Check field for email address **(IF NOT MATCHED – GO BACK TO "EMAIL ADDRESS")**

Please can I take a note of your phone number where we can contact you for quality control purposes?

Phone number (including STD code)

EXPORT:
LOCATION
DATE
AGE
GENDER

Transport for London

Introduction

Thank you very much for agreeing to complete this on-line survey for Transport for London into cycleways which is being conducted by Accent. The closing date for completion of this survey is **July 23rd**

The research is being conducted under the terms of the MRS code of conduct and is completely confidential. If you would like to **confirm** Accent's credentials please call the MRS free on 0500 396999.

As thank you for your time you will be provided with a £5 voucher or we can make a donation of the same amount to a charity on completion of the online questionnaire.

The questionnaire will take about 10 minutes to complete.

You do not have to answer questions you do not wish to and you can terminate the interview at any point.

For convenience you can stop and return to complete the questionnaire as many times as you wish, although once submitted you will not be able to enter again.

Q3.   When we contacted you on #DATE#, you were making a cycling journey on a cycleway on #LOCATION#.

    We would now like to ask you some questions about that trip.

    Where did you begin the cycling part of that journey? Please enter the postcode of this

location (eg WD4 5RT) in the box ⓘ[1], otherwise click on the map below to show the location of where you began cycling ⓘ[2].

Q4.   Where did you end **the cycling part** of that journey? Please enter the postcode of this location in the box ⓘ[2], otherwise click on the map below to show the location of where you began cycling ⓘ[3].

Q5.   What was the **main** purpose of the cycle journey?

Commuting to/from work
Business travel (travel as part of your job during working hours, e.g. meetings or site visits)
Travel to/from a place of education
Going to/from a leisure activity (e.g. meeting friends, going to the cinema or a sports event)
To visit friends / relatives at their home
Shopping
Personal business (e.g. doctor's appointment, going to the bank)
For pleasure rather than to get to a destination (e.g. cycling around a park)
To get some exercise rather than to get to a destination (e.g. cycling around a park)
For fitness training / sport
Accompanying a child/student (e.g. to/from school)
Other (please specify)

Q6.   How often do you make that cycle journey?

5 or more days a week
3 or 4 days a week
1 or 2 days a week
At least once a fortnight
At least once a month
At least once a year
This was the first time I have made this journey

---

[1] HOVER BUTTON WITH FOLLOWING TEXT: Type in the postcode in the box and click on the search icon to the right of the box.

[2] HOVER BUTTON WITH FOLLOWING TEXT: You can zoom in by clicking on the map or by using the zoom controls to the left of the map. You can move the location by clicking and dragging or by using the controls on the top left of the map.
When you have located the location click on the forward arrow at the bottom of the screen

Q7. Did you make that cycle journey with other people?

No, I cycled alone
Yes, I cycled with others

Q8. **IF Q7=2 ASK, OTHERWISE GO TO Q9:** How many **other** people did you cycle with? Please enter 0 if none in that category.

Number

Adults
Children aged 16 or under (on their own bikes)
Children aged 16 or under (not on their own bikes)

Q9. Approximately how long (in minutes) did it take you to make the cycle part of this journey? If you don't know please enter your best estimate.

Range: 1-360 minutes

Q10. How safe did you feel when cycling on the cycleway?

I felt safe throughout this journey
I felt safe for most of this journey
I felt safe for some of this journey, but there were a number of occasions where I didn't feel safe
I didn't feel safe at all when making this journey

Q11. Overall, how satisfied or dissatisfied are you with the following aspects of the cycleway?

	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied
Volume of traffic					
Space for cyclists					
Quality of road surface					
Helpfulness of signs and markings for cyclists					
The time it took to make the journey by cycle					
The reliability of the cycle journey					

Q12. **ASK IF Q6<>7 (THIS WAS THE FIRST TIME I HAVE MADE THIS JOURNEY). OTHERWISE GO TO Q13:** When did you first start making this part of the journey by bicycle?

In the last month
In the last 3 months
In the last 6 months
In the last year
More than a year ago

Cycling in general

Q13. How often do you cycle on the cycleway at #LOCATION#?

5 or more days a week
3-4 days a week
2 days a week
Once a week
Once a fortnight
About once a month
Less than once a month

First time

Q14. How often do you cycle in London?

5 or more days a week
3-4 days a week
2 days a week
Once a week
Once a fortnight **GO TO Q16**
About once a month **GO TO Q16**
Less than once a month **GO TO Q16**

Q15. What kinds of trips do you currently make by bicycle? **Please tick all that apply**

Commuting to/from work
Business travel (travel as part of your job during working hours, e.g. meetings or site visits)
Travel to/from a place of education
Going to/from a leisure activity (e.g. meeting friends, going to the cinema or a sports event)
To visit friends / relatives at their home
Shopping
Personal business (e.g. doctor's appointment, going to the bank)
For pleasure rather than to get to a destination (e.g. cycling around a park)
To get some exercise rather than to get to a destination (e.g. cycling around a park)
For fitness training / sport
Accompanying a child/student (e.g. to/from school)
Other (please specify)

Q16. How would you describe yourself as a 'cyclist'?

Complete beginner
Novice
Quite confident
Very confident
Other (please specify)

Q17. How safe do you feel generally as a cyclist in London?

I feel safe cycling on all roads in London
I feel safe cycling on most roads in London, but there are a few roads or junctions where I don't feel safe
I feel safe cycling on quieter roads in London, but not on roads where there is lots of traffic
I generally don't feel very safe cycling in London

Q18. What type of bike do you use?

Mountain bike
Racing/Road bike
Hybrid bike
Folding bike
Dutch /traditional bike
Hire bike (eg Santander Cycle)
Other (please specify)

Current perceptions of carriageway condition

Q19. This questionnaire is about the condition of the cycleway. We are particularly interested in your views with respect to the nature of any defects (for example, subsidence, cracks etc) which may or may not affect how you ride on the cycleway.

How would you describe the overall condition of the cycleway?
Very poor

Poor
Neither poor nor good
Good
Very good
Don't know

Q20.   How important is the quality of the cycleway to you?
Very unimportant
Unimportant
Neither
Important
Very important
Don't know

Rating of cycleway defects

Q20b   We are now going to focus on a series of cycleway defects, that is aspects of the cycleway where wear and tear has meant that the cycleway surface is no longer smooth and flat.

We will be looking at the following cycleway defects:

- Longitudinal gaps
- Potholes
- Surface fretting (fretting is where the carriageway surface breaks up)
- Surface cracking (cracks on the cycleway surface)
- Worn surface
- Quality and condition of signage
- Grass-ingress/verge creep
- Ride quality – Reinstatement related
- Ride quality – Condition related
- Ride quality – Ironwork related
- Standing water (where parts of the carriageway remain under water after rain)
- Cleanliness
- Overhanging vegetation/obstructions/width restrictions
- Quality of lighting
- Worn lines and other road markings

Each of these defects may occur to different degrees and over varying parts of the cycleway. They may also occur separately or together.

For this research we will deal with each of them separately.

This research is seeking to capture **your opinions** on these defects; **your opinions** will be used to inform TfLs maintenance plans.

It is, of course, not feasible or necessary to maintain all cycleways in perfect condition. Therefore TfL would like you to consider each defect type, with regard to its impact on your experience of using a cycleway.

Longitudinal gaps

Q21. Longitudinal gaps are gaps in the surface of the cycleway (e.g. between a kerb and edge of a cycleway, or where paving has opened up) running in the direction of cycling.

#

How satisfied are you with the cycleway with respect to longitudinal gaps?

Very dissatisfied

Dissatisfied

Neither

Satisfied

Very satisfied **GO TO Q23**

Not applicable **GO TO Q23**

Q22. How important is it that the cycleway has no longitudinal gaps?

Very unimportant
Unimportant
Neither
Important
Very important

Surface fretting

Q23. Fretting is where the cycleway surface breaks up and surface material has been lost.

How satisfied are you with the cycleway with respect to surface fretting?
Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q25**
Not applicable **GO TO Q25**

Q24. How important is it that the cycleway has no surface fretting?

Very unimportant
Unimportant
Neither
Important
Very important

Potholes

Q25. Potholes are where the whole surface of the cycleway has broken away to cause a hole.

How satisfied are you with the cycleway with respect to potholes?

Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q27**
Not applicable **GO TO Q27**

Q26. How important is it that the cycleway has no potholes?

Very unimportant
Unimportant
Neither
Important
Very important

Surface Cracking

Q27. Surface Cracking is where there are cracks on the cycleway surface.

How satisfied are you with the cycleway with respect to surface cracking?

Very dissatisfied
Dissatisified
Neither
Satisfied
Very satisfied **GO TO Q29**
Not applicable **GO TO Q29**

Q28. How important is it that the cycleway has no surface cracking?

Very unimportant

Unimportant
Neither
Important
Very important

Worn surface

Q29. Worn surfaces are where the original surface is worn smooth to the point where it may be slippery when ridden on.

How satisfied are you with the cycleway with respect to surface wear?

Very dissatisified
Dissatisified
Neither
Satisfied
Very satisfied **GO TO Q31**
Not applicable **GO TO Q31**

Q30. How important is it that the cycleway has no surface wear?

Very unimportant
Unimportant
Neither
Important
Very important

Quality and condition of signage

Q31. This concerns whether appropriate signs have been provided and if so, whether their condition is satisfactory.

How satisfied are you with the cycleway with respect to the quality and condition of signage?

Very dissatisified
Dissatisified
Neither
Satisfied
Very satisfied **GO TO Q33**
Not applicable **GO TO Q33**

Q32. How important is it that the cycleway has good quality and good condition signage?

Very unimportant
Unimportant
Neither
Important
Very important

Grass-ingress or verge creep

Q33. Grass-ingress or verge creep is where grass grows onto the cycle path track, from an adjacent verge or properties, or where grass is growing through the surface of the cycleway.

How satisfied are you with the cycleway with respect to grass-ingress or verge creep?

Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q35**
Not applicable **GO TO Q35**

Q34.   How important is it that the cycleway is free of grass-ingress or verge creep?

Very unimportant
Unimportant
Neither
Important
Very important

Ride quality – reinstatement related

Q35.   This concerns the quality of ride after parts of the cycleway have been resurfaced, such as repairs after utility (gas, water, communications etc) works or small area repairs of defects.

How satisfied are you with the cycleway with respect to quality of ride after parts of the cycleway have been resurfaced?

Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q37**
Not applicable **GO TO Q37**

Q36. How important is it that the cycleway provides a smooth ride after parts of the cycleway have been resurfaced?

Very unimportant
Unimportant
Neither
Important
Very important

Ride quality – Condition related

Q37.   This concerns the quality of ride on the cycleway in terms of how smooth or bumpy it is.

How satisfied are you with the cycleway with respect to the quality of ride?
Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q39**
Not applicable **GO TO Q39**

Q38.   How important is it that the quality of ride on the cycleway is good?

Very unimportant
Unimportant
Neither
Important
Very important

Ride quality – Ironwork related

Q39.　This concerns the quality of ride on the cycleway where there is ironwork.

How satisfied are you with the quality of ride on the cycleway where there is ironwork?

Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q41**
Not applicable **GO TO Q41**

Q40.　How important is it that the quality of ride on the cycleway where there is ironwork is good?

Very unimportant
Unimportant
Neither
Important
Very important

Standing water

Q41.   Standing water is where parts of the cycleway remain under water after rain.

How satisfied are you with the cycleway with respect to standing water?
Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q43**
Not applicable **GO TO Q43**

Q42.   How important is it that the cycleway has no pools of water after it rains?

Very unimportant
Unimportant
Neither
Important
Very important

Cleanliness

Q43.   Cleanliness refers to the cycleway being free of litter, leaves, mud and other detritus etc.

How satisfied are you with the cycleway with respect to cleanliness?
Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q45**
Not applicable **GO TO Q45**

Q44.   How important is it that the cycleway is kept free of litter and leaves etc?

Very unimportant
Unimportant
Neither
Important
Very important

Overhanging vegetation/obstructions/width restrictions

Q45.   Overhanging vegetation, obstructions and width restrictions may reduce the usable width of the cycleway, causing cyclists to swerve or to move out of the cycleway into the footway or the road.

How satisfied are you with the cycleway with respect to overhanging vegetation or obstructions or width restrictions?

Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q47**
Not applicable **GO TO Q47**

Q46. How important is it that the cycleway has no overhanging vegetation or obstructions or width restrictions?

Very unimportant
Unimportant
Neither
Important
Very important

Quality of lighting

Q47. Quality of lighting refers to the brightness and evenness of lighting on the cycleway when it is dark.

How satisfied are you with the cycleway with respect to the quality of lighting when it is dark?

Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q49**
Not applicable **GO TO Q49**

Q48. How important is it that the cycleway has good quality lighting when it is dark?

Very unimportant
Unimportant
Neither
Important
Very important

Worn lines and other Road Markings

Q49. Worn lines are where road markings on the cycleway such as white lines or cycle marking have partially or completely worn away.

How satisfied are you with the cycleway with respect to worn lines and markings?

Very dissatisfied
Dissatisfied
Neither
Satisfied
Very satisfied **GO TO Q51**
Not applicable **GO TO Q51**

Q50. How important is it that the cycleway has no wear to white lines and markings?

Very unimportant
Unimportant
Neither
Important
Very important

Priorities

Q51. We have looked at a number of different types of defects to the cycleway. How would you rank the top nine in terms of priority for improvements? **ROTATE. SHOW IMAGES AGAIN**

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	don't know
Longitudinal gaps										
Potholes and										
Surface fretting										
Surface cracking										
Worn surface										
Quality and condition of signage										
Grass-ingress/verge creep										
Ride quality – Reinstatement related										

Ride quality – Condition related												
Ride quality – Ironwork related												
Standing Water												
Cleanliness												
Overhanging vegetation/ obstructions/width restrictions												
Quality of lighting												
Worn lines and road markings												

Q52.   Do you have any other comments you would like to make on the condition of cycleways?

Demographic Questions

Q53.   We would now just like to ask a few questions which will help us to understand some of the information you have provided us with. Please be assured that all details you give will be treated with the strictest confidence.

Which of the following age groups do you fall into?

18-24
25-34
35-44
45-54
55-64
65 or over

Q54.   What is your gender

Male
Female
Prefer not to say

Q55.   What is your employment status?

Working full time (30+ hours a week)
Working part time (less than 30 hours a week)
A full time student
A part time student
Not working - looking for work
Not working - not looking for work
Retired
Looking after family and home
Other (please write in)
Prefer not to say

Q56.   What is your annual household income?

Under £4,999
£5,000 to £9,999
£10,000 to £14,999
£15,000 to £19,999
£20,000 to £29,999
£30,000 to £39,999
£40,000 to £49,999
£50,000 to £75,000
Over £75,000
Don't know/prefer not to say

Q57.　What is your ethnicity?

White
Mixed or multiple ethnic groups
Asian or Asian British
Black or Black British
Chinese or other ethnic group
Prefer not to say

Q58.　How many adults, including yourself, live in your household? An adult is aged 18 years or older.

LOW 0
HIGH 9

Q59.　How many children aged 17 or younger live in your household?

LOW 0
HIGH 9

Q60.　Transport for London (TfL) would like to collect your postcode for classification purposes only. The results of the analysis will be presented in aggregated format only. It will not be passed on to any third party. All data will be processed in adherence to Market Research Society's Code of Conduct and Data Protection Act 1998.

Please enter your home postcode:

Prefer not to say

Q61.　**If Q60=PREFER NOT TO SAY ASK, OTHERWISE GO TO Q63**: In which part of the UK do you live?

London
Outside London, but in the UK
Outside of the UK

Q62.　**IFQ61=1 ASK** (**OTHERWISE GO TO Q63**): In which borough do you live?

Barking & Dagenham	Hammersmith & Fulham	Newham
Barnet	Haringey	Redbridge
Bexley	Harrow	Richmond-upon-Thames
Brent	Havering	Southwark
Bromley	Hillingdon	Sutton
Camden	Hounslow	Tower Hamlets
City of Westminster	Islington	Waltham Forest
Croydon	Kensington & Chelsea	Wandsworth
Ealing	Kingston-upon-Thames	Don't know
Enfield	Lambeth	Refused
Greenwich	Lewisham	
Hackney	Merton	

Q63.　Do you have any further comments about this survey?

Q64.　That was the last question. Thank you very much for taking part in this research.

Accent, on behalf of TfL, would like to thank you for taking the time to complete this

questionnaire. As mentioned, we will provide you with a £5 Amazon or M&S voucher or make a donation to a charity on your behalf. Charity donations will be to MacMillan Cancer Support (charity number 261017). Please tell us which you would prefer?

Amazon voucher
M&S voucher
Charity donation **GO TO Q66**

Q65.   **IF Q64=1-2:** We will send your **#Q64#** to your email address. Please enter your email address.

Email address:

Q66.   We really appreciate the time that you have given us today. Would you be willing to be contacted again for clarification purposes or be invited to take part in other research for Transport for London?

Yes, for both clarification and further research
Yes, for clarification only
Yes, for further research only
No

Thank you for taking part in this survey.

If you have any questions or comments on the survey please email: chris.heywood@accent-mr.com with 'cycle survey' in the subject line.

This research was conducted under the terms of the UK Market Research Society code of conduct and is completely confidential.

APPENDIX B

## Maps and Photos of Sites
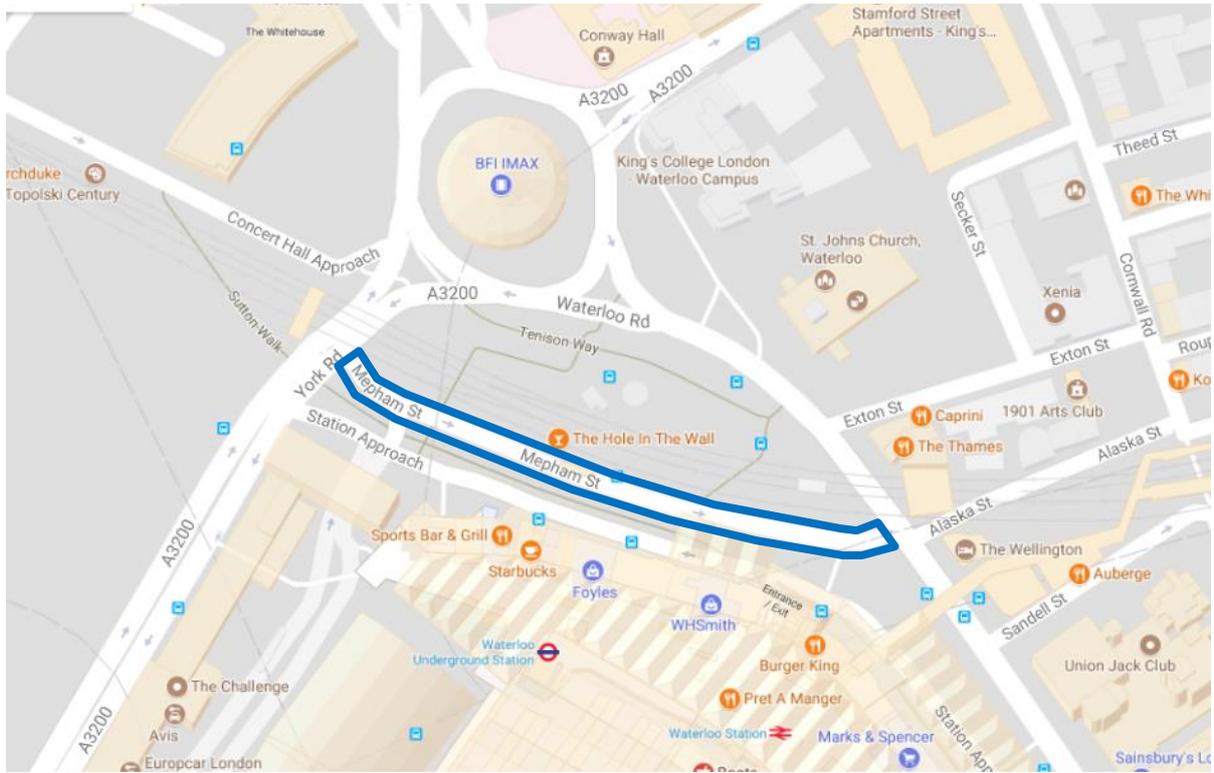
Mepham Street
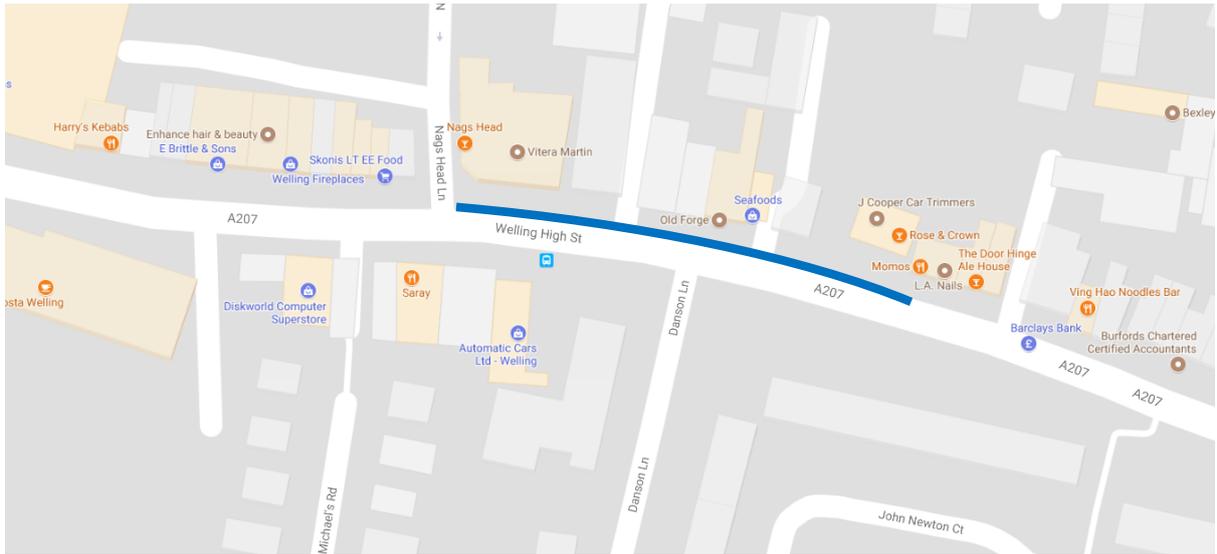
Welling High Street
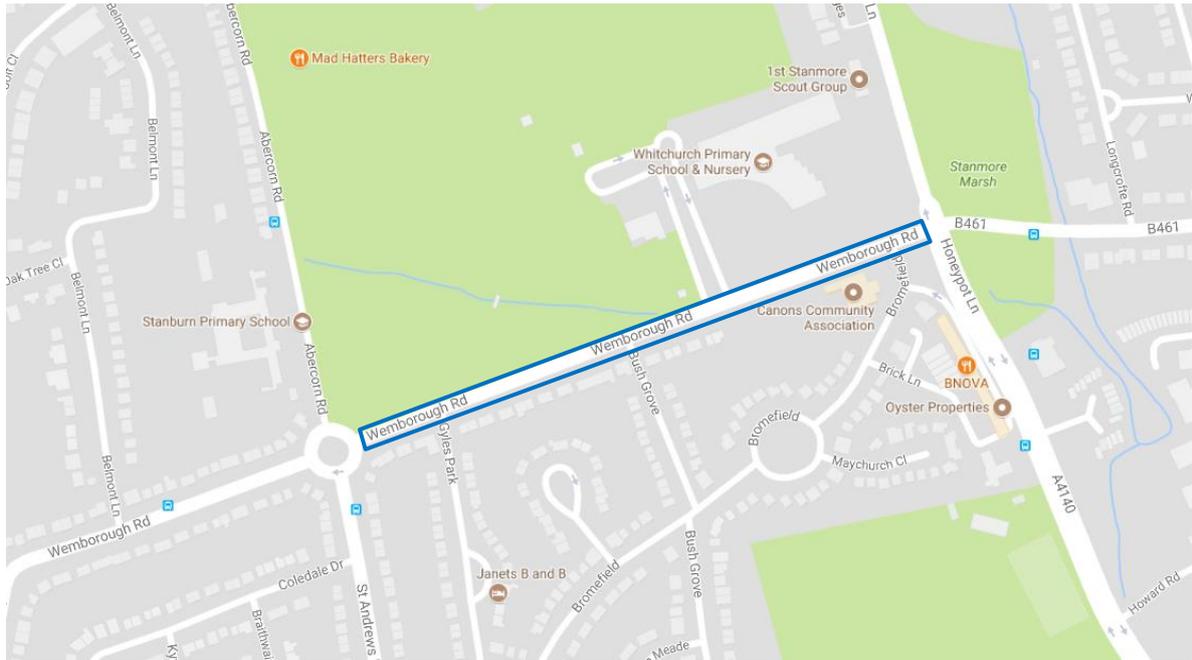
Wemborough Road
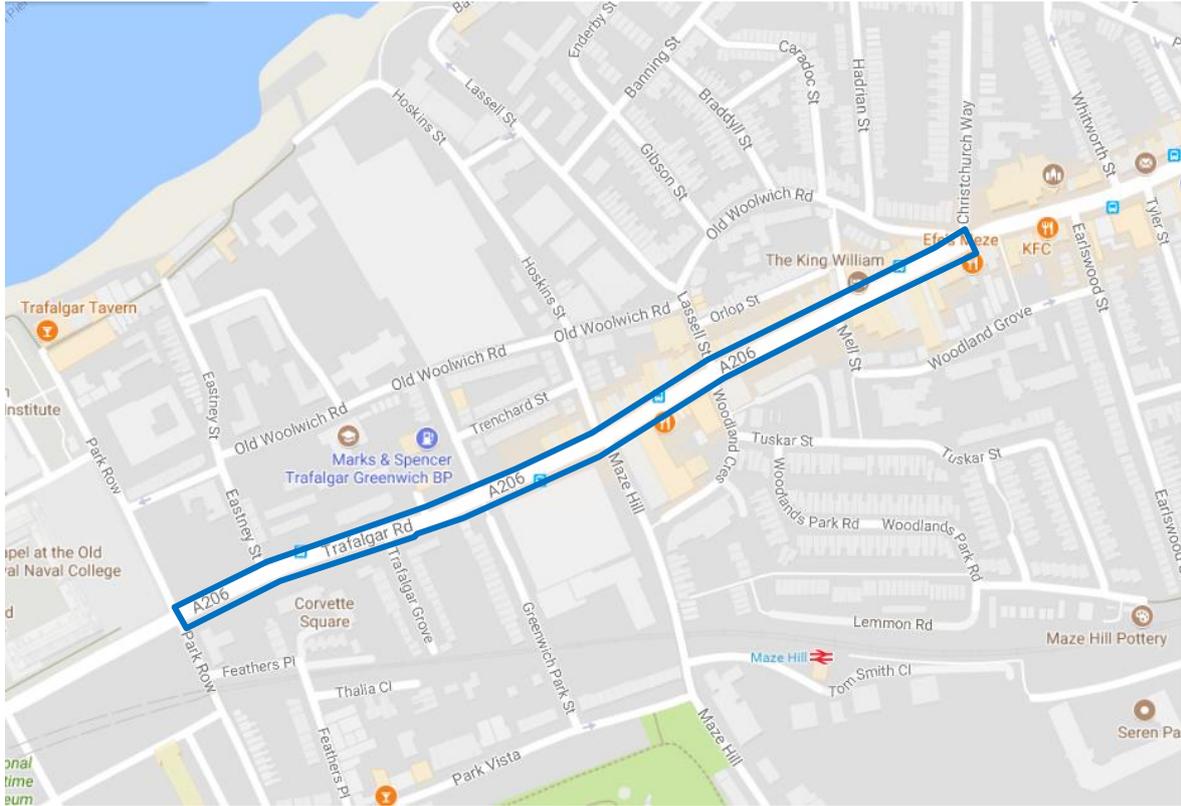
Trafalgar Road
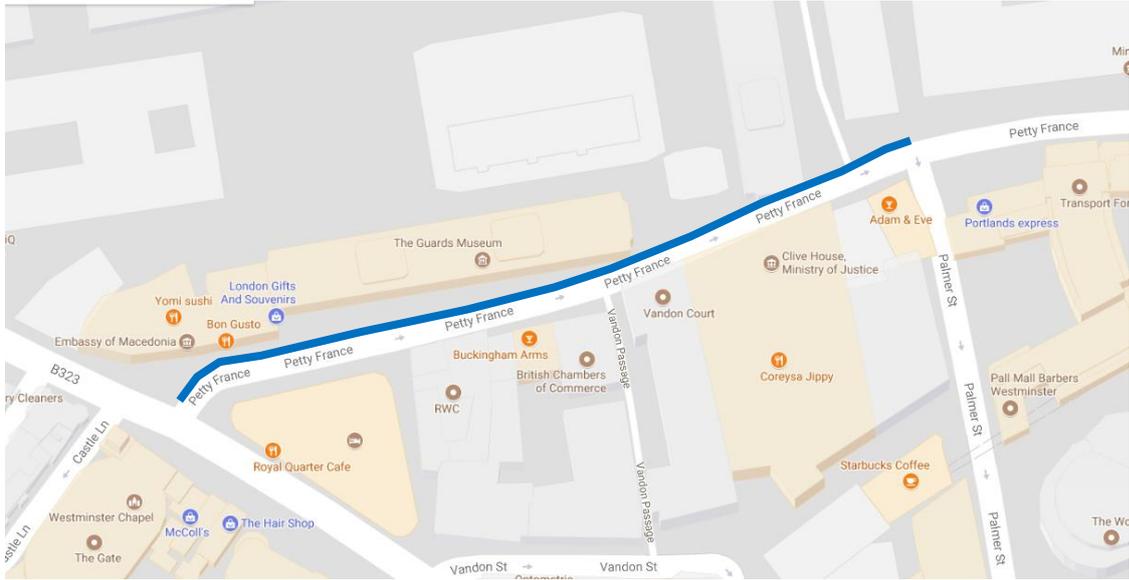
Petty France
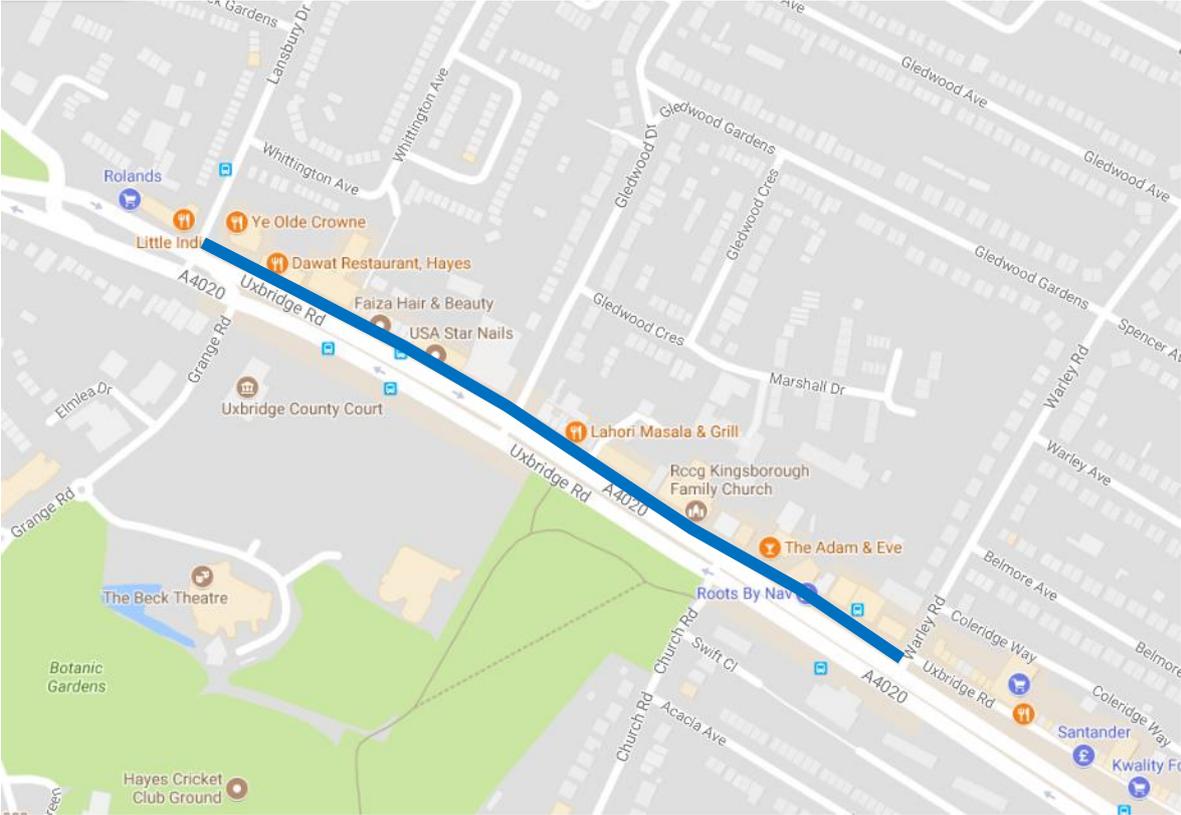
Uxbridge Road
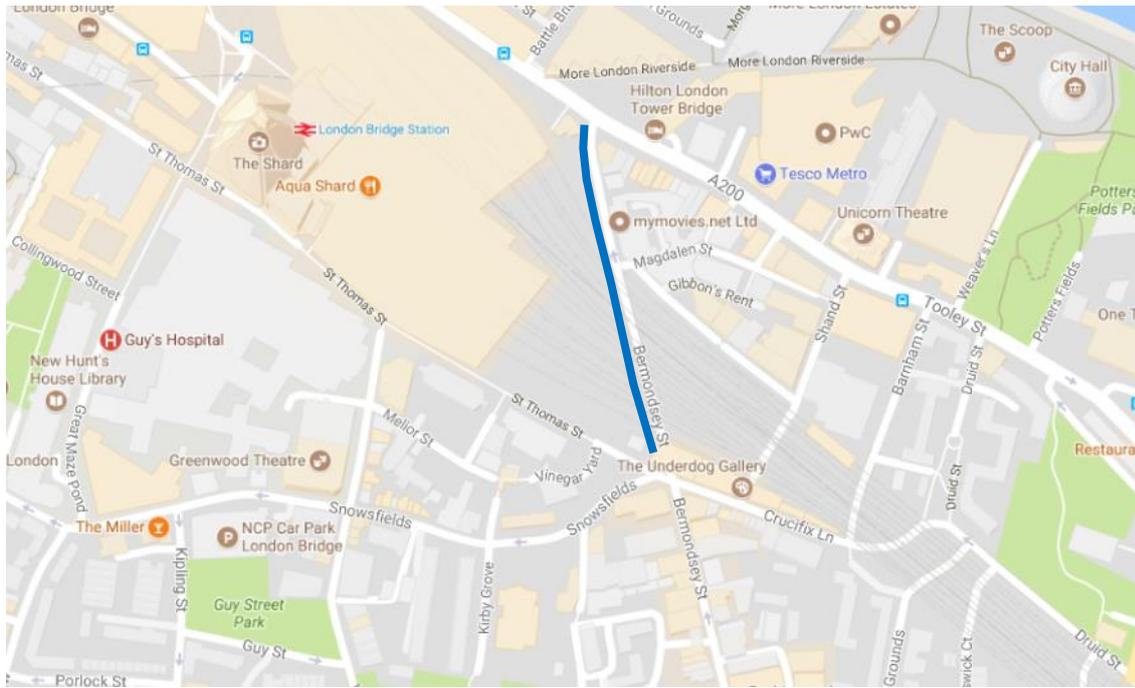
Bermondsey Street
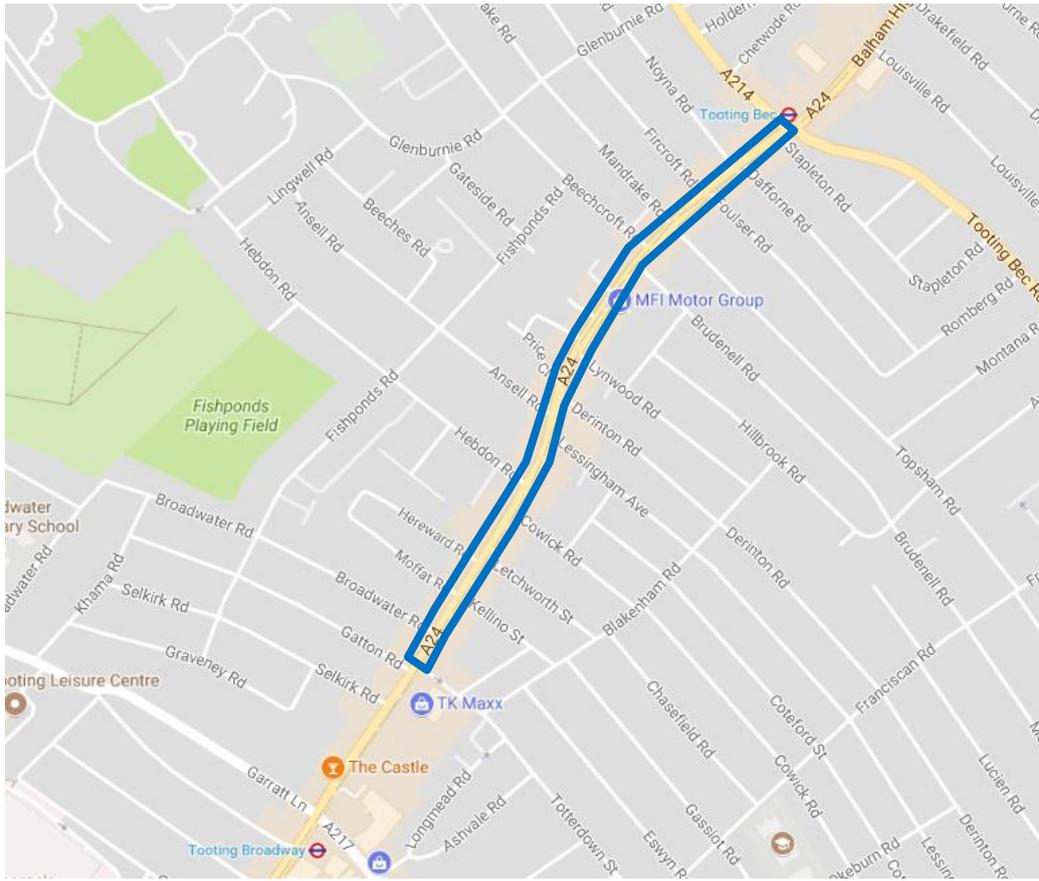
Upper Tooting Road
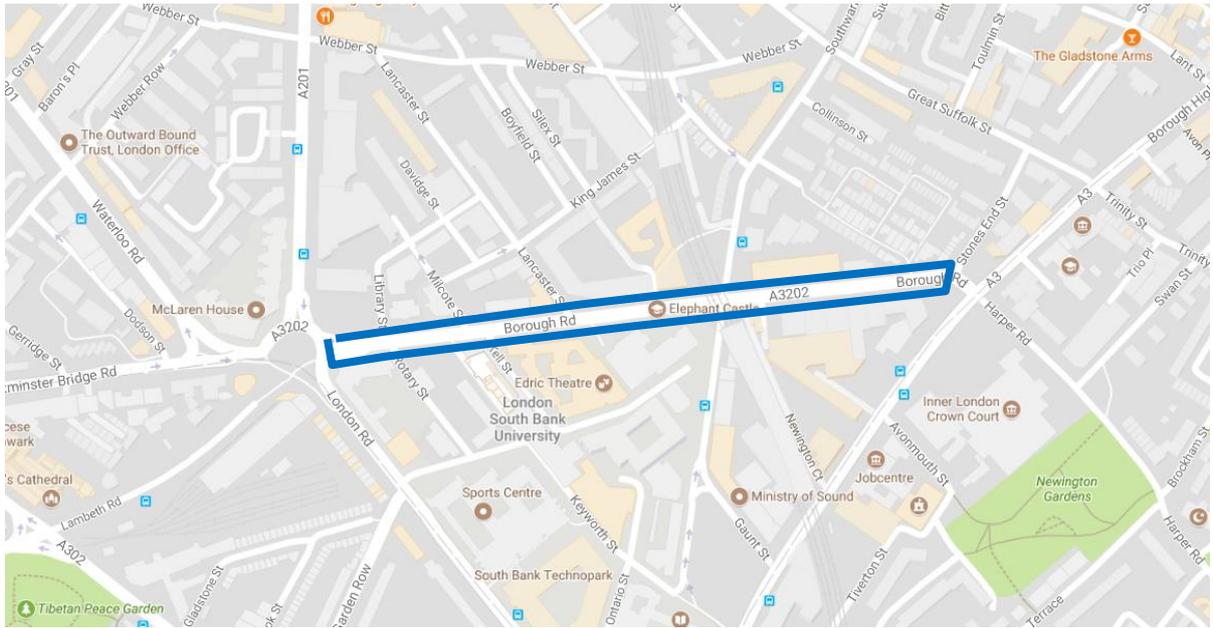
Borough Road
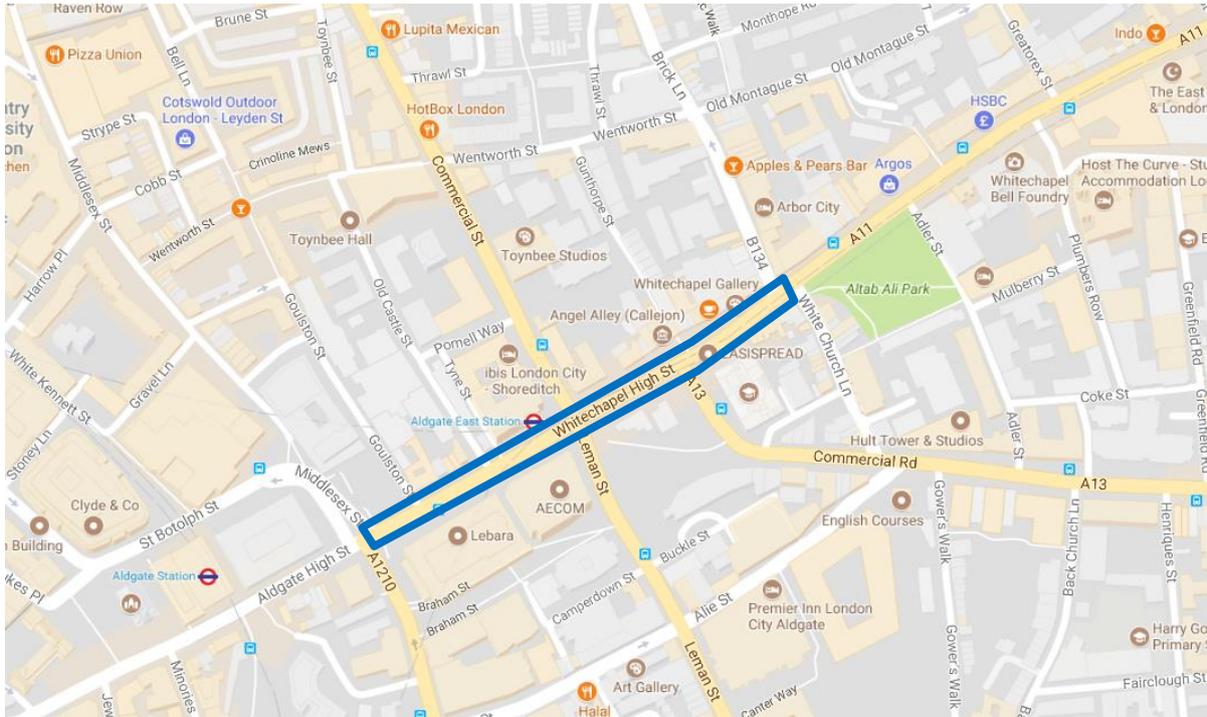
Whitechapel High Street
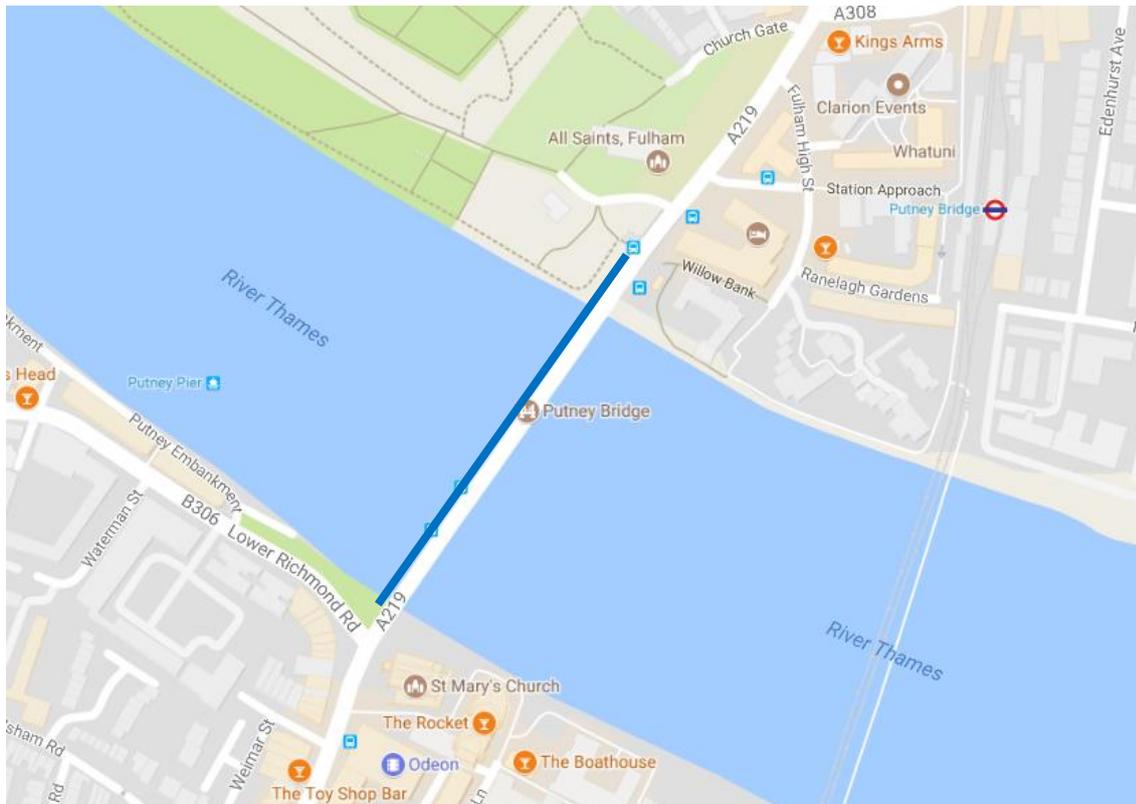
Putney Bridge
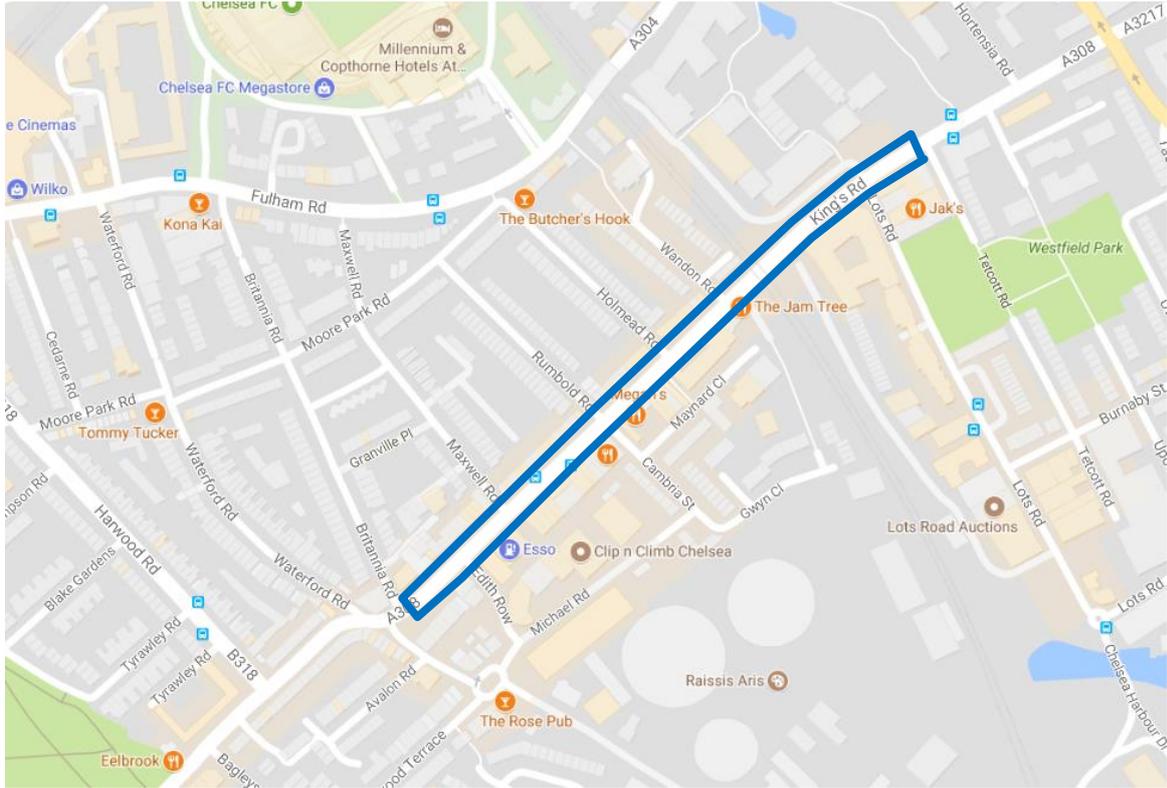
Kings Road

Appendix 2: UKPMS Cycletrack Visual Surveys and Defects

Survey Type Description	Pavement Type	Defect Type Description
Coarse Visual Inspection	Bituminous	Major Bituminous Deterioration
		Minor Bituminous Deterioration
		Not Assessed
		Not Defective
	Block Paved	Major Block Deterioration
		Minor Block Deterioration
		Not Assessed
		Not Defective
	Concrete	Major Concrete Deterioration
		Minor Concrete Deterioration
		Not Assessed
		Not Defective
	Flagged	Major Flagged Deterioration
		Minor Flagged Deterioration
		Not Assessed
		Not Defective
	Unknown	Not Assessed
		Not Defective
Detailed Visual Inspection	Bituminous	Longitudinal Trip
		Major Cracking
		Major Fretting
		Minor Cracking
		Minor Fretting
		Moderate Local Settlement/Subsidence
		Not Assessed
		Not Defective
		Severe Local Settlement/Subsidence
		Spot Defects
	Block Paved	Cracked and Depressed Blocks
		Cracked but Level Blocks
		Depressed or Missing Blocks
		Longitudinal Trip
		Missing Filler
		Not assessed
		Not Defective
		Spot Defects
	Concrete	Longitudinal Trip
		Major Cracking
		Major Scaling/Fretting
		Minor Cracking
		Minor Scaling/Fretting

Survey Type Description	Pavement Type	Defect Type Description
		Moderate Local Settlement/Subsidence
		Not Assessed
		Not Defective
		Severe Local Settlement/Subsidence
		Spot Defects
	Flagged	Cracked and Depressed Flags
		Cracked but Level Flags
		Depressed Flags (not Cracked)
		Longitudinal Trip
		Not Assessed
		Not Defective
		Spot Defects
	Unknown	Not Assessed
		Not Defective
Footway Network Survey	Bituminous	As New
		Aesthetically Impaired
		Functionally Impaired
		Structurally Unsound
	Block Paved	As New
		Aesthetically Impaired
		Functionally Impaired
		Structurally Unsound
	Concrete	As New
		Aesthetically Impaired
		Functionally Impaired
		Structurally Unsound
	Flagged	As New
		Aesthetically Impaired
		Functionally Impaired
		Structurally Unsound
	Unknown	As New
		Aesthetically Impaired
		Functionally Impaired
		Structurally Unsound

Appendix 3: Cycle Network Infrastructure Level of Service (CINLoS)

a.   Assessment Criteria and Weighting

Defect	Description	Scoring Criteria			Importance Weighting (0-100 Scale)
		Basic LoS (Score = 0)	Satisfactory LoS (Score = 1)	High LoS (Score = 2)	
Longitudinal gaps	Longitudinal gaps are gaps in the surface of the cycleway (e.g. between a kerb and edge of a cycleway, or where paving has opened up) running in the direction of cycling.	Extensive longitudinal gaps and cracks or Longitudinal gaps present that would cause a cyclist to change course to avoid wheels becoming trapped.	Occasional longitudinal gaps that do not present a risk to cyclists.	No longitudinal gaps in the cycleway.	3.3
Surface fretting	Fretting is where the cycleway surface breaks up and surface material has been lost.	Extensive fretting to the point where riding is uncomfortable and/or where the cyclist takes a different course to avoid the areas affected.	Some surface fretting that can be felt when riding over, but not to the point where cyclist would avoid riding over those areas.	No significant surface fretting.	3.3
Potholes	Potholes are where the whole surface of the cycleway has broken away to cause a hole.	Significant numbers of potholes to the point where riding is uncomfortable or presents a risk of dismounting the cyclist.	Occasional minor potholes, with room for the cyclist to avoid.	No potholes present.	3.6
Surface Cracking	Surface cracking is where there are cracks on the cycleway surface.	Significant surface cracking affecting the comfort or quality of ride.	Some surface cracking but minimal impact upon the quality of the ride.	No significant cracking.	3.1
Worn surface	Worn surfaces are where the original surface is worn smooth to the point where it may be slippery when ridden on.	Significant surface wear over the majority of the cycleway, to the point where the cycleway could be slippery.	Minor surface wear or surface wear in parts of the cycleway with sufficient room to avoid.	No surface wear. Good surface texture.	3.3

Defect	Description	Scoring Criteria			Importance Weighting (0-100 Scale)
		Basic LoS (Score = 0)	Satisfactory LoS (Score = 1)	High LoS (Score = 2)	
Quality and condition of signage	This concerns whether appropriate signs have been provided and if so, whether their condition is satisfactory.	Appropriate signs are present but show deterioration to the point where they are difficult to read. A lack of signs means that it is difficult to negotiate the cycleway.	Appropriate signs are present but show some deterioration.	No issues with signage, either because all signs are present and in good condition, or because signs are not required.	3.2
Grass-ingress or verge creep	Grass-ingress or verge creep is where grass grows onto the cycle path track, from an adjacent verge or properties, or where grass is growing through the surface of the cycleway.	Significant surface vegetation restricting the width of the cycleway making it difficult to negotiate or to maintain speed.	Some surface vegetation restricting the width of the cycleway, but still sufficient to maintain cycle flow/capacity	Little or no vegetation on the surface of the cycleway.	3.1
Ride quality – reinstatement related	This concerns the quality of ride after parts of the cycleway have been resurfaced, such as repairs after utility (gas, water, communications etc.) works or small area repairs of defects.	Reinstatements or patches with some differences in level to the surrounding cycleway affecting the quality of ride to the point where the cyclist would be likely to slow down or change course.	Reinstatements or patches with some differences in level to the surrounding cycleway affecting the quality of ride.	No reinstatements or patches and reinstatements that are in good condition, level with the surrounding cycleway and have little or no impact on riding quality.	3.4
Ride quality – condition related	This concerns the quality of ride on the cycleway in terms of how smooth or bumpy it is.	Defects such as potholes, surface fretting and poor shape affecting the quality of ride to the point where the cyclist would be likely to slow down or change course.	Some defects such as potholes, surface fretting and poor shape affecting the quality of ride.	Surface of the cycleway is level and in good condition and provides a good quality of ride.	3.5

Defect	Description	Scoring Criteria			Importance Weighting (0-100 Scale)
		Basic LoS (Score = 0)	Satisfactory LoS (Score = 1)	High LoS (Score = 2)	
Ride quality – ironwork related	This concerns the quality of ride on the cycleway where there is ironwork.	Ironwork within the cycleway is in poor condition or is sunken or raised in relation to the surrounding surface affecting the quality of ride to the point where the cyclist would be likely to slow down or change course.	Some ironwork within the cycleway is in poor condition or is sunken or raised in relation to the surrounding surface to the point where it is affecting the quality of ride.	Ironwork within the cycleway is level with the surrounding surface, in good condition and has minimal impact on the quality of ride.	3.5
Standing water	Standing water is where parts of the cycleway remain under water after rain.	Evidence of significant puddling or standing water after rain that would restricting the width of the cycleway to the point where the cyclist would be likely to slow down or change course.	Evidence of some puddling or standing water to the point where the width of the remaining cycleway is restricted but still sufficient to maintain flow/capacity.	No evidence of any significant puddling or water remaining on the cycleway after rain. Surface is generally even and well drained.	3.3
Cleanliness	Cleanliness refers to the cycleway being free of litter, leaves, mud and other detritus etc.	Litter, leaves, mud or other detritus to the point where the cyclist would be likely to slow down or change course	Litter, leaves, mud or other detritus to the point where the effective width of the cycleway is restricted but still sufficient to maintain flow/capacity	Little or no litter, leaves, mud or other detritus within the cycleway	3.3

| Defect | Description | Scoring Criteria | | | Importance Weighting (0-100 Scale) |
		Basic LoS (Score = 0)	Satisfactory LoS (Score = 1)	High LoS (Score = 2)	
Overhanging vegetation/ obstructions/width restrictions	Overhanging vegetation, obstructions and width restrictions may reduce the usable width of the cycleway, causing cyclists to swerve or to move out of the cycleway into the footway or the road.	Significant overhanging vegetation or other obstructions restricting the width of the cycleway to the point where the cyclist would be likely to slow down, stop or change course	Some overhanging vegetation or other obstructions restricting the width of the cycleway, but still sufficient to maintain cycle flow/capacity.	Little or no reduction in the usable width of the cycleway from overhanging vegetation or other obstructions.	3.3
Quality of lighting	Quality of lighting refers to the brightness and evenness of lighting on the cycleway when it is dark.	Lighting is not present or is present but is not functional when it is dark.	Some degradation in the quality of lighting or insufficient lighting for the type of cycleway.	Good quality of lighting on the cycleway. Lighting all in good working order.	3.5
Worn lines and other road markings	Worn lines are where road markings on the cycleway such as white lines or cycle marking have partially or completely worn away.	Wear to the lines and markings in the cycleway to point where they are worn away or difficult to discern	Some wear to the lines and markings in the cycleway but they are still complete and visible.	Any lines and marking on the cycleway are in good condition with minimal wear.	3.3

b. Calculating Cycleway Level of Service

- For each length of cycleway that has been inspected each "defect" is rated and scored 0, 1 or 2 in accordance with the criteria above.
- The rating for each "defect" is then multiplied by the weighting value for that defect (as given in the table above) to derive the weighted score
- The total of these weighted scores for the length of cycleway is the level of service score for that length.
- This score is on a 0 – 100 scale where 0 is the worst possible level of service and 100 is the best possible level of service

To derive the Level of Service score for the whole of a cycleway network or for a sub-network, this is simply a question of taking a length-weighted average of the individual scores i.e.

$$\frac{\sum(CWL\ Length\ \times CWL\ Score)}{\sum CWL\ Length}$$

Where:

CWL Length is the length of each inspected stretch of cycleway and

CWL Score is the score for that length of cycleway

Note that the length of each stretch of cycleway inspected must be recorded as part of the assessment or must have been determined separately, for example from a cycleway network representation