

# How we help buses – the RARR process

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## Introduction

Transport for London (TfL) operates the most frequent and extensive bus network in the world with over 700 routes and 8,800 vehicles. This service is vital to the economic and social wellbeing of London with 1.7 billion bus journeys made in London last year, contributing £1.36 billion to TfL's revenue.

Buses transport more people than any other public transport mode in London. They form key links to town centres and other destinations across the city and are one of the most efficient uses of road space, playing an important role in delivering the Healthy Streets Approach outlined in the Mayor's Transport Strategy.

At previous symposiums, we have outlined how TfL's Network Performance Delivery (NPD) Team are squeezing more and more Bus Priority out of the existing technology and infrastructure. However, NPD do more for buses than just Bus Priority at traffic signals. This paper details the Bus RARR (Route Analysis Recommendation Report) programme – what it is, what we do and what benefits it brings.

## The Bus RARR programme – a brief history

*“A RARR is a total route analysis, considering performance data, system data and on-street observations. The aim is to resolve faults and make system changes to give instant operational benefits, and to identify schemes to deliver longer term benefits”.*

The Bus RARR programme was established in 2016/17, primarily as a means of using NPD's network knowledge to identify low cost / high impact schemes on the bus network to improve bus journey times. This was in response to worsening bus journey times resulting from numerous transformational road safety and cycling schemes. NPD Network Managers in Area Teams would review an assigned route and propose schemes where relevant to support this metric.

In 2018/19, the Network Performance Specialist Team took ownership of the Bus RARR programme. Following feedback from TfL Buses, its purpose was redefined, adjusting the emphasis from purely scheme generation to have a wider scope - to include more instant operational benefits.

The programme was modified to focus on one bus route per period (13 total in a financial year), with a period of engagement, action, and benefit reporting. Further detail on this will be covered later in this paper.

## Defining the programme – how are routes chosen each year?

With over 700 routes, 8 Bus Operators and a wealth of data, there's lots to consider when formulating a programme of routes to focus on.

Initially, the RARR programme was purely data led, focussing on routes where journey times had slowed versus previous years. However, some of the most impacted routes identified were not frequent or high patronage services, and as a result our improvements were not necessarily targeting the largest group of bus customers.

The data set used to select routes was then expanded to include bus patronage data – the intended impact being to elevate busier routes in the selection process so that more passengers would see benefits.

Using patronage data did have the desired affect and this was a key metric in defining the programme for two years. However, as many busy bus routes are in Central London, after two years of focussing on that area there was limited scope to deliver more benefits. This is due to the nature of the bus network and the fact that in Central London many routes overlap\*.

\*It should be noted that when undertaking a RARR, benefits delivered for one route often benefit other buses intersecting with that route also.

As a purely data led approach, whilst assisting focus, does not account for all factors, the RARR programme is now defined using the criteria shown in Table 1, and then a further review is applied.

Table 1 – Criteria & weighting of data to create a weighted average metric for RARR prioritisation

Input	Weighting
Speed change (mph)	3
Average speed (mph)	2
Excess Wait Time	1
Passenger journeys	1
Change in passenger journeys	2
Operated km/period	1

Once routes are ranked using the relative weighting above, further analysis is undertaken.

- Only the top 100 routes are initially considered for inclusion.
- Routes with fewer than 40 sets of signals on the line of route are excluded.
- Routes reviewed as part of any RARR programme since 2018-19 FY are excluded.
- Routes where over 40% of signals have been subject to a RARR since 2018-19 FY are excluded.
- Routes with fewer than 40 sets of signals are excluded.
- Routes where over 25% of signals were reviewed on last year's (2022-23 FY) Timing Review Programme are excluded.
- Routes where over 25% of signals are forecast to be reviewed on this year's (2023-24 FY) Timing Review Programme are excluded.



For this year’s programme this led to a final shortlist of 33 routes. These were then manually reviewed to ensure they were suitable (i.e., of a suitable length, with potential opportunities available, and minimal overlap between routes).

Using GIS mapping, a final visual check is then performed to ensure an even geographical spread (to include all areas of London), and a fair allocation between Bus Operators.

## The 2023/24 RARR programme

Following the application of the methodology described above, the 2023/24 RARR programme was formulated. This is illustrated in Figure 1 and shown in Table 2.

Figure 1 – 2023/24 RARR programme

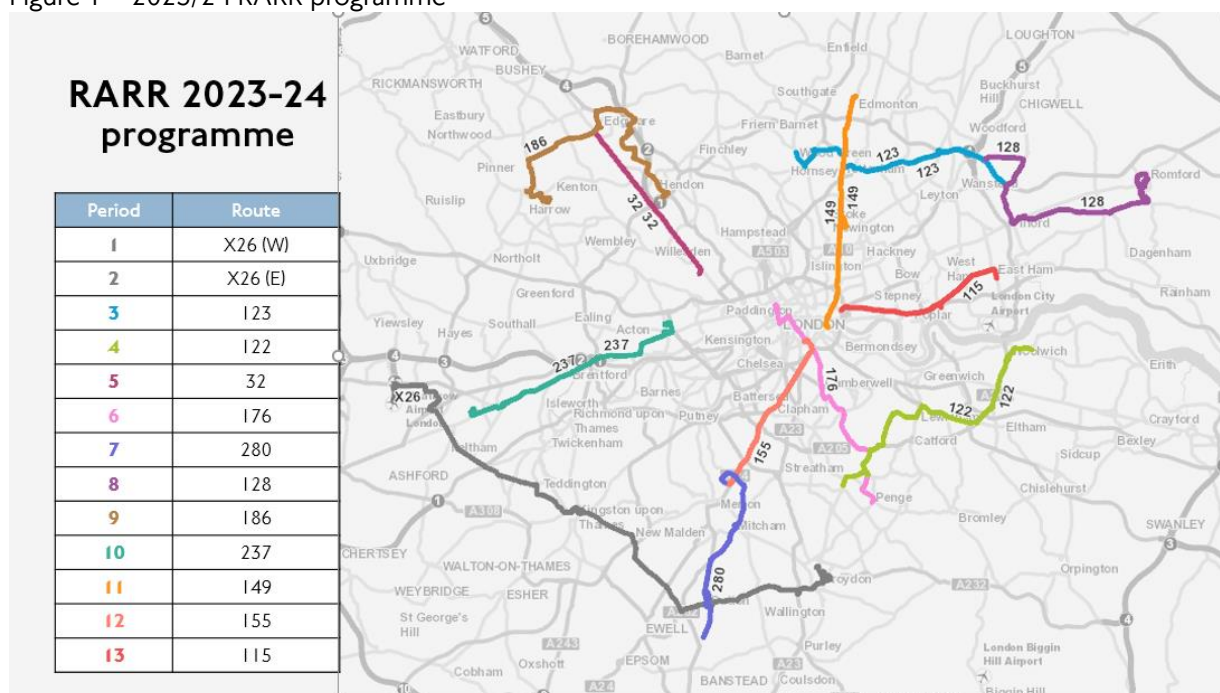
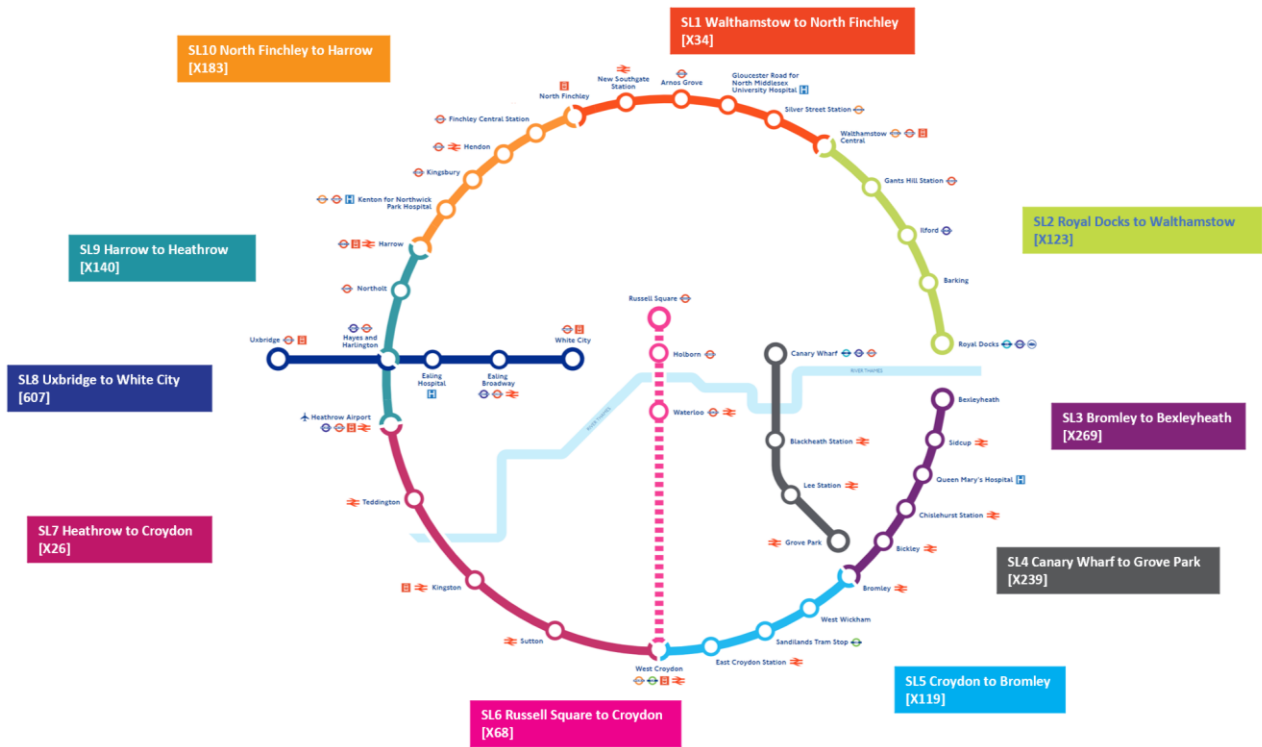


Table 2 – 2023/24 RARR programme

Period	Route	From-To	Operator
1	X26 (W)	Kingston Town Centre to Heathrow Airport Central	Go-Ahead
2	X26 (E)	West Croydon to Kingston Town Centre	---
3	123	Ilford, Hainault Street to Wood Green	Arriva
4	122	Crystal Palace to Plumstead Bus Garage	Stagecoach
5	32	Edgware Station to Kilburn Park	Metroline
6	176	Penge to Tottenham Court Road	Go-Ahead
7	280	Tooting, St George's Hospital to Belmont	Go-Ahead
8	128	Claybury Broadway to Romford Station	Stagecoach
9	186	Brent Cross to Northwick Park Hospital	Metroline
10	237	Hounslow Heath to White City	Metroline
11	149	Edmonton Green to London Bridge	Arriva
12	155	Elephant & Castle to Tooting, St George's Hospital	Go-Ahead
13	115	Aldgate to East Ham, Central Park	Go-Ahead

At the time of writing, this year's programme is undergoing a revision due to the launch of the new bus "Superloop" network. Superloop is a mayoral priority with an objective to form a circular arrangement of express bus services in outer London (see Figure 2). The X26 (the RARR for Periods 1 & 2) lies on the Superloop and the remaining Superloop routes will be incorporated onto this year's programme (with some routes originally selected being deferred to the next financial year). Precise changes are yet to be finalised.

Figure 2 – Superloop express bus routes



## The Bus RARR Process

Each Bus RARR follows a process of start-up, implementation and close out. The following sections provide detail as to what is covered in each step.

### Start-up

A period of investigation, engagement and fact finding. The assigned Network Performance Specialist (NPS) will undertake the following tasks during start-up.

- **Bus Operator engagement** – open a dialogue and meet with the Bus Operator. This is to understand how the route performs from a Bus Operator perspective. This is a chance to learn detailed intelligence about pinch points, delays and other operational issues.
- **NPD Area Team engagement** – open a dialogue and meet with the relevant NPD Area Team. The NPD Area Team has good overall local network knowledge, being aware of key pinch points and delays, upcoming traffic schemes and programmed timing reviews.
- **Bus Priority Configuration data** – a review of Bus Priority (BP) configurations to ensure that all junctions the route passes through with BP are correctly configured (it is these configurations which allow us to “see” the bus and grant BP at traffic signals).
- **UTC System data** – a review of the UTC system data for junctions along the route, primarily BP focussed, to identify potential locations which would benefit from a BP optimisation Timing Review.
- **iBus Performance data** – a review of actual iBus journey time data to identify key areas of delay and slow running.
- **Route walk** – undertaking an end-to-end bus journey (to be the customer and get a “feel” for the route), and then walking the route in the reverse direction. The route walk is a key activity in the RARR process and will be explored further below.

### The Route Walk

During the route walk, everything and anything is considered to help improve the bus route. Route walks are an opportunity to identify issues and actions, and further explore delays / issues raised by Operators, Area Teams or iBus data.

Observations are noted and issues / actions are primarily sorted into one of four categories.

I – **Faults with signal equipment** – issues encountered include faulty detection (e.g., detectors registering permanent demand or pedestrian cancel detectors failing to cancel), misaligned detection (e.g., detectors unnecessarily demanding a signal stage) and faulty signal equipment (e.g., red lamp faults). Examples of signal equipment checked on a RARR walk are shown in Figure 3.

Figure 3 – Examples of signal equipment checked on a RARR walk – SCOOT detection, MVDs, IRDs, Pedestrian Cancel Detection, and faulty / damaged aspects.



2 – **Enforcement** – issues encountered include parking & loading violations, bus lane use by non-permitted vehicles, undertaking banned turns, cross junction blocking. Examples of enforcement issues are shown in Figure 4.

Figure 4 – examples of enforcement issues identified on a RARR walk – illegal parking / loading, banned turns and non-permitted bus lane use



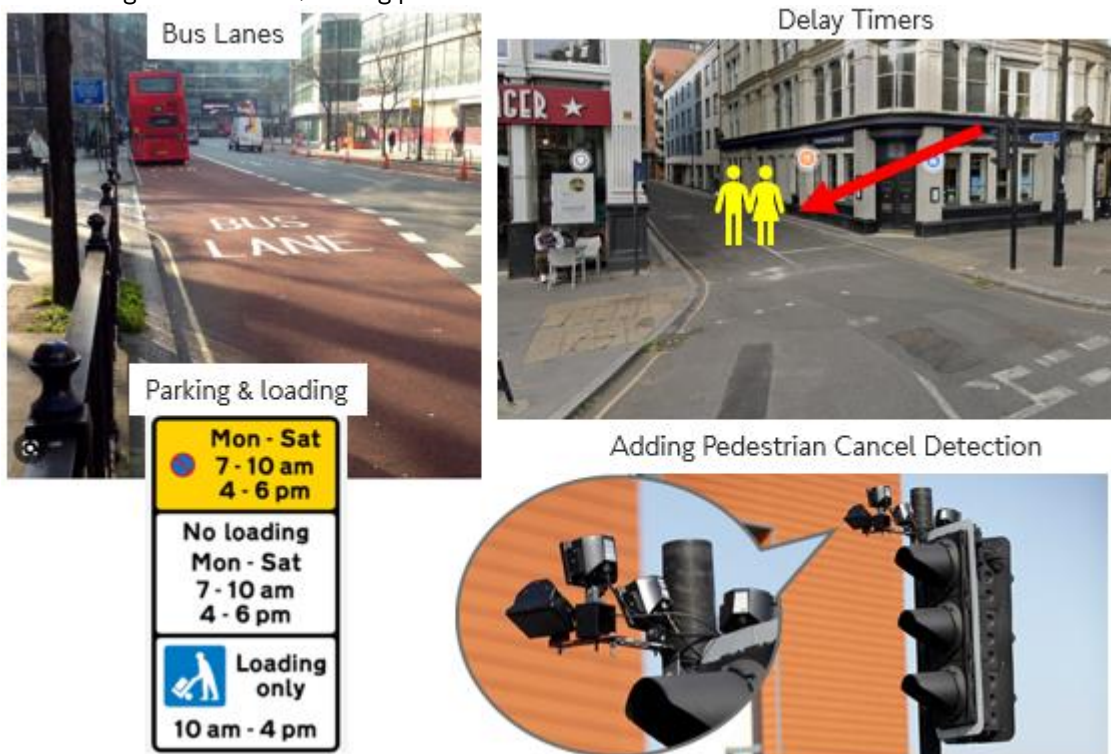


3 – **Scheme identification** – this includes both;

- Highways schemes (e.g., lining & signing, amending bus lane hours, proposing new bus lanes, geometry changes) and,
- Signal schemes (e.g., pedestrian cancel detection, adding stage demand dependency, method of control efficiencies).

Examples of schemes identified to help bus journeys are shown in Figure 5.

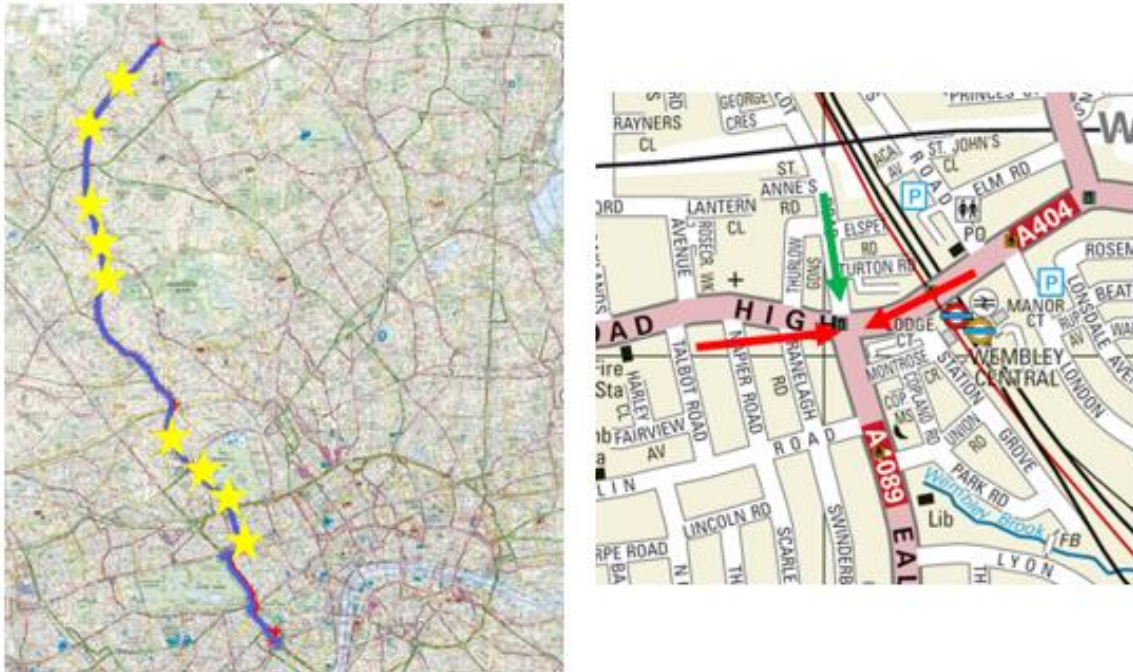
Figure 5 – Examples of schemes identified – bus lane introduction / increased hours, delay timers, parking and loading amendments, adding pedestrian cancel detection



4 – **Timing Review identification** – in conjunction with UTC system data, if junctions are observed to not be operating efficiently, a timing review can be raised and added to our Timing Review Programme. Figure 6 illustrates locations of Timing Reviews identified along the RARR for Bus Route 13, and short right of way noted on two approaches to a junction in Wembley Central.



Figure 6 – Locations of BP optimisation reviews on Route 13, and short right of way identified at a junction in Wembley Central.



These issues / actions are entered into a RARR action log and progressed appropriately. Most route walks generate between 75-100 entries in a typical RARR Action Log, an example of which can be seen Figure 7.

Figure 7 – RARR action log template for capturing observations and issues to pursue

102 RARR   Actions							
Network Limitations:							
LTNs in Haringey (Alexandra Park Road/Durnsford Road) seen to cause delays to buses; area teams are currently conducting timing reviews at Edmonton Green and Great Cambridge Circus							
Recommendations:							
Reference	Type	Key Action Area	Bucket	Recommendation	Progress	RARR Comments	MB Comments
Brent Cross bus station	Infrastructure recommendation	Brent Cross & Golders Green	Scheme identification	Exit of bus station is currently give-way to traffic on Prince Charles Drive; consider redesigning such that Prince Charles Drive is give-way to buses exiting the station instead	Dropped	Entered into Schemes tracker s/s; dropped due to upcoming redesign of bus station	
Claremont Road Stops V & W	Infrastructure recommendation	Brent Cross & Golders Green	Scheme identification	Repair poor road surface by stops V & W on Claremont Road	With area team	Entered into Schemes tracker s/s; NW to liaise with Brent Cross South project due to several linked developments around Claremont Road area	
30/183	Network Performance recommendation	Brent Cross & Golders Green	Quick wins / other	Ped crossing appears to be switched off - query in SFM	Complete	Various safety-related faults in SFM - now resolved	
30/183	Network Performance recommendation	Brent Cross & Golders Green	Quick wins / other	Check status of BP at site (pending outcome of previous 30/183 entry)	Complete	Site has iBus unit and VDPs; can be recommended for removal; requires cross-ref against BPEPP. Site operates on local control so VA BP only.  As per Dave Howard e-mail 30/183 equipment has been removed and repurposed as part of BPEPP	
Cleveland Gardens	Network Performance recommendation	Brent Cross & Golders Green	Scheme identification	Parking by stop P seen to cause issues for eastbound/westbound buses; investigate options for increased enforcement and/or parking restrictions	Complete	Entered into Schemes tracker s/s; approved by area team	

## **Implementation**

Once start up is complete, the assigned NPS will proceed to action the items noted from the route walk.

1. Faults are raised to maintenance contractors to resolve via our Fault Management System.
2. Enforcement issues are raised to TfL's Compliance, Policing, Operations and Security (CPOS) Team.
3. Scheme proposals are investigated and if deemed pursuable are passed to TfL Engineering to design and deliver.
4. BP Optimisation Timing Reviews are added to the departmental Timing Review programme and scheduled for completion during the RARR action period.

Resolving faults and improved enforcement brings immediate benefits to bus operations. Timing Reviews also give immediate benefits once completed, primarily through improved BP. More medium- and longer-term benefits are delivered once schemes are implemented (timescale dependent upon scheme complexity).

As actions are completed, the action log is updated to capture progress. At the end of the implementation phase (typically between 12-16 weeks in length), the action log is reviewed and signed off as complete.

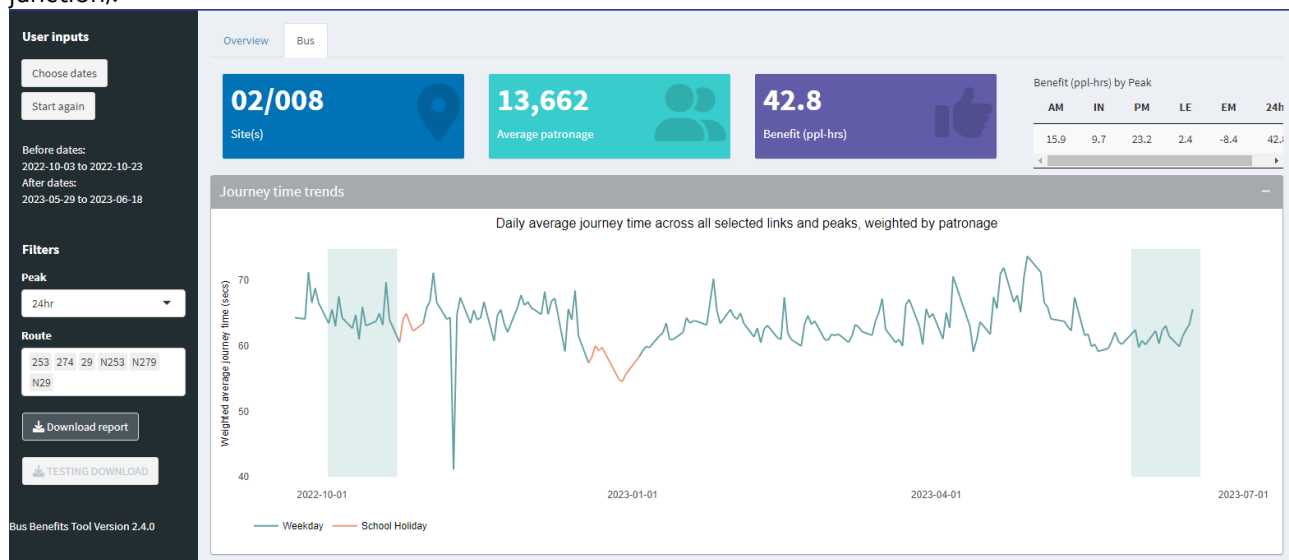
## **Close out – benefit measurement**

Once the action phase of the RARR is complete, attention is turned to benefit measurement and reporting.

To measure the benefit of the RARR, the locations of key implemented actions / changes are identified. This could be where a notable fault has been resolved (e.g., permanent demand for a quiet road fixed), or where a BP Optimisation Timing Review has occurred.

Using our Timing Review Benefits Database, iBus journey time data from before and after the action is analysed to quantify the benefit to bus services at that location. An example of an output from this database is shown in Figure 8. Data is extracted for the specific route focussed upon during the RARR, however, as previously mentioned, other bus services passing through that location are likely to have also benefited.

Figure 8 – Output from Timing Review Benefits database for BP Optimisation Review undertaken as part of the Route 29 RARR. 42.8 people hours / day of benefit were recorded (across all routes passing through the junction).

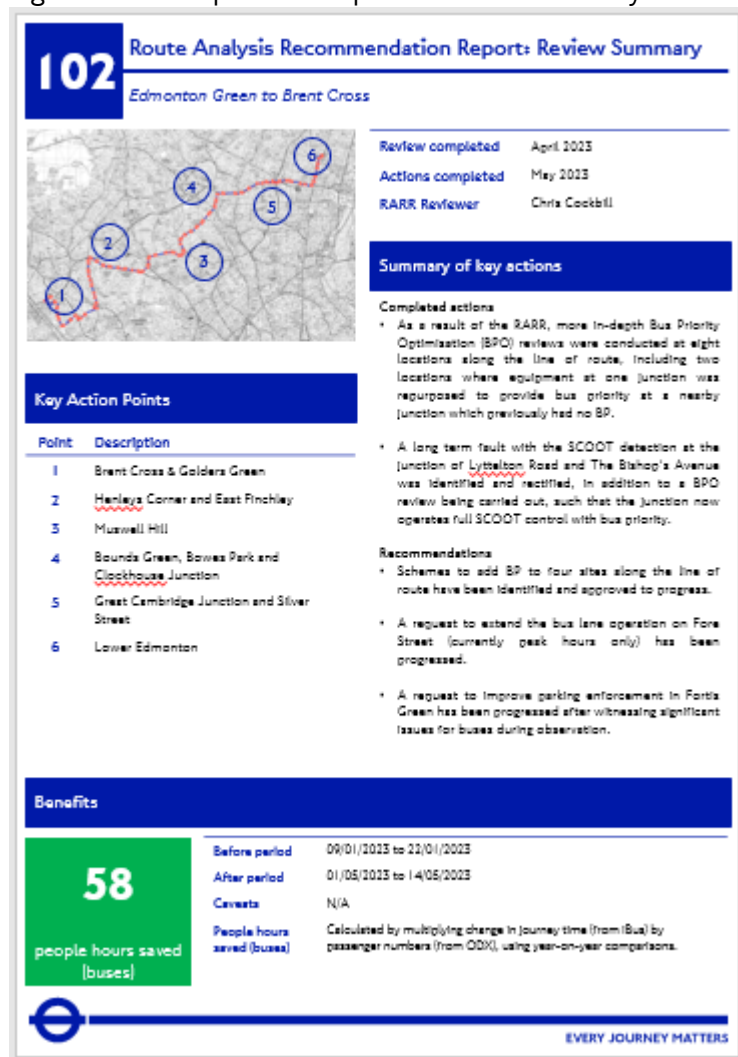


For each location, benefits are measured using the “people hours saved” metric, can be calculated by multiplying the passenger numbers by the time saved. Benefits at each location are then aggregated to calculate the measured benefit across the entire route.

It should be noted that proposed schemes are not included in the RARR benefit measurement process as the RARR “Close Out” typically occurs before a scheme is delivered (which can take upwards of 9 months).

For reporting, a RARR Summary Document is completed, highlighting the key actions / outcomes and details of proposed schemes. The measured benefit figure is also included. This Summary Document is then shared with the Route Operator, and at the monthly Bus Operator Engagement Meeting (BOEM), a meeting hosted by TfL where all Operators are present. It is also shared with the NPD Area Team to make them aware of actions undertaken within their areas. An example of a completed RARR Summary Document is shown in Figure 9.

Figure 9 – Example of completed RARR Summary Document for Bus Route 102



## 2022/23 RARR Programme – some highlights

For the 13 routes reviewed in the 2022/23 RARR programme, some notable highlights are given below.

- Over **133** miles of the network were walked and considered in detail – an average route walk is over 10 miles
- In total, **119** schemes were identified and proposed
- In total, **78** faults were identified, reported and resolved
- In total, **77** BP Optimisation Reviews were identified, programmed and completed, reporting on average over **25hrs** people benefit per junction (all routes)
- The average benefit of a RARR was **96.16** people hours / day



Further details of the 2022/23 RARR programme, for each route, is show below in Table 3.

Table 3 – 2022/23 RARR programme & outcomes

Period	Route	From	To	Operator	Area teams	Faults resolved	Schemes Proposed	BP Optimisation Reviews completed	Benefit (ppl hrs)
1	21	Lewisham	Newington Green	Go-Ahead	Centre + South	11	11	5	112.6
2	136	Grove Park	Elephant & Castle	Stagecoach	South	12	12	4	74
3	109	Brixton	Croydon	Abellio	South	7	7	6	226
4	140	Harrow Weald	Hayes & Harlington	<u>Metroline</u>	North West	9	9	6	41
5	41	Archway	Tottenham Hale	Arriva	North East	7	7	2	160
6	65	Kingston	Ealing Broadway	RATP	North West	4	4	7	56.3
7	158	Stratford	Chingford Mount	Arriva	North East	7	7	5	12
8	13	Victoria	North Finchley Bus station	London Transit	Centre + North West	8	8	12	210.6
9	182	Hatch End	Brent Cross	<u>Metroline</u>	North West	4	4	9	79.5
10	97	Stratford City	Chingford Station	Stagecoach	North East	11	11	3	53
11	43	London Bridge	Friern Barnet	<u>Metroline</u>	Centre + North East	10	10	6	44
12	102	Brent Cross	Edmonton Green	Arriva	North West + North East	9	9	8	58
13	29	Charing Cross	Wood Green	Arriva	Centre + NW + NE	20	20	4	123.1

## Acknowledgements

I would like to acknowledge the work of the NPD Specialist Team (listed below), each of whom either undertake a RARR or provide essential support to deliver the programme.

A special mention to Christopher Cockbill who, with input from buses, develops the programme and cross checks numerous data sources to ensure a balanced set of routes are considered each year. And, to Christopher Blucke who manages the funding allocation, scheme coordination and various stakeholder engagement elements of the programme.

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