Transport for London
London Buses

Technical Services Group

Detection and Presentation of Bus Network Delays

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LONDON BUS SERVICES LIMITED
TECHNICAL SERVICES GROUP

DETECTION AND PRESENTATION OF BUS NETWORK DELAYS

CONTENTS

REFERENCES

1 Performance Systems - Feasibility Study Process Definitions - Performance Management. Issue 1.0, 26 March 2008.

DETECTION AND PRESENTATION OF BUS NETWORK DELAYS

1 Introduction

One of the greatest problems affecting the operation of any bus service network, and particularly a ‘greater city’ network of the size and complexity of London’s, is disruption to services caused by traffic delays.

The causes of these delays are almost entirely outside the control of the operator, yet are probably the greatest single factor contributing to any negative view of the operation by the travelling public. The complaint that you wait half-an-hour for a bus and then three arrive together is an old cliché, but none the less true for being so; it carries an implication of blame for the operator, yet irregularities such as this are usually caused by traffic delay of one sort or another.

Many London routes are intensively operated with headways of only a few minutes, so even a minor delay along a section of route can have a noticeable effect on the perceived regularity of the service.

London Buses’ ‘iBus’ Automatic Vehicle Location system tracks the progress of every bus on every route in real time; the purpose of this document is to investigate ways in which that information may be used to flag developing instances of undue delay and allow mitigating measures to be more effectively and efficiently deployed.

2 Objectives

The ‘iBus’ AVL system plots each bus’s location on a graphical display and compares its progress with the schedule to give operators’ service controllers an live visual indication of the state of the service on each route they control, and a powerful aid to managing that service.

This is currently done individually for each route in isolation.

Collection and correlation of data for general traffic delays affecting wider areas and the recording of network delays is carried out by CentreComm using largely manual procedures and dependent on the gathering of information from a variety of sources. It has been recognised that there may be a strong business case for aggregating the same iBus data as is currently used for individual route service control to give a global and comprehensive picture of traffic delays across the London road network as a whole (at least, those parts of it served by bus routes) and to provide an accurate and immediate assessment of network delays in real time. This will enable CentreComm to achieve a more proactive and timely response for dealing with delays than is possible with the current manual procedures, leading to possible improvements in the efficiency of fleet deployment.

It is a stated aim to reduce or phase out the manual gathering and recording of such data in the medium term.

This is not to say that there should be total reliance on an automated system, a principal reason for this being that although iBus may be able to furnish information on delay times, it has no intrinsic knowledge of the reason for such delay. This information will still need to be gathered from traditional sources, but taken as ‘supporting data’ together with the raw real-time data which iBus can provide, should enable a much more comprehensive analysis to be realised.

As well as simply providing information on delays, there is an important potential benefit in using the knowledge gained to improve the quality of information given to passengers, and intending passengers, particularly via the iBus on-bus signs and the ‘Countdown’ system.

This document aims to explore those concepts.

3 Current Practice

3.1 The SDIX Report

Information concerning severe traffic delays is currently recorded by CentreComm in a daily Excel spreadsheet known as the SDIX (**S**ervice **D**isruption **I**nformation E**X**change) report.

The report records the date, time, location of each incident together with brief details, a brief statement of the likely effect on the service, and the clearance time. If a diversion was necessary the reference is noted.

Other sheets record reported traffic incidents and traffic signal faults affecting bus operations. The compilation of this information is done manually, and is based largely on information supplied by bus operators. Examples of the reports are given in Appendix 1.

The original purpose of the SDIX report was to assist CentreComm staff in quickly taking steps to deal with delays as soon as they became aware, as a general aid to service control. Due however to the inherent and variable time-lag between a delaying event occurring and the report reaching CentreComm, perhaps when the event is already well established, or even cleared, any effort to take remedial action can be tardy or at worst, pointless.

The main function of SDIX now seems to be to provide a channel for operators to submit supporting evidence for their claims for dispensation for lost mileage arising from traffic delay, a slightly ludicrous situation when such claims are being correlated against information supplied by the operators themselves! Such a system is wholly reactive and open to abuse: there is an obvious temptation to exaggerate the effects of traffic delays in order to mask other shortfalls in service quality. It is also extremely labour-intensive and requires the full-time attention of up to five CentreComm operators, especially if contested exemptions need to be checked against other available sources of information such as iBus data, police reports or CCTV footage.

A sample analysis of SDIX data is given in Appendix 2: the information recorded in a typical SDIX report is correlated and checked against data from the iBus log files. As can be seen, most of the reported delays are not substantiated by the iBus data.

For these reasons the SDIX report has become largely unsuitable for the purpose for which is was originally created, and there is thus a desire to bring an element of automation into this area using the data available within the iBus system to proactively produce network delay indications in real time and reduce or eliminate the need for manual recording based on operators' reports and other sources.

It is the intended aim to phase out the daily SDIX report.

3.2 Passenger Information

There are several methods of disseminating information to passengers concerning disruptions or alterations to the service; currently these all require the information to be manually produced and distributed to the affected locations by the most appropriate media, according to the amount of notice available.

(a) Printed Information

For planned alterations which may be in place for a significant length of time, such as longer-term diversions, closures of stops, etc. printed publicity material can be posted at bus stops, and to a lesser extent in vehicles. This is expensive and is only done if necessary; there also appears to be a lack of clarity on the processes for commissioning and displaying printed material.

(b) On-bus Signs

The iBus On-bus Signs and public address facility can be used to display and announce ad-hoc messages generated by Centrecomm; however it seems that this facility is currently unavailable pending an upgrade to iBus software.

On-bus signs are currently blanked if a bus goes off-route; thus during a diversion they show no information at all.

(c) Countdown Signs

Information can be displayed on Countdown signs using bottom-line flexible messages, and this facility is used to a limited extent to inform intending passengers of diversions and certain other service-affecting incidents.

Such information is obviously available only at stops with signs (about 1,800 out of a total of 18,000+, or no more than than 10%), and due to the nature of the display (a single line of scrolling text) is useful only for brief messages which can be read and understood easily.

There is currently no facility in the Countdown system to indicate that a particular predicted arrival is delayed, other than the fact that the displayed time to arrival is held at the current value if the bus is not progressing as expected. If the predicted time to arrival increases beyond 20 minutes, the bus is removed from the display.

Countdown can only advise intending passengers downstream of a delay of the predicted arrival time of buses. It cannot advise those waiting upstream of likely increases to journey times.

(d) On Bus Announcements

Drivers can initiate audio announcements from a library of pre-recorded announcements provided by iBus, or make 'live' announcements, via the public address system.

It is apparent that use of these facilities is inconsistent, and of variable quality; these issues are being addressed in training.

(e) The Press

Press publicity is used in a similar way to printed material, mainly via the London free papers which carry a regular column for public transport matters. Although its usefulness is slightly more immediate, it cannot be used for real-time information due to the obvious lag between generation and publication.

(f) Web and Email

Facilities exist to allow Oyster users to be emailed with details of delays and diversions, which can either provide the information directly or via a link to a website.

(g) Countdown II

The forthcoming Countdown II system and associated standard signs will have a similar flexible messaging capability to the existing Countdown signs, which is likely to be used in a similar manner. However there will be extended facilities which will improve the ability to broadcast information:

- special messages on signs using the full matrix;
- access to information via text messaging to mobile phones;
- access to information via web pages;
- provision for alternative signs of designs better suited to information display.

4 Reasons for Delay

Detailed analysis of reasons for traffic delay across a road network as complex and busy as London's is almost impossible due the organically amorphous nature of the beast; it is probably a good candidate for the application of chaos theory.

As far as the bus service is concerned, the important thing is not so much the reason for the delay, but which routes will be affected, to what extent, at what times of day or days of the week, for how long, and what if anything can be done to mitigate it to the best advantage.

This exercise is not concerned with delays affecting individual buses as the result of accidents, mechanical breakdowns, passenger incidents, etc., unless such incidents cause wider traffic delay.

Broadly speaking, delays can be categorised as planned or unplanned.

4.1 Planned Delays

Planned delays are those for which time, duration, location and likely effect are known in advance, for instance:

Scheduled roadworks;
Street closures;
Major public events.

If the cause of delay is going to be present for an appreciable length of time, special schedules can be applied to account for it, implemented by a temporary service change. This will apply particularly if a diversion is required - see also 4.3 below – but may also apply if temporary traffic control, e.g. alternate single lanes, is in use.

Public events may be one-off, such as the 2012 London Olympics, or regularly recurring, such as Wimbledon, the Cup Final, London Marathon, Notting Hill Carnival, etc.. Such events often warrant their own special services in addition to any changes required to normal services.

Delays caused by congestion due to sheer weight of traffic can often be considered as 'planned' because they happen regularly at the same times of day and days of the week; this is accounted for in the normal scheduling process.

4.2 Unplanned Delays

Unplanned delays include all those occurring without due notice, for a variety of reasons, for instance:

Emergency roadworks;

Road traffic accidents;
Breakdowns and other temporary obstructions;
Police incidents;
Other emergencies - fire, security alert, etc.;
Traffic signal faults.

These must be dealt with ad-hoc as they occur, and may or may not involve such measures as diversion, curtailment or route splitting.

4.3 Diversions

Diversions are necessary when buses cannot, for whatever reason, follow their normal line of route. They may be planned, medium- to long-term, due to planned roadworks, or unplanned and ad-hoc as the result of traffic incidents. They may affect one direction of travel only, or both directions, and the diversion may be different for each direction.

If a situation requires a diversion from normal line of route, this can be scheduled in by a service change if required. Likewise, any special information pertaining such as stops not served, alternative stops, etc., can be dealt with.

Normally, if an event requiring a diversion is likely to last for twelve weeks or more, this will trigger a service change to be implemented in the Busnet system. This will include any stops not served, and additional stops served. A service change will only be made if warranted, that is If any additional running time cannot be absorbed within the normal scheduled slack. Events lasting less that twelve weeks may be included if they require a long diversion that will add sufficient running time to warrant a service change.

Ideally, twelve weeks' lead time is required to set up such changes, but in an emergency this can be reduced especially if no schedule change is required and the only change is to Busnet.

The procedures for implementing and removing temporary service service changes are described in Ref 1; Service Change Types 19 and 20 as defined in Section 3.1 of that document apply.

4.5 Sources of Information

Information about planned and unplanned delays can come from various sources:

(a) The SDIX report mentioned in 3.1 above;

(b) TfL Streets – roadworks and other matters relating to the street network;

(c) Police – information relating to public events, traffic and other incidents, emergencies, etc.;

(d) IRIS – **I**ncident **R**ecording **I**nformation **S**ystem – information relating to health and safety incidents;

(e) CCTV

(f) Information received directly from bus drivers at the scene via voice radio.

5 Current iBus Function

The iBus database contains the schedule for all routes. It therefore knows the scheduled travel times between and through a defined set of fixed timing points on each route, and can compare these with the actual travel times recorded as each bus travels along the route. It can therefore identify easily any sections of a route where the actual travel times are at variance with expected.

There is also a learning algorithm such that the progress of each bus is not considered in isolation but is compared with the progress of preceding buses passing through the same section of a route. The expected travel time for any section of route is therefore not based simply on the schedule, but constantly modified according to prevailing conditions at any time.

Thus as a service pattern progresses through the day, iBus builds up a dynamic picture of the actual conditions in real time, and displays information relating to each bus's progress relative to the schedule in real time either on a strip map of the route, or on a zoomable streetmap. This information is available to service controllers to help them manage the service.

The data is also logged for later analysis.

6 What is needed?

At the moment, the information described above is produced independently for each route. What is needed is a means of correlating the information for all buses on all routes to produce a global picture of sections of the network where particular delays are occurring.

Taking a step back, however, the main purpose of the current algorithm is to produce predictions of arrival times for buses at stops along the route, rather than indications of delay at specific points or through particular corridors. Thus delays, rather than being specifically indicated other than for individual buses, are incorporated into a more complex calculation. Also, this information is calculated separately for each route and no attempt is made to correlate information between all routes and buses serving a given location or corridor.

It is therefore apparent that what is needed in this instance is a separate algorithm purely focused on indicating sections of the network where actual travel times are in excess of scheduled travel times. This is potentially a much simpler task than producing arrival predictions as all that is necessary is a running comparison of actual transit times with known expected or scheduled values. This should be done on a per-bus basis, not a per-route basis, to build up an overall picture of delays at any location.

7 Brief Statement of Requirements

The overall purpose of these Requirements is to specify functions which will allow the use of iBus data to indicate instances of delay across the London bus network.

They are given in overview only, as it is not the intended purpose of this document to present detailed functional requirements.

The requirements are:

- to identify locations subject to delays of *t* minutes or more in real time;
- to identify corridors subject to cumulative delays of *t* minutes or more in real time;
- to identify the routes and directions of travel affected by the delays indicated;
- to identify routes and/or corridors subject to cumulative delays of *t* minutes or more over the progress of a full trip in either direction in real time;
- to present the information in tabular form in real time, sortable on a selection of keys;
- to present the information graphically in real time;
- to present information for an individual route if required;
- to manually annotate the information with reasons for delay, references, etc.;
- to provide a means of classifying standard delay scenarios into a range of predefined categories for ease of reference and reporting;
- the ability to selectively ignore particular delay situations where the cause is known and acknowledged;
- to log this information in an archive form suitable for later review for QSI correlation purposes;
- to record the real time development and easing of delays in a form that can be replayed graphically in configurable time steps;
- to record remedial actions taken for future reference in recurring similar situations.

The value *t* above should be configurable; 20 minutes is the delay threshold required by CentreComm. A possible refinement is to be able to specify several

levels of alert such that a developing delay situation can be identified and possibly dealt with before reaching the configured threshold.

There is currently a change request (PCP300) to iBus functionality in progress to allow Service Controllers to record cause details for lost mileage at the point of requesting a curtailment or cancellation. A similar function is proposed for recording causes for delays which may be able to be wholly or partially integrated with this change.

8 Overview of Algorithm

- Receive a data supply consisting of the scheduled travel times for all times of day and day types for all links in the bus network, the starting and ending locations for each link, the geographical locations of links and the routes for which each link is a constituent part. Other data will probably be required;

- The data should be available from iBus: it is not envisaged that any other data would be required

- Monitor the link travel times of all buses against the scheduled travel times pertaining;

- Record all instances where the difference is greater than x, y, z minutes, where x, y and z are configurable delay thresholds;

- Against each link, monitor the build up of delays by identifying when more than a configurable percentage of transits through the link are subject to delay;

- Ignore one-off instances such as might be due to an incident affecting an individual bus, where other transits through the same link are not delayed;

- Where delays are seen to be building up, compare monitored links with adjacent links in the network; where delays are occurring they are unlikely to be confined to one link as the effect will steadily spread upstream;

- Where delays are seen to be affecting groups of links, identify these with supporting information indicating the build up of delay over time, the route(s) involved, and the direction(s) of travel affected;

- As delay situations develop, present this information in a tabular form available to an operator to view;

- Similarly, detect and indicate when an existing delay situation eases and link travel times return progressively to normal;

- Present the information as indications on a zoomable geographical map;

- Present information for an individual route, including cumulative delay resulting from several separate instances of delay;

- Log information in a format that can be analysed for use in QSI correlation;

- Log information in a format that can be used to replay the delay build-up and easement for the whole network or any part of it.

9 Presentation of Information

Figures 1 and 2 show suggested ways of presenting the delay information graphically on a geographical map.

The location of a delay is shown as a red circle in the general location, with a figure indicating the average number of minutes delay.

Clicking on the circle opens a pop-up window containing further details, and including a ‘Comments’ pane for the operator to manually enter any supporting information. Clicking on one of the affected routes opens a new window with a strip map indicating delays for that route.

Optionally this can include a ‘Severity History’ which indicates the progressive build-up and easement of delay according to the configured thresholds.

Zooming the map will show specific locations more accurately.

Figure 3 shows delay information presented for an individual route in strip-map form.

Clicking on a section of the route opens a pop-up window containing further details, and including a ‘Comments’ pane for the operator to manually enter any supporting information.

In order to indicate cumulative delay more effectively, different colours can be used to indicate the passing of thresholds; the cumulative delay is also indicated in the pop-up window.

10 Better Information to Passengers

There is considerable scope for using the iBus and Countdown passenger information elements to provide more comprehensive and more timely information on delays, to waiting passengers both upstream and downstream of a delay, and to those already on the bus. The generated information on delays could be used to generate standardised messages for use by on-bus signs and Countdown.

Due to the limited format of current Countdown signs, they are probably not the ideal medium to do this, as their primary function is to display arrival predictions. Attempting to interleave this with other service information may be confusing and counter-productive, especially at busy stops served by several routes. The introduction of Web and SMS services with Countdown II is likely to provide a better medium as the format is less constrained, information can be targeted with more discrimination, and there are opportunities for menu-driven options.

There may be merit in considering some simple options for Countdown signs, such as indicating when a particular arrival is delayed by more than a threshold amount, rather that just holding the time to arrival steady, and giving a better indication of changes such as curtailments and cancellations. Currently curtailed and cancelled predictions change without warning, or simply disappear.

11 Benefits

The potential benefits gained are:

(a) A better understanding of the incidence of delays in real time;

(b) Less reliance on manual collection and correlation of data;

(c) Less reliance on operators' information of delays;

(d) Less reliance on operators' own assessments of the correlation of delays to lost mileage claims;

(e) A better ability to inform the travelling public;

(f) More timely information allowing service controllers to act more quickly to optimise the service.

(g) The information may be useful to organisations outside TfL, e.g. Police, Motoring organisations, Media.

(h) A better holistic understanding of the behaviour of the bus network as as organic entity, and of the actual service performance on routes, leading to more efficient scheduling.

(i) More productive use of vehicles and drivers, leading to fewer such resources being needed to provide a given level of service.

(j) Availability of information for general traffic control, with mutual benefits for all road users.

(k) The ability to contact bus drivers at the scene of a developing incident as the 'eyes and ears' to provide truly up to the minute information.

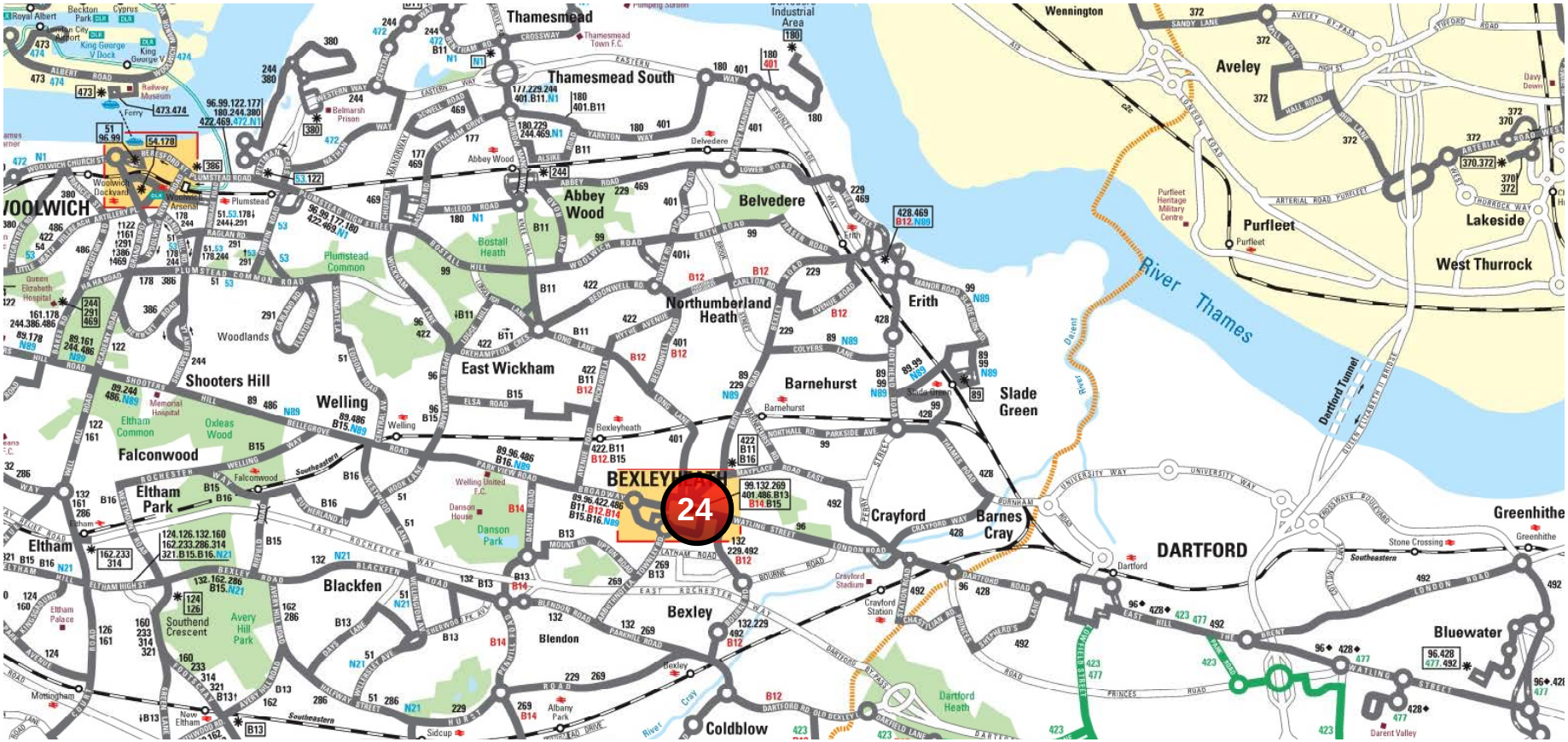

Figure 1
Presentation of network map showing possible means of indicating a delay ‘hotspot’, with indication of minutes.
At this scale, the general area is indicated.

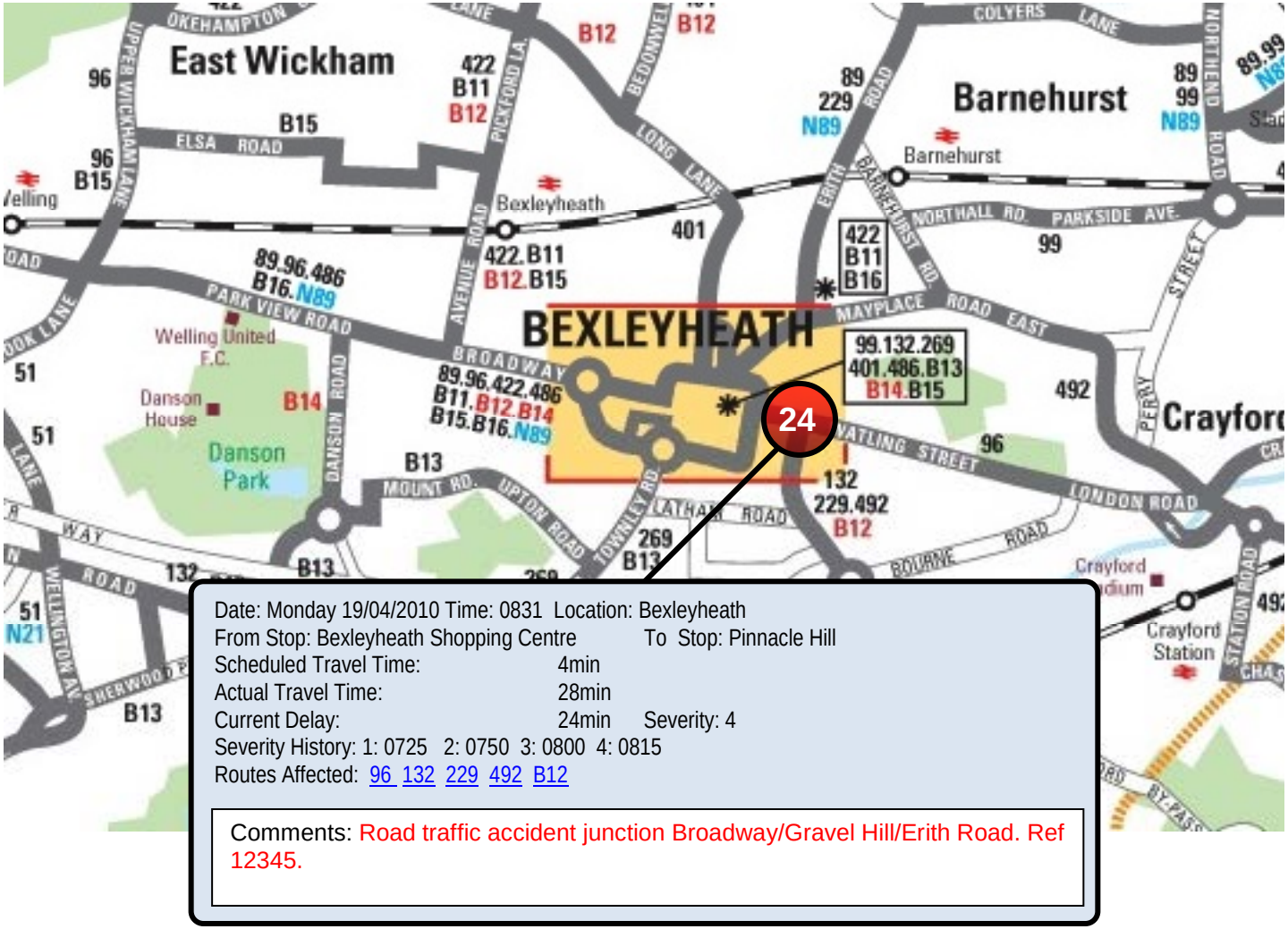

Figure 2
Zoom in to area shown on Figure 1, location of delay indicated more accurately.
Click on indicator do open detail window with facility for operator to append notes. Click on a route to show detail for that route.

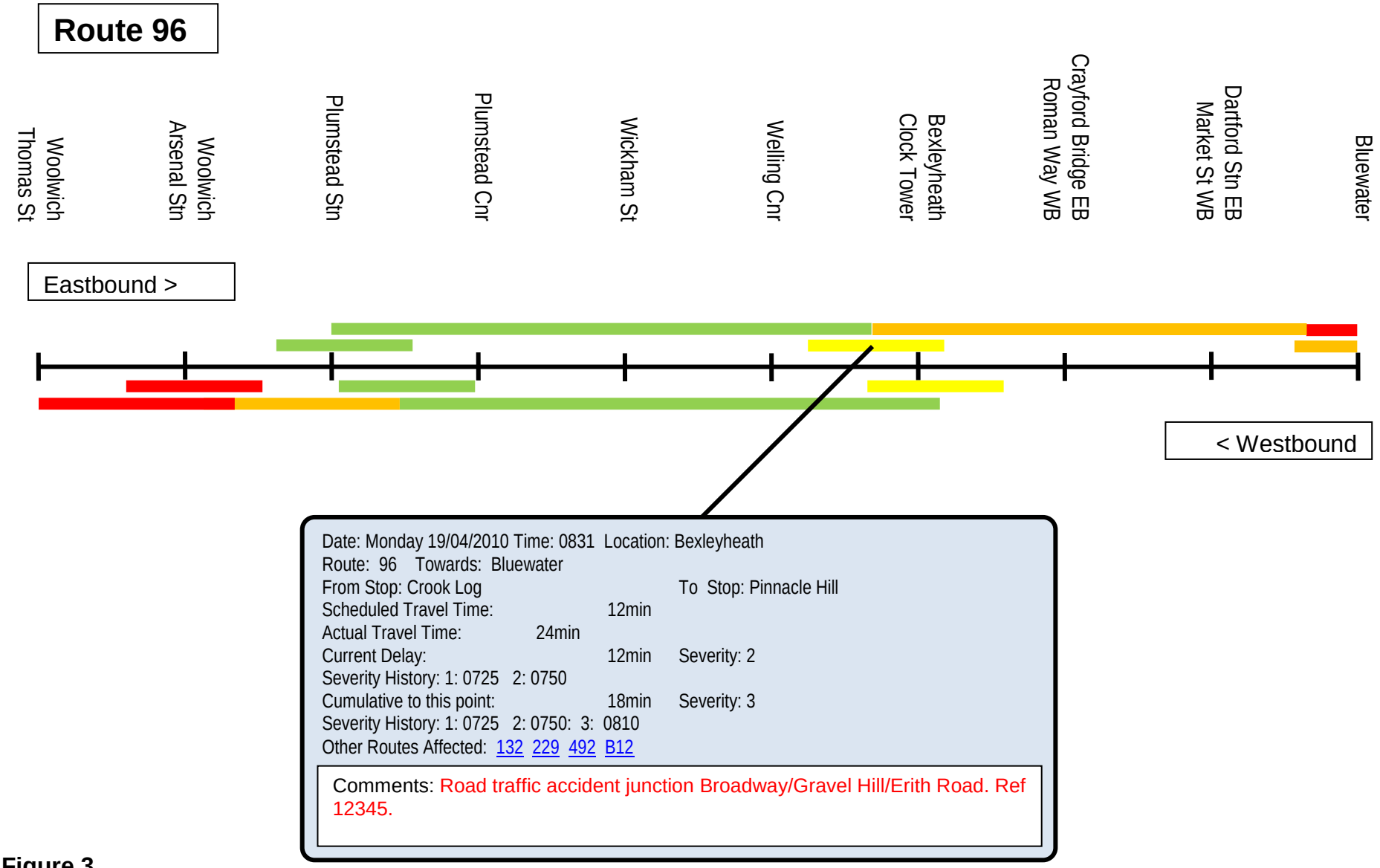

Figure 3
Detail of delays for a route, both separate and cumulative.
Click on a section to open detail window with facility for operator to append notes.

Appendix 1
Examples of SDIX and Other Reports

STTOC - CentreComm Network Response Team

Daily Service Disruption report

From 07:00 Sunday 27-Jun-2010 until 06:59 Wednesday 30-Jun-2010

CentreComm (STTOC) Floor 2, Zone 2R2, Palestra. Tel: 0844 251 0160 email: cic@tfl.gov.uk

This report details all delays reported to the CentreComm Collators. Reports of delays are, where possible, checked and verified

Date	Time First Reported	Reported Location of Incident/Event	Bus Route Reporting Delay	TOCU Route	Time Delay Started	Delays Reported	SDIX Cause	Other Details	Time Cleared	Garage Reporting	Person Reporting	SDIX Reference Number
27-Jun-10	**12:57**	STATION ROAD BR6	-----	**No**	12:45	**20 minutes**	**Diversion**	HEAVY TRAFFIC CAUSED BY DIVERSION		**MB**	**Mark Cassidy**	**290842**
27-Jun-10	**14:25**	HIGH ROAD N20	-----	**No**	14:00	**25 minutes**	**Roadworks**	3 WAY TEMP LIGHTS PUT UP FOR RE-SURFACING		**PB**	**Matt Doke**	**290843**
27-Jun-10	**14:27**	HOGARTH RBT W4	-----	**No**	13:46	**20 minutes**	**Roadworks**	AS PER NOE WE10527 HOU		**AH**	**Steve Long**	**290844**
27-Jun-10	**14:27**	KNIGHTSBRIDGE SW1	-----	**No**	14:10	**30 minutes**	**Roadworks**	CRANE OPERATION ROADWORKS		**AC**	**P Baldi**	**290845**
27-Jun-10	**14:33**	WOOLWICH MANOR WAY E6	-----	**No**	14:10	**25 minutes**	**Other (Specify)**	UNKNOWN HEAVY TRAFFIC		**SI**	**Saad Fayyaz**	**290846**
27-Jun-10	**17:47**	KNIGHTSBRIDGE SW1	-----	**No**	17:20	**25 minutes**	**Roadworks**	CRANE OPERATION ROADWORKS		**AC**	**Igor Oleinici**	**290847**
27-Jun-10	**18:24**	CROMWELL ROAD SW7	-----	**No**	17:45	**30 minutes**	**Road Traffic Collision**	ROAD TRAFFIC COLLISION		**SW**	**D Tyson**	**290848**
27-Jun-10	**18:50**	DALSTON LANE E8	-----	**No**	18:00	**20 minutes**	**Other (Specify)**	TRAFFIC		**T**	**W Cossington**	**290849**
27-Jun-10	**20:23**	THE BROADWAY UB1	-----	**No**	19:40	**30 minutes**	**Road Traffic Collision**			**HS**	**Omar**	**290850**
27-Jun-10	**20:25**	OXFORD STREET W1	-----	**No**	19:55	**20 minutes**	**Other (Specify)**	BROKEN DOWN BUS	**20:01**	**T**	**W Cossington**	**290851**

SDIX - Service Disruption Information Report
LSTCC - London Streets Traffic Control Centre
LB - London Buses
OP - Operating Company
CAD - Computer Aided Despatch
MPS - Metropolitan police Service
TOCU - Transport Operational Command Unit
ARB - Accident Report Book
CRIS - Crime Report Intelligence System
ASNT - Area Searched No Trace

STTOC - CentreComm Network Response Team

24 hour report on Bus Operations

Covering period from 0700 Wednesday, 10 March 2010 0659 Thursday, 11 March 2010

CentreComm (STTOC) Floor 2, Zone 2R2, Palestra. Tel: 0844 251 0160 email: cic@tfl-buses.co.uk

This report lists incidents which have had an major impact on the London Bus Network

Date	First Report	Exact Location of Incident/Event	LBSL area	Details of Incident/event	Time delay Started	Effect of Incident	Time cleared	Collators initials
10-Mar-10	0606	Parry Street, Wandsworth Road, Vauxhall Bus Station, SW8	SO	Road traffic collision CAD 1226 Diversion reference 39547	0630	Roads closed Roads reopened at 07:00hrs but lane restrictions in Parry Street at exit from Bus Station, caused continuing delays through morning peak	0954	IF
10-Mar-10	0743	Southend Road, Park Road, Beckenham	SO	Road traffic collision Cad 1319 Diversion Reference 39549	0743	Road closed both directions	1000	IF
10-Mar-10	0753	High Road, Wembley Triangle, Wembley	WE	Road traffic collision Cad 1498 Diversion Reference 39550	0753	Road closed southbound	0820	IF
10-Mar-10	0830	Millbank, Lambeth Bridge, SW1	CE	Motorcyclist Demonstration Cad 1425	0830	Roundabout blocked by demonstrators traffic and buses held	0845	IF
10-Mar-10	0849	Lauriston Road, Victoria Pk Rd, E9	CE	HGV v Motorcycle Cad 1824 Diversion Reference 39551	0849	Junction blocked	1420	KM
10-Mar-10	0851	Sheepbarn Lane, Jewels Lane, Warlingham	SO	Road traffic collision Cad 1932 Diversion Reference 39552	0900	Junction blocked	1030	IF
10-Mar-10	0900	Mare Street Lower Clapton Road E8	CE	Dangerous road surface Thames water Ref 00307454861 CAD 1989 NOE CE100366	0900	Road surface has failed again, road closed for buses		IF
10-Mar-10	1057	Blackheath Road, Lewisham Hill, SE10	SO	Road traffic collision Cad 2808 Diversion Reference 39553	1057	Road closed in both directions	1420	IF
10-Mar-10	1326	Piccadilly, Green Park, W1	CE	Road traffic collision Cad 4237	1326	Road closed westbound, alternate working on the eastbound under police supervision	1350	IF
10-Mar-10	1556	Woodcote Road Lordsbury Field to Farm Lane Wallington	SO	Road traffic collision Cad 5887 Diversion reference 39555	1556	Road blocked both ways	1731	KM
10-Mar-10	1605	South Street Romford Station Romford	CE	Incident in Romford Station Cad 5879	1605	Emergency services blocking road 16:40hrs buses being supervised past emergency vehicles	1640	IF
10-Mar-10	1756	Orchard Street, Oxford Street, W1	CE	Road traffic collision Cad 7549 Diversion reference 39556	1756	Junction blocked to all approaches	1810	IF
10-Mar-10	1842	Dudden Hill Lane Neasden Circle NW10	WE	Police Incident CAD 7478 No diversion ref due to Operators implementing their own diversions and no calls received to CentreComm	1842	Road blocked	1925	FW
10-Mar-10	1911	Catford Road Canadian Avenue SE6	SO	Road traffic accident CAD 8216 Diversion reference 39557	1911	Road blocked southbound	1952	FW
10-Mar-10	1927	Great Eastern Road Broadway E15	EA	Road traffic accident CAD 8096	1927	Road blocked southbound	1951	FW
10-Mar-10	2145	Upper Clapton Road Mount Pleasant Road E5	CE	Road traffic accident CAD 9688 Diversion reference 39558	2145	Road closed both ways	1255	FW
10-Mar-10	2231	High Street Middle Lane N8	EA	Road traffic accident CAD 9875 Diversion reference 39561	2231	Road closed both ways	0505	FW
10-Mar-10	2308	Anerley Hill Croydon Road SE19	SO	Road traffic accident CAD 10203 Diversion reference 39560	2308	Road closed both ways	0015	FW
11-Jan-00	0609	City Road Finsbury Square EC2	CE	Building fire CAD 981 Diversion reference 39562	0609	Road closed both ways		FW
11-Jan-10	0646	Kymberley Road, College Road, Harrow	WE	Broken down bus Cad 1371 Diversion Reference 39563	0646	Road blocked		IF

Key to abbreviations used

TIC -Travel Information Centre
NTC - Network Traffic Controller
SDIX - Service Disruption Information Report
LSTCC - London Streets Traffic Control Centre
LB - London Buses
OP - Operating Company
CAD - Computer Aided Despatch
MPS - Metropolitan police Service
TOCU - Transport Operational Command Unit
ARB - Accident Report Book
CRIS - Crime Report Intelligence System
ASNT - Area Searched No Trace
SALT -Single Alternative Line Traffic

STTOC - CentreComm Network Response Team

Traffic Signal Observations Report

Period from 0700 **Wednesday, 10 March 2010** until 0659 **Thursday, 11 March 2010**

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O = OUT S = STUCK P = PHASING F = FACING WRONG DIRECTION D = DAMAGED L = LEANING B = Bulb Out any Colour or Filter

Date	Time	Location	Junction	Postcode	CCTV	Fault Code	Fault Found	ATS site No.	Comments	Cirs log	Cleared by	Time
10-Mar-10	0724	Ferry lane	Jarrow Road	N17		S	Yes	31/121	Stuck on red Fault SER1066864 0828hrs Engineer on way	184		
10-Mar-10	0746	Highgate Road	Fortess Road	NW5		P		2/128	Phasing fault	210		
10-Mar-10	0803	Black Prince Road	Albert Embankment	SE11		S		09/250	Stuck on Red	242		
10-Mar-10	0822	Chinbrook Road	Marvels Lane	SE12		F		07/144	Right Turn Filter turned facing wrong way	266		
10-Mar-10	0841	Graham Road	Mare Street	E8		P		04/22	Short Green exiting	293		
10-Mar-10	0938	Wales Farm Road	Western Avenue	W3		O		27/48	ATS all out Engineer on scene Ref 800149	356		
10-Mar-10	1328	Selborne Road	Walthamstow Bus Station	E17		P		13/39	Short Green exiting Bus Station 1540 further liaised with LSTCC as problem is ongoing	607		1318
10-Mar-10	1350	New Road	Commercial Road	E1		P		05/23	Short Green	649		1318
10-Mar-10	0758	Porchester Road	Lords Hill Bridge	W2		F		01/244	Cluster facing wrong way	233		1318
10-Mar-10	0954	Jermyn Street	Regent Street	SW1		P		01/51	Stuck red phase for 2 changes	365		
10-Mar-10	1203	West Ham lane	Densham Road	E15		P		17/28	short green 10secs	504		
10-Mar-10	1219	Ruislip Road	White Hart Roundabout	UB5		O		27/159 27/161	Sitechecked now working 27/161 remain out	521		
10-Mar-10	1238	Mare Street	Morning lane	E8		P		04/25	New filter causing major delays	550		
10-Mar-10	1255	St Nicholas Way	Greenford Road	SM1		P		21/66	8 secs green, normally 20/25secs	567		
10-Mar-10	1523	High Street	Kingsley Road	TW3		P		25/23	Long Red	766		
10-Mar-10	1551	High Street	Wood Street to Underhill	Barnet		O		30/17 30/70 30/148	3 sets of ATS out	804		
10-Mar-10	1607	Upney lane	Ripple Road	Barking		S		10/116	Stuck on red Upney lane into Ripple Rd LSTCC confirm local control	827		
10-Mar-10	1617	Palmerston Road	High Street	Harrow		S		29/111	Stuck on red			
10-Mar-10	1748	Duke Street Hill	Borough High Street	SE1		P		08/51	Short Green			
10-Mar-10		Wandsworth Road	Lansdowne Way	SW8		S		09/119	Stuck red Lansdowne Way pek1069931	146		

Key to abbreviations used

O = Out
S = Stuck
P = Phasing
F = Facing
D = Damaged
L = Leaning
B = Bulb out
LTCC = London Traffic Control Centre
UTC = Urban Traffic Control

Appendix 2
Sample SDIX Analysis

CentreComm SDIX Monitoring Exercise - Thursday 08 July 2010

From SDIX form						From iBus system						
Route	Time delay started	Time delay finished	Location	Direction	Delay claimed	Section of route monitored (Stop names)	Time from	Block no	Time to	Block no	Average Delay found (mins)	Operator
P4	0745	1045	Honor Oak Road / Grierson Road	Westbound	25	Stondon Park - London Road	0715	107	0827	102	17	Catford Garage (Selkent)
203	0745	0820	Great West Road / The Causeway	Both Directions	22	Hounslow West Station / Great South West Road (The Parkway)	0748	71143	0909	71146	30	
299	0800	1028	Brownlow Road / Bowes Road	Both Directions	25	Durnsford Road & Albert Road / Aldermans Hill	0800	86623	0904	86621	8	Northumberland Park
W6	0810		Hedge Lane / Great Cambridge Road	Both Directions	25	Silver Street / Palmers Green Tesco	0815	86601	0911	86604	13	Northumberland Park
28 / 295	0815		Wandsworth Bridge Road / New Kings Road	Southbound	22	Fulham Broadway (Harwood Place) / Wandsworth Road (Bovingdon Road)	0815	40720	0901	40705	No delays found	Westbourne Park Garage - out of the 9 buses checked 1 bus was running 1 minute late the other 9 where between 4 & 10 minutes early
H98	0815		Bath Road / Vicarage Farm Road	Southbound	60	Hounslow (Bell Junction) / Bath Road (Jolly Wagner)	0812	71279	1006	71273	36	Hounslow Garage
170 / 345	0820		Battersea Bridge Road / Westbridge Road	Northbound	25	Lombard Road / Cheyne Walk	0810	24072	0935	24079	5	Stockwell Garage - No roadworks observed on CCTV
234	0830		Muswell Hill Broadway / Princes Avenue	Both Directions	25	Colney Hatch Lane (Ashmore Court) / Fortis Green (Tetherdown)	0830	26132	1003	26130	7	Metroline
82	0840		Regents Park / Henleys Corner	Both Directions	30	Finchley (Churchend) / Finchley Road (Childs Way)	0838	26074	1007	26082	15	Metroline
121 / 329	0854		Green Lanes / North Circular Road	Southbound	20	Palmers Green Station / Green Lanes (Spencer Avenue)	0811	36230	0912	36234	11	Wood Green (Arriva)
453	0900		Regent Street / Piccadilly	Northbound	22	Trafalgar Square / Portland Place (New Cavendish Street)	0858	122008	1005	122015	15	Mandela Way
88	0900		Piccadilly / Regent Street	Northbound	25	Trafalgar Square / Portland Place (New Cavendish Street)	0858	24138	0959	24124	15	Stockwell Garage
12	0900		Piccadilly / Regent Street	Northbound	25	Trafalgar Square / Oxford Circus	0921	34232	1011	34239	15	Camberwell Garage
331	0920		High Street Harefield / Breakspear Road North	Both Directions	25	Ruislip (The Oaks) / Jackets Lane	0915	21133	1224	21136	10	Alperton Garage
82	1000		Finchley Road / Hendon Way	Both Directions	60	Golders Green (Post Office) / Finchley & Frognal Station	1005	26081	1205	26074	30	Potters Barr
216	1030		Hampton Court Road / Hampton Court Way	Both Directions	25-30	Cromwell Road (Bus Station) / Hampton Station	1025	91134	1304	91136	4	Fulwell Garage
172	1100		Ludgate Hill / New Change	Both Directions	25	Strand (law Court) / St Pauls Station	1107	80106	1218	80113	15	New Cross
25	1115		Manor Park / Ilford Hill	Eastbound	30	Manor Park Broadway / Hainault Street	1128	101624	1249	101638	20	West Ham - SDIX submitted sbetween two timing point and not specific location.
216/290	1135		Country Wat / Staines Road West	Both Directions	35	Windmill Road / Sundbury Village (The Three Fishes)	1200	91136	1514	91136	7	Fulwell Garage
120	1230	1325	South Road / Lady Magaret Road	Southbound	25	Southall (post office) / Lady Margaret Road (Kenilworth Gardens)	1245	71110	1325	71114	16	Hounslow Garage (AV)
113	1625		Hendon Way / Finchley Road	Both Directions	180	Edgware Bus Station / Marble Arch					60	Metroline Edgware reporting 180 minute delays, controller stated that buses were taking 3hrs to complete one rounder, upon checking schedule it takes 2.5hrs to complete a scheduled journey meaning that effectivley buses are only 30 minutes late.
111	1640		Hampton Court Road / Hampton Court Green	Both Directions	40	Cromwell Road (Bus Station) / Hampton Station	1647	71060	1736	71045	23	Hounslow Garage (AV)