

# Rail Demand Information System (RDIS)

Origin Destination Analyser – User Guide

24<sup>th</sup> September 2020

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## 1 Introduction

This guide covers all services delivered under CitiAnalytics. Please note that you may have different modules to those described within this guide.

CitiAnalytics is Citi Logik's web-based portal to access real time and historic analysis tool, using underlying mobile network data (MND) from Vodafone. The system gains access to all recorded anonymised live events taking place on Vodafone mobile devices and through a series of algorithms that process this data in real time. This results in the real-time identification of:

- Passenger movements from station to station via rail

All data is also saved to create an historic database. This allows the production of historic data and baseline data.

This information is then post processed to provide clients with key outputs through the CitiAnalytics web portal. This guide covers functionalities specifically for Rail Origin and Destination movements along with additional specific Real-Time station metrics and TfL rail interchange metrics from near time updating information.

The portal was designed to be as intuitive as possible, making it easy for the user to navigate and find information.

After this introduction, this user guide covers:

- Mobile network Data and Citi Logik;
- Installation and setup, including user types;
- Login;
- Menus; and
- Details of the views.

### 1.1 Web Portal URL

<https://web.citianalytics.com/login.html>

## 2 RDIS Using Mobile Network Data (MND) Introduction

The RDIS platform uses MND from the Vodafone Network processed by Citi Logik.

Vodafone customers communicate their positions with the networks of Vodafone cells every time they use their mobile phones to text or make a call and through ad-hoc events generated through applications running on smart phone devices, such as web searching, location services etc. Each such communication is registered by one of the network cells as an 'event' with a unique and anonymous user ID, a timestamp, a local area code (LAC<sup>1</sup>) and the cell's ID being attributed to it.

Each event that is recorded can be either an 'active' or 'passive' event. Passive events refer to mobile devices' background periodic updates and their reassignments between Vodafone LACs and as such may not necessarily coincide with physical activities of Vodafone customers on their devices. Passive events translate into handovers between each LAC, which generates spatially less detailed information but a very large sample i.e. the whole pool of Vodafone devices which can be followed (see section on privacy and license restriction).

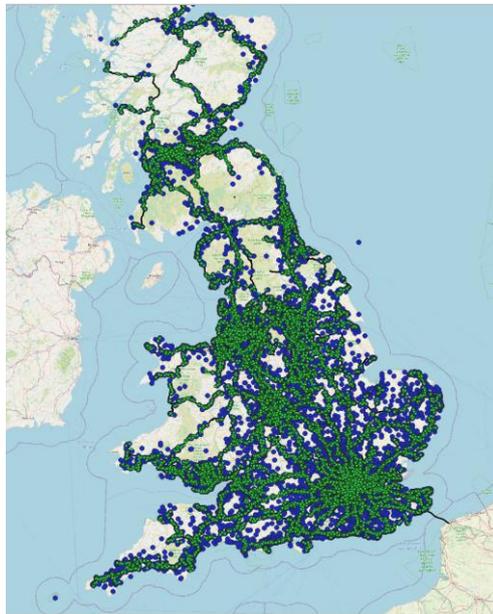
Active events refer to phone calls, web-browsing, email or text exchanges, with references to the cells which have been used by customers during such 'live' communications. Generally active events translate into handovers between each cell tower used by a phone when active which generates spatially very detailed information but with a limited sample.

The anonymisation of events is a regulated activity that Vodafone (the MNO) must adhere to. The customer details associated with each recorded event are replaced with an encrypted ID, which from here on shall be called the device ID. The device ID allows the tracking of movements of mobile devices in terms of visited places and durations of stay, in a way that is not compromised. This information is anonymised within the core network to GDPR compliant standards and then processed by Citi Logik as billions of events per day.

These events are then built up into a set of Origin to Destination movements using complex algorithms to establish journey paths and travel modes for each anonymised device across a day. From this we can best determine the devices movements and probabilistic journey path and travel mode that applies to the rail network.

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<sup>1</sup> LAC – Location Area Code is a unique number for the current location area. A location area is a set of base stations that are grouped together to optimize signaling.



The Core Network for Rail

### 2.1.1 Time Slots

The system builds up a database of Origin to Destination movements from Station to Station in 15-minute Time Slots. This is important as we must group movement together to minimise the impact of the privacy restrictions linked to GDPR.

The time slots start at midnight 00:00 and increase in 15 minute intervals.

Eg 00:15, 00:30 etc.

Where timeslots are present in a report, the time is based on either the Departures or Arrivals within the timeslot depending if the reports are “From” or “To” respectively. Journey duration has no impact.

For clarity when running reports, time works for the whole minute.

Time slot 08:15 really means 08:15:00 to 08:29:59.

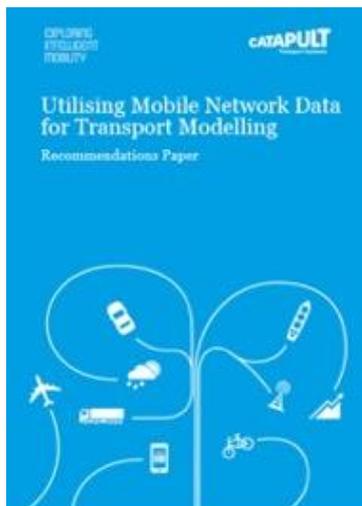
### 2.1.2 Single Leg and Multi Leg Journeys

The movements presented show end to end journeys where there has been no significant journey break.

This means that both single leg and multi leg journeys where there may be an interchange are included.

## 2.2 Expanding to Full Population

The data from one network provider can be expanded to Full UK Population using a methodology approved by DfT with support by Citi Logik. This is published as the Catapult recommendations to DfT for utilising mobile network data for transport planning and mobile data is a recognised source of origin destination information by DfT.



This method has been accepted by engineering consultancies for over 5 years in transport planning and design as the main data source

MND has been the primary data source in £1Bn+ projects and successfully accepted in public enquiries.

As a simplified process Citi Logik applies expansion from Vodafone devices to person trips using both localised market share and mobile penetration based on DfT approved methodology, this technique does not require information for all mobile operators data.

This approach uses network identified Home and Work locations provided by Vodafone based on device behaviour. The process matches Vodafone device counts of home location to Census Population at Local level e.g LSOA. This provides an accurate expansion factor for a localised area. E.G Simplified - 1500 person census location and 350 VF night-time devices = expansion 4.29.

Across the UK, each area is unique and so is the expansion factor for each device, as described in the Catapult document. This takes care of variances in market penetration for any given locality and also automatically caters for users with multiple devices including tablets.

Using the expansion number, we can multiply the number of individual VF devices seen by their respective expansion number to produce a total count of travelling persons. Results have previously been validated for rail journeys in trials against onboard counts undertaken by Tracsis.

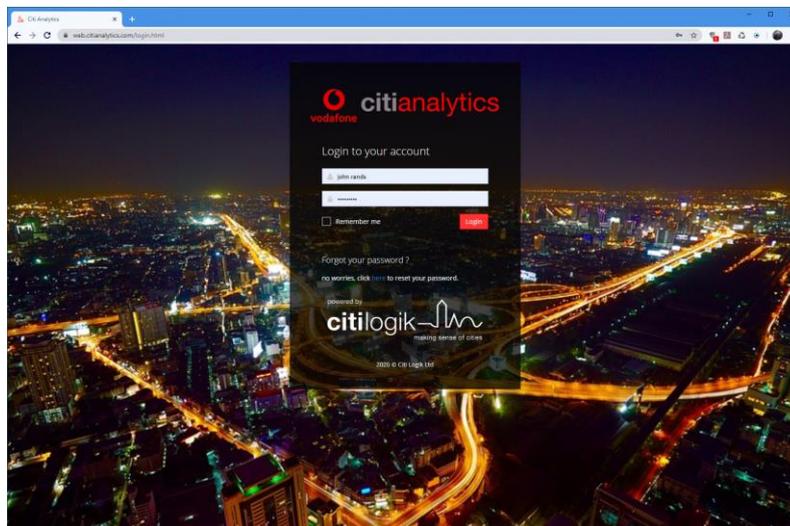
### 3 Login

CitiAnalytics operates as a web-based portal, and hence no installation is required. An electronic device with web access and a common browser is needed. The portal interface is responsive and will adjust its layout to any browser/device used.

Access to the portal is done through the following link:

<https://web.citianalytics.com>

When prompted, enter your login and password. If you do not have a login/password, please contact your administrator.



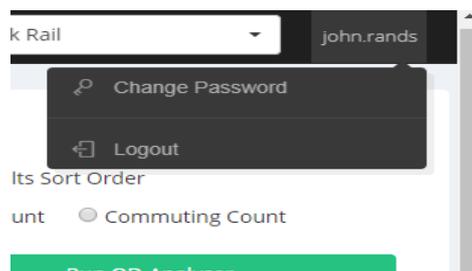
On your first login, it is recommended that you change your password using the “Forgot your password” function which will email you a link to your email account which has already been created for you.

#### Self Admin

Once logged in users can undertake various basic admin tasks through the drop-down menu top right of the screen. Select your username displayer in the top right-hand corner

This includes:

- Change password.
- Logout.

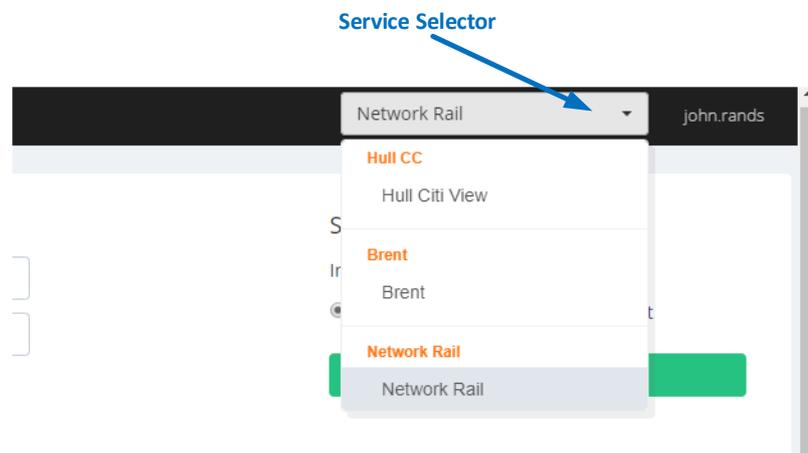


## 4 Menus

CitiAnalytics has been designed to offer a flexible approach to data access for multiple clients and client groups.

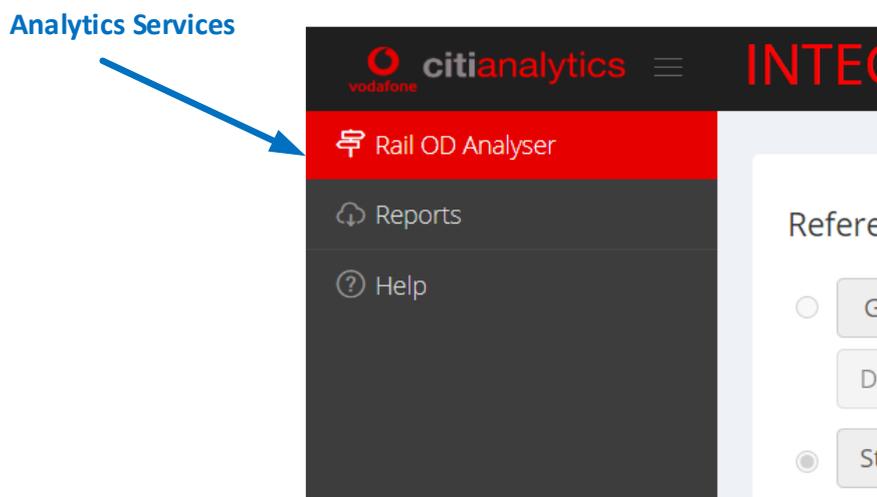
Access hierarchy is shown through Service Selection via drop down menu and Analytics Services displayed as service tabs.

It is likely that most users will only have access to one Service Selector drop down service but can have multiple Analytics Services depending upon permission.



**Service Selector**

Please check to see if you have additional services permissioned under Service Selector if you can't find what you are looking for.

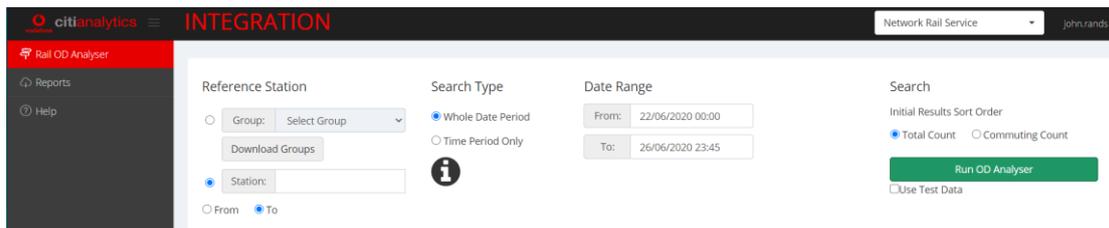


**Analytics Services**

## 5 Rail OD Analyser

This dashboard provides detailed access to Station Origin to Station Destination journeys.

The Dashboard provides several features to allow the user to search and refine station to station movements. The detail of which is shown below.



The screenshot shows the 'Rail OD Analyser' dashboard. It features a navigation menu on the left with 'Reports' and 'Help'. The main area is titled 'INTEGRATION' and includes a 'Network Rail Service' dropdown and a user profile 'john.rands'. The dashboard is divided into several sections: 'Reference Station' with a 'Group' dropdown (set to 'Kent') and a 'Station' input field; 'Search Type' with radio buttons for 'Whole Date Period' (selected) and 'Time Period Only'; 'Date Range' with 'From' (22/06/2020 00:00) and 'To' (26/06/2020 23:45) fields; and a 'Search' section with 'Initial Results Sort Order' options for 'Total Count' (selected) and 'Commuting Count', and a 'Run OD Analyser' button. There is also a 'Use Test Data' checkbox.

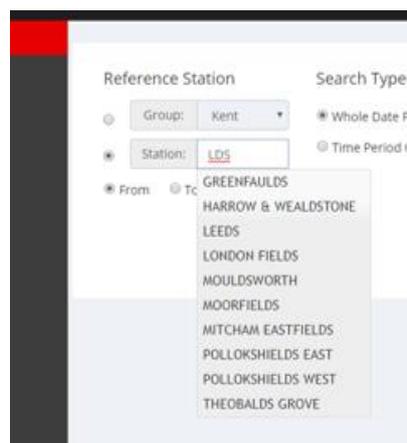
### Rail Origin to Destination Analyser

#### 5.1 Input Controls

##### 5.1.1 Reference Station

The reference Station can be selected by either specifying the station name or CRS code by just typing the name into the entry box.

The user can also select one of several preset Station Groups which is centrally managed by the system Admin.



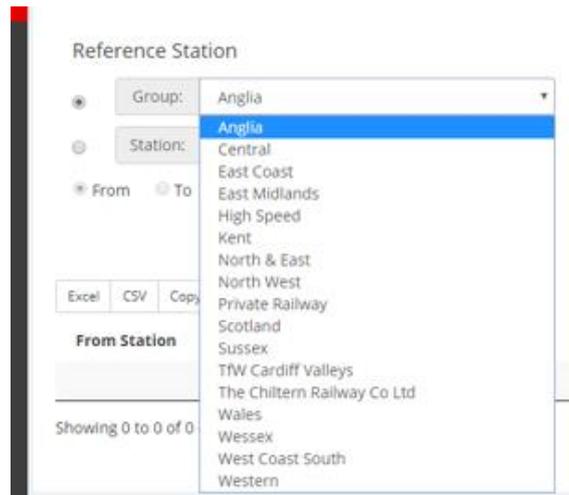
This close-up shows the 'Reference Station' section. The 'Group' dropdown is set to 'Kent'. The 'Station' input field contains 'LDS'. A dropdown menu is open below the input field, listing several station names: GREENFAULDS, HARROW & WEALDSTONE, LEEDS, LONDON FIELDS, MOULDSWORTH, MOORFIELDS, MITCHAM EASTFIELDS, POLLOKSHIELDS EAST, POLLOKSHIELDS WEST, and THEOBALDS GROVE. The 'Search Type' section shows 'Whole Date Period' selected.

#### Station Entry

Once the reference station has been selected. The user must select journeys "To", or "From" this station to be displayed (not applicable to Groups as both To and From are displayed within the results).

*IMPORTANT – All timing is based on the following:*

If **From** is selected in Reference station – the timing is based on **Departure**.  
If **To** is selected in Reference station – the timing is based on **Arrival**.



The screenshot shows a web interface for selecting a reference station. At the top, it says "Reference Station". Below this, there are two dropdown menus: "Group:" and "Station:". The "Group:" dropdown is currently set to "Anglia". The "Station:" dropdown is open, showing a list of options: Anglia, Central, East Coast, East Midlands, High Speed, Kent, North & East, North West, Private Railway, Scotland, Sussex, TfW Cardiff Valleys, The Chiltern Railway Co Ltd, Wales, Wessex, West Coast South, and Western. Below the dropdowns, there are radio buttons for "From" (selected) and "To". At the bottom left, there are buttons for "Excel", "CSV", and "Copy". Below these buttons, it says "From Station" and "Showing 0 to 0 of 0".

### Group Selector

As an alternative one of the preset groups can be selected. Make sure that you select if you are using **Station** or **Group** first.

#### 5.1.2 Group Composition

The Group function is preset lists of stations under a common name. When requested, the system will deliver matrix OD results based on journeys between each station listed within the group. It does not show journeys which originate or end outside of the group.

To understand the stations within each Group, the list of groups and station details can be downloaded for further understanding. The list is large and so can be downloaded in Excel format for easy manipulation.

Group Details Download Button

Group:

Download Groups

Station:

From  To

	A	B	C	D
1	Group Id	Group Name	Station Name	CRS
2	CG1	Anglia	Westerfield	WFI
3	CG1	Anglia	Willesden Junction (High)	LWJ
4	CG1	Anglia	Worstead	WRT
5	CG1	Anglia	Woodgrange Park	WGR
5	CG1	Anglia	Wivenhoe	WIV
7	CG1	Anglia	Wickham Market	WCM
3	CG1	Anglia	White Hart Lane	WHL
9	CG1	Anglia	West Horndon	WHR
0	CG1	Anglia	Wanstead Park	WNP
1	CG1	Anglia	Walton-On-Naze	WON
2	CG1	Anglia	Waltham Cross	WLC
3	CG1	Anglia	Turkey Street	TUR
4	CG1	Anglia	Thorpe-Le-Soken	TLS
5	CG1	Anglia	Sudbury (Suffolk)	SUY
6	CG1	Anglia	Stansted Mountfitchet	SST
7	CG1	Anglia	St James Street (Waltham)	SJS
8	CG1	Anglia	Southbury	SBU
9	CG1	Anglia	Shoeburyness	SRY
0	CG1	Anglia	Shippea Hill	SPP
1	CG1	Anglia	Shepreth	STH
2	CG1	Anglia	Sawbridgeworth	SAW
3	CG1	Anglia	Reedham (Norfolk)	REE
4	CG1	Anglia	Rainham (Essex)	RNM
5	CG1	Anglia	Purfleet	DFI

### Example of Group Download content

#### 5.1.3 Search Type and Time Period

Search Type      Date Range

Whole Date Period      From:

Time Period Only      To:

#### Search Type Selector

The Search Type controls how the data is analysed compared to date ranges.

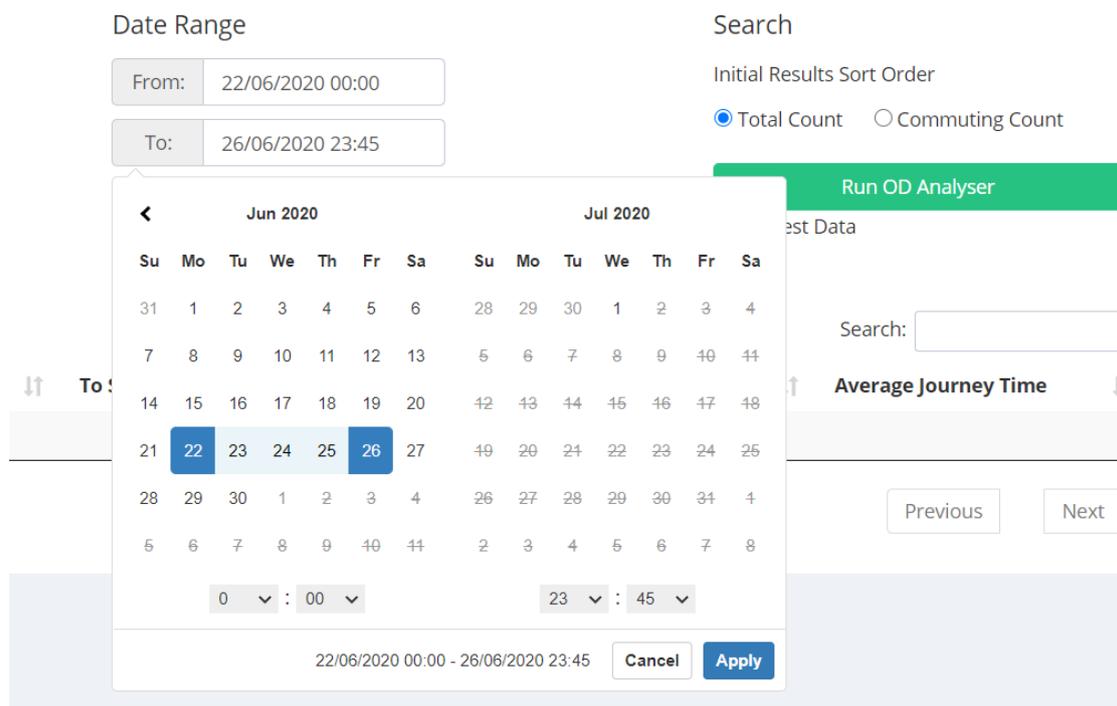
*IMPORTANT – All timing is based on the following:*

If **From** is selected in Reference station – the timing is based on **Departure**.

If **To** is selected in Reference station – the timing is based on **Arrival**.

**Whole Date Period** – The system analyses ALL the data between the two specified date and time ranges.

The user can select a start date and a start time and an end date and time using the date and time picker function. Please note that the system works in 15-minute periods.



### Date and Time Picker

The date picker works by first selecting the start date that the user selects and then the second date that the user selects. If you hit select “Apply” then these dates will be used.

You can also adjust the time range using the timing value displayed at the bottom of the date picker.

**Help Note:** Same day analysis. If you want to analyse the just one day then select the select the day with one mouse click and then click again. This locks the start day and end day into the date picker. Don’t forget to hit “Apply”.

The time is selected in 15 minute increments.

If you wanted to look at 07:00 to 09:00 as a time period use the values 07:00 – 08:45.

This represents the last time period with runs from 08:45 to 08:59:59

**Time Period Only** – This is more powerful and can analyse data across a date range but only between specific times or days of the week.

For example, it could be set to look at a months’ worth of data but only specific weekdays during the morning rush hour etc.

<p>Search Type</p> <p><input type="radio"/> Whole Date Period</p> <p><input checked="" type="radio"/> Time Period Only</p>	<p>Time Period</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">From:</td> <td style="width: 35%;">19/05/2020</td> <td style="width: 15%;">To:</td> <td style="width: 35%;">26/05/2020</td> </tr> <tr> <td>From:</td> <td>06:30</td> <td>To:</td> <td>09:00</td> </tr> <tr> <td>M</td> <td>T</td> <td>W</td> <td>T</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>F</td> <td>S</td> <td>S</td> <td></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> </tr> </table>	From:	19/05/2020	To:	26/05/2020	From:	06:30	To:	09:00	M	T	W	T	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	F	S	S		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
From:	19/05/2020	To:	26/05/2020																						
From:	06:30	To:	09:00																						
M	T	W	T																						
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																						
F	S	S																							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																							

**Time Period Selector**

**5.1.4 Search**

This allows the user to search and order the results based on the Total Count of journeys or on then total count of Commuting Journeys.

A commuting Journey is one where we have a defined Home and Work(s) locations for a device based on regular day and nighttime behaviour and that trips start and finish relative to either location.

Search

Initial Results Sort Order

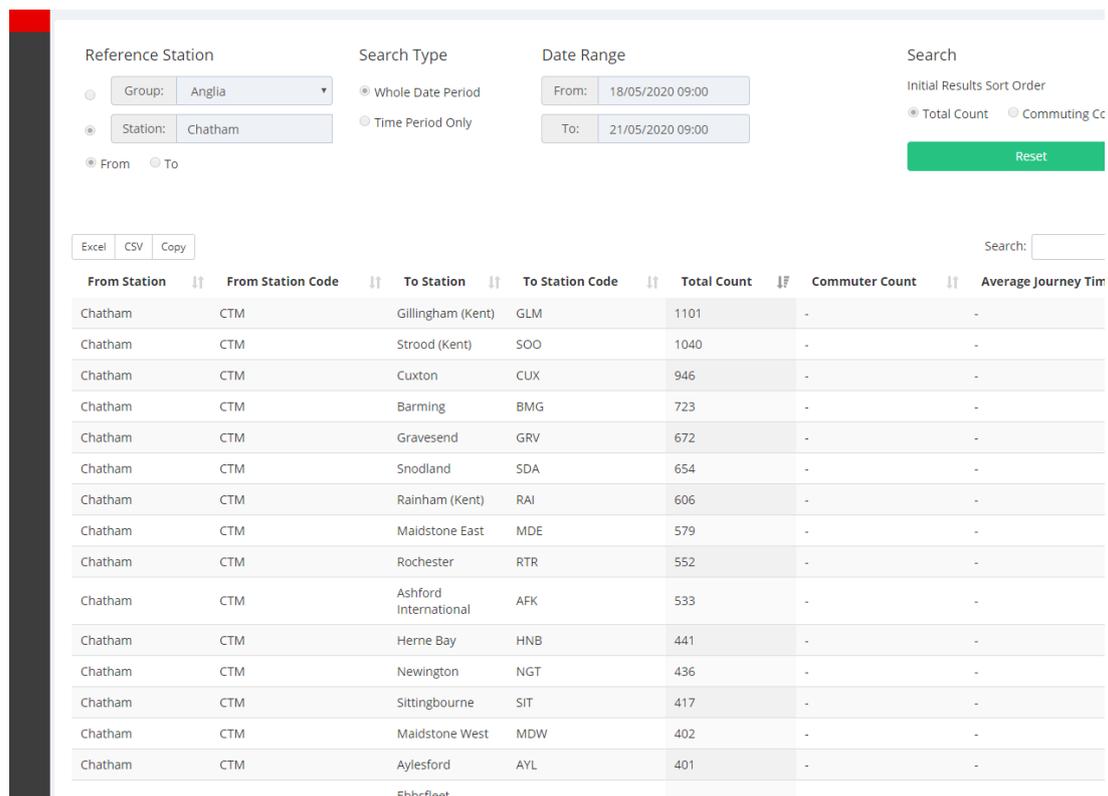
Total Count     Commuting Count

Run OD Analyser

**Analysis Start and Sort Selector**

## 5.2 Results

The results are shown on the screen in a tabular format with sort buttons beside each column heading.



Reference Station: Group: Anglia, Station: Chatham, From, To

Search Type: Whole Date Period, Time Period Only

Date Range: From: 18/05/2020 09:00, To: 21/05/2020 09:00

Search: Initial Results Sort Order: Total Count, Commuting Cc, Reset

Excel CSV Copy Search:

From Station	From Station Code	To Station	To Station Code	Total Count	Commuter Count	Average Journey Time
Chatham	CTM	Gillingham (Kent)	GLM	1101	-	-
Chatham	CTM	Strood (Kent)	SOO	1040	-	-
Chatham	CTM	Cuxton	CUX	946	-	-
Chatham	CTM	Barming	BMG	723	-	-
Chatham	CTM	Gravesend	GRV	672	-	-
Chatham	CTM	Snodland	SDA	654	-	-
Chatham	CTM	Rainham (Kent)	RAI	606	-	-
Chatham	CTM	Maldstone East	MDE	579	-	-
Chatham	CTM	Rochester	RTR	552	-	-
Chatham	CTM	Ashford International	AFK	533	-	-
Chatham	CTM	Herne Bay	HNB	441	-	-
Chatham	CTM	Newington	NGT	436	-	-
Chatham	CTM	Sittingbourne	SIT	417	-	-
Chatham	CTM	Maldstone West	MDW	402	-	-
Chatham	CTM	Aylesford	AYL	401	-	-

Fhhcfiept

The results columns for Commuting Count and Average Journey Time will be added later in the project cycle delivery.

### 5.2.1 Reviewing the Data

Where the number of results exceeds that which can be displayed on a single screen, pagination shown at the bottom of the screen allows the user to step through the pages.

st	SOR	122	-	-
rs	BSR	121	-	-
	CRY	120	-	-
ray	SMY	118	-	-
e	KDB	114	-	-
(ent)	MRN	113	-	-
	SAY	109	-	-

### Results Pagination

## 5.3 Data Privacy

The results contain counts of journeys between station.

To protect individuals and to ensure that the system cannot be used to identify individuals there is a minimum number of 10 which must be presented if there are between 1 and 10 journeys made. If there are no journeys, then there will be no results returned.

This is a legal requirement for GDPR and Mobile Network Operators for data sharing.

**The Rule** – Where the count is between 1 and 10 then the GDPR and Data Privacy requirements will be applied, and the number 10 will be displayed.

### 5.3.1 Managing the effects of Privacy

To help reduce the privacy effect, try running your query against a wider date or time range. The wider the time period looked at, the greater the number of trips made and therefore the 10 Privacy number will be less likely.

If you are looking at specific travel times, then use the “Time Period Only” search to run your search across multiple days just between the hours that you need.

There is also a daily count report, which provides a total of all actual trips made. You can use this together with full matrix trip report to work out the actual daily average of the privacy number across the whole network.

As a working number if doing counts then you may substitute an averaged number of approximately 4 instead of 10 for result affected by privacy. This number will change over time and should be used with caution.

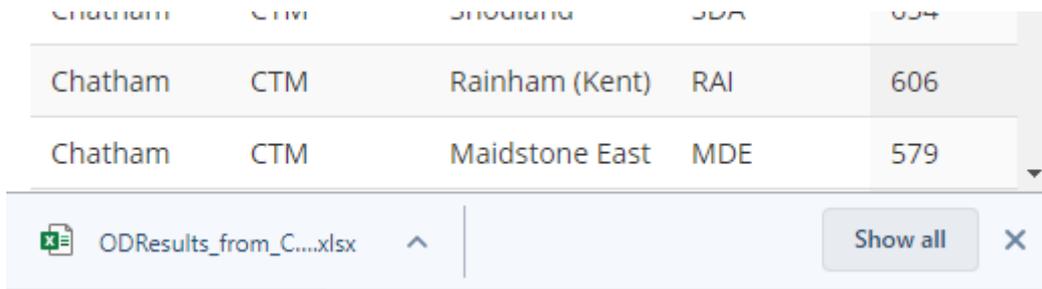
### 5.3.2 Downloading the Results

For convenience and further analytics, the results returned can be downloaded in their entirety in one of 3 formats. Excel, CSV or Copy function.

From Station	From Station Code	To Station
Chatham	CTM	Gillingham
Chatham	CTM	Strood (Kent)
Chatham	CTM	Cuxton

#### Download Results

By selecting either Excel or CSV a file will be created and downloaded into the browser download function at the bottom of your browser window.



#### Downloaded File

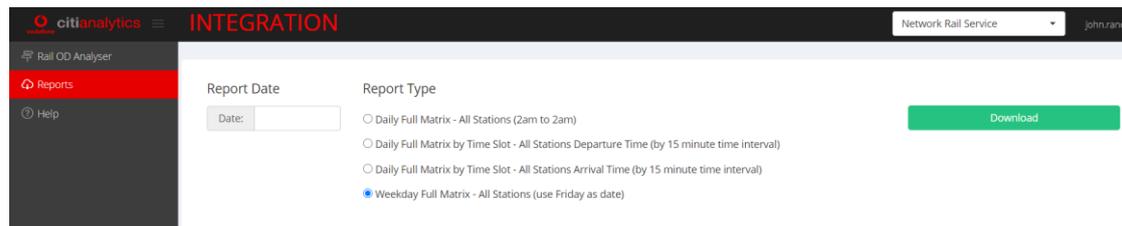
### 5.4 Future Services

Additional analytics capability may be added to this service over time.

## 6 Reports

Several fixed reports are generated automatically every day. These are available if you have the permission under the Reports tab on the web portal.

Additional reports will be added here.



### Report Services

#### 6.1 Report Types

Each report can be run against a specific date. Set the date and select the report and it will be generated and downloaded in your browser automatically.

All reports are in easy to use excel format for further manipulation.

##### 6.1.1 Report 1 – Daily Full Matrix – All Stations

This report provides the complete matrix of all journeys across an entire day (2am - 2am).

These are the daily totals

	A	B	C
1	Start_CRS	End_CRS	Trips
2	CLJ	VIC	2230
3	SRA	LST	2079
4	WAT	CLJ	2000
5	VIC	CLJ	1896
6	EAD	WIM	1688
7	SPB	PAD	1688
8	LST	SRA	1575
9	WIM	EAD	1491
10	CLJ	WAT	1437
11	LBG	CLJ	1425
12	PAD	SPB	1288
13	CLJ	WIM	1239

#### Example of daily full Matrix

### 6.1.2 Reports 2 & 3 – Daily Full Matrix by Time Slot – All Stations by Departure and Arrival Time

This report is highly granular and provides the detail of all journeys broken down into 15 time slots.

There are 96 Timeslots in a 24hr Period.

This means all journeys seen that depart a station within the 15 minutes time slots. Journey time is irrelevant. It is just about departure time.

The second of these reports is the same but relate to arrival time at station.

	A	B	C	D	E
1	TimeSlotS	TimeStart	Start_CRS	End_CRS	Trips
2	65	16:15	LDS	YRK	127
3	65	16:15	WAT	VXH	118
4	36	09:00	WAT	VXH	118
5	55	13:45	VXH	WAT	118
6	68	17:00	CDQ	CDQ	99
7	27	06:45	CDQ	CDQ	99
8	54	13:30	CDQ	CDQ	99
9	37	09:15	CLJ	VIC	95
10	19	04:45	GLC	EDB	92
11	82	20:30	BHM	CDQ	90
12	29	07:15	WAT	VXH	88
13	40	10:00	MAN	BHM	88
14	60	17:15	BHM	MAN	88

### 6.1.3 Report 4 – Weekday Full Matrix – All Stations

This report covers all journeys on weekdays summarised together to give total counts by Origin to Destination pairs.

	A	B	C
1	Start_CRS	End_CRS	Trips
2	CLJ	VIC	8822
3	VIC	CLJ	8582
4	SPB	PAD	7590
5	PAD	SPB	7113
6	WIM	EAD	6221
7	EAD	WIM	6086
8	CLJ	PAD	5657
9	CLJ	WAT	5395
10	CLJ	LBG	4895
11	CLJ	WIM	4866
12	WIM	CLJ	4840
13	WAT	CLJ	4374
14	ECR	VIC	4249

### Example of weekday full Matrix

## 6.2 Future Reports

In addition to the current reports available, further reports have been requested and will be made available in due course. The User guide will be updated when these reports are available.

## **7 Support**

### **7.1 User Guide**

Please refer to the “Help” tab option on the main left-hand menu bar as this will always contain the latest user guide.

### **7.2 Browser Support**

The system has been optimised for Chrome and Edge browsers. Low screen resolution devices and some legacy browsers may experience different presentation of the web portal.

### **7.3 Latest Updates**

The system is updated on a regular basis with new features and presentation changes being applied. These are available next time the user logs into the system.