Transport
for NSW

Urban Freight Forecasting Model

User Guide

September 2023
Version 2.0

transport.nsw.gov.au

NSW GOVERNMENT

Table of Contents

September 2023

What's new in this version.

The version includes:

- Hotels as a building land use
- More survey data incorporated in back-end regression analysis that improves the results particularly for larger buildings
- Display of the Arrivals attribution tab
- User guide for saving and sharing models
- Minor display edits

Model Overview

The Urban Freight Forecasting Model (UFFM) performs two main functions:

1. Provides daily profiles of the volume and types of freight & servicing activity that a building is likely to generate across a typical weekday, based on building information entered by the user.
2. Assesses the performance of loading dock parking spaces provided by a development to manage the freight demand generated by the building.

The objective of the model is to assist planners and developers in understanding the facilities that will be appropriate for a development to be self-sufficient in managing its own freight and servicing activity.

Model Process Flow

Once information has been entered on the 'Inputs' page and the calculate button has been pressed, the output tabs will be unlocked. For the 'Efficacy' and 'Utilisation' tabs, information on dock spaces is also needed.

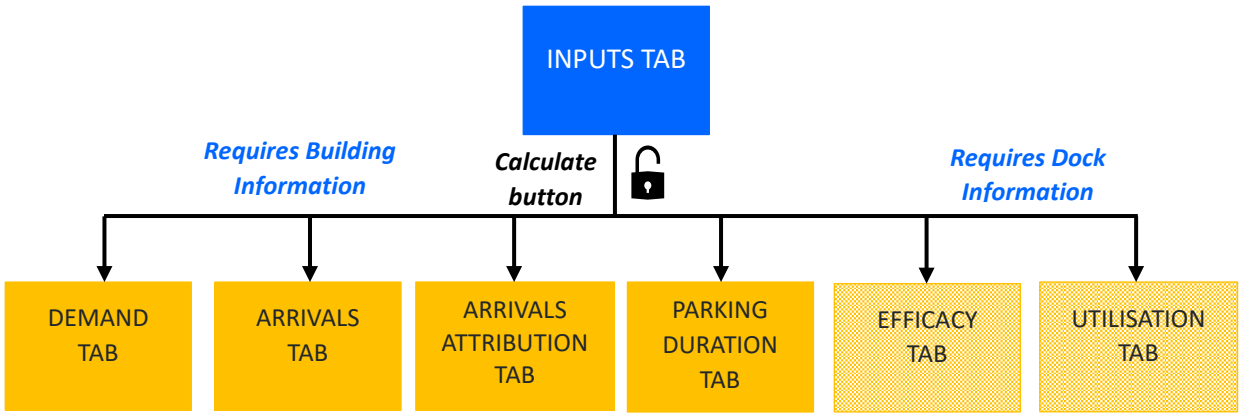


Figure 1: Overview of model

User Access

Existing Users

Users can access the model via the URL: https://lastmileff.transport.nsw.gov.au/ and entering their Smart ID Connect username and password.

Due to the limited number of licenses, the application will automatically log out after 30 minutes.

New Users

New users can request an account from the Urban Freight team via email at freight@transport.nsw.gov.au.

Once the team has set up the account, the following confirmation email will be sent to your inbox which will guide you through the set-up process.

Figure 2: Confirmation email

Inputs

After logging into the web application, users will be presented with the 'Inputs' tab. This is the only tab in the model that requires information. Cells that require an input are highlighted in yellow.

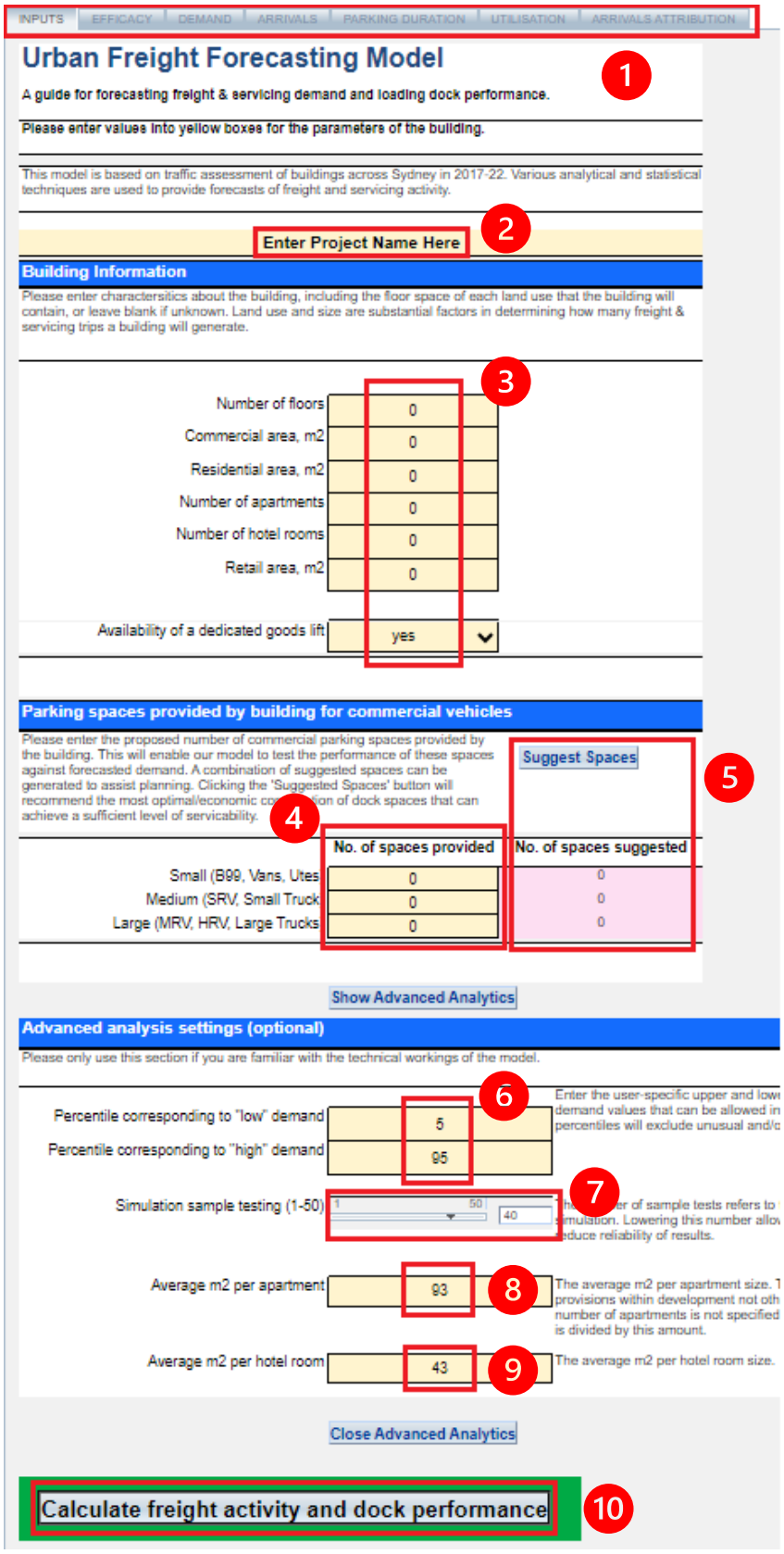


Figure 3: Inputs tab

Reference	Explanation
1	Each tab of the model is displayed along the top of the page. The 'Inputs' tab will always be available for editing; however, the other output tabs will be locked until information has been provided on the Inputs tab and the calculate button has been pressed.
2	Enter the name of your project (optional)
3	Enter information about the building. This information determines the freight & servicing demand of the building. • **Number of Floors:** Enter the number of floors that make up the building. More floors translate to longer average service times. Value must be greater than zero. • **Commercial Area:** Enter the square meters of the building dedicated to commercial land use such as office space. • **Residential Area OR Number of Apartments:** Enter the square meters of the building dedicated to living space. This includes apartments and any other shared spaces used by residents. Alternatively, users can enter the number of apartments the building will provide. If both values are entered, then the *Number of apartments* will override *residential area.* • **Number of Hotel Rooms:** Enter the number of hotel rooms. This works with the square meters per room in the Advanced Analysis settings (point 9 below). • **Retail Area:** Enter the square meters of the building dedicated to retail land use such as shops, restaurants, etc. Retail generates more freight activity than commercial. • **Availability of a dedicated goods lift:** Select Yes or No. Buildings with dedicated goods elevators tend to have reduced service times than those without. *Availability of dedicated goods lift* drop down contains a blank option in the list. Selecting this will default to the last value in the list.
4	While the dock information section is optional for calculating the freight demand of the building, it's needed for the model to assess dock performance and utilisation. These fields offer the capability to test different combinations of dock space sizes in relation to demand. Medium spaces can also accommodate small vehicles and similarly large spaces can accommodate medium and small vehicles.
5	As a starting point to assist, the model offers to calculate an ideal combination of dock spaces for the building based on the building information provided. These values are set to zero after first launching the tool. Note that this aims for a 95% service level solution and it can only work in integers.
6	In various output tabs like 'Demand', the model breaks down the profiles into 'low', 'average' and 'high' outcomes. By defining the upper and lower percentiles, the model samples the lowest and highest figures from the simulation to illustrate off-peak and peak days. The default values are 5% and 95% which means the model will consider the smallest 5% of the simulation outcomes as part of the 'low' average, and the highest 5% of outcomes as part of the 'high' average.
7	In the simulation, the model samples up to 50 possible demand profiles per hour from surveyed data. The smaller the number, the quicker the processing time, however it may affect the reliability of results.
8	This option allows users to manually set the size of an apartment. This works in partnership with the defined **Residential Area** to determine an approximate number of apartments.
9	This option allows users to manually set the size of a hotel room. This works in partnership with the defined **Number of hotel rooms** to calculate the size of a hotel. This is intended to include common space within the hotel. Please see further notes below.
10	When all your building parameters are set, press the calculate button. A message box will appear to confirm the process is running and that it will take approximately 40 seconds.

Notes

Building size

Regression analysis parameters and new data points have been updated to produce improved results for larger buildings. The model is reliable to produce results for large buildings but may not be most as accurate for planning entire precincts in a single pass. A precinct could be 150,000m^2 or larger. If you would like to discuss an approach to doing this please contact us at freight@transport.nsw.gov.au to discuss approaches.

Hotels

We have designed the model similar to historic approaches. This reflects the approach that hotels may be of different grades and provide different amounts of facilities. For hotels:

Input parameters	Notes
Enter the number of rooms. Note the parameter for average room size in the Advanced Analysis settings	The average space is intended to include the size of rooms and common space (corridors, lobbies etc)
Use retail area to describe restaurants, bars, kitchen space and boutiques	This will account for the variety of facilities that a hotel may offer. Some may have multiple restaurants, others may have a simple small coffee shop. Obviously, this will impact the freight and servicing task to the hotel.
Use commercial area to describe other common and activity space this might include extended lobby areas, ballrooms, offices and gym areas	This space can also generate a small amount of freight and servicing activity (cleaning, maintenance, event deliveries etc)

Inputs for a hotel may therefore look like the following:

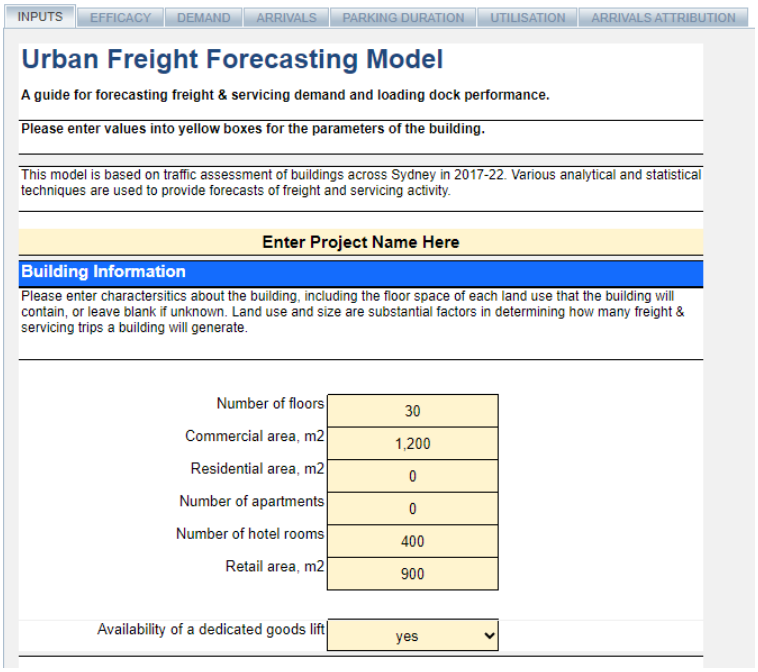


Figure 4: A large hotel with multiple restaurant bar and dining options and other facilities

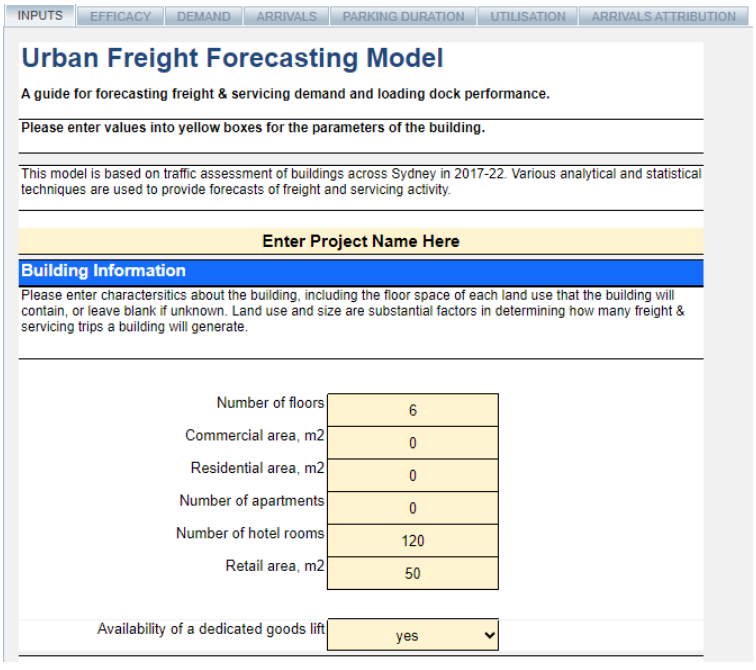


Figure 5: A small boutique hotel with a small coffee shop and no other facilities

Outputs

Efficacy

Once the calculate process has run, the website will automatically redirect the user to the 'Efficacy' tab.

The 'Efficacy' tab displays results regarding dock performance. If no dock space information is entered on the 'Inputs' tab, the values in this tab will either be blank or contain errors.

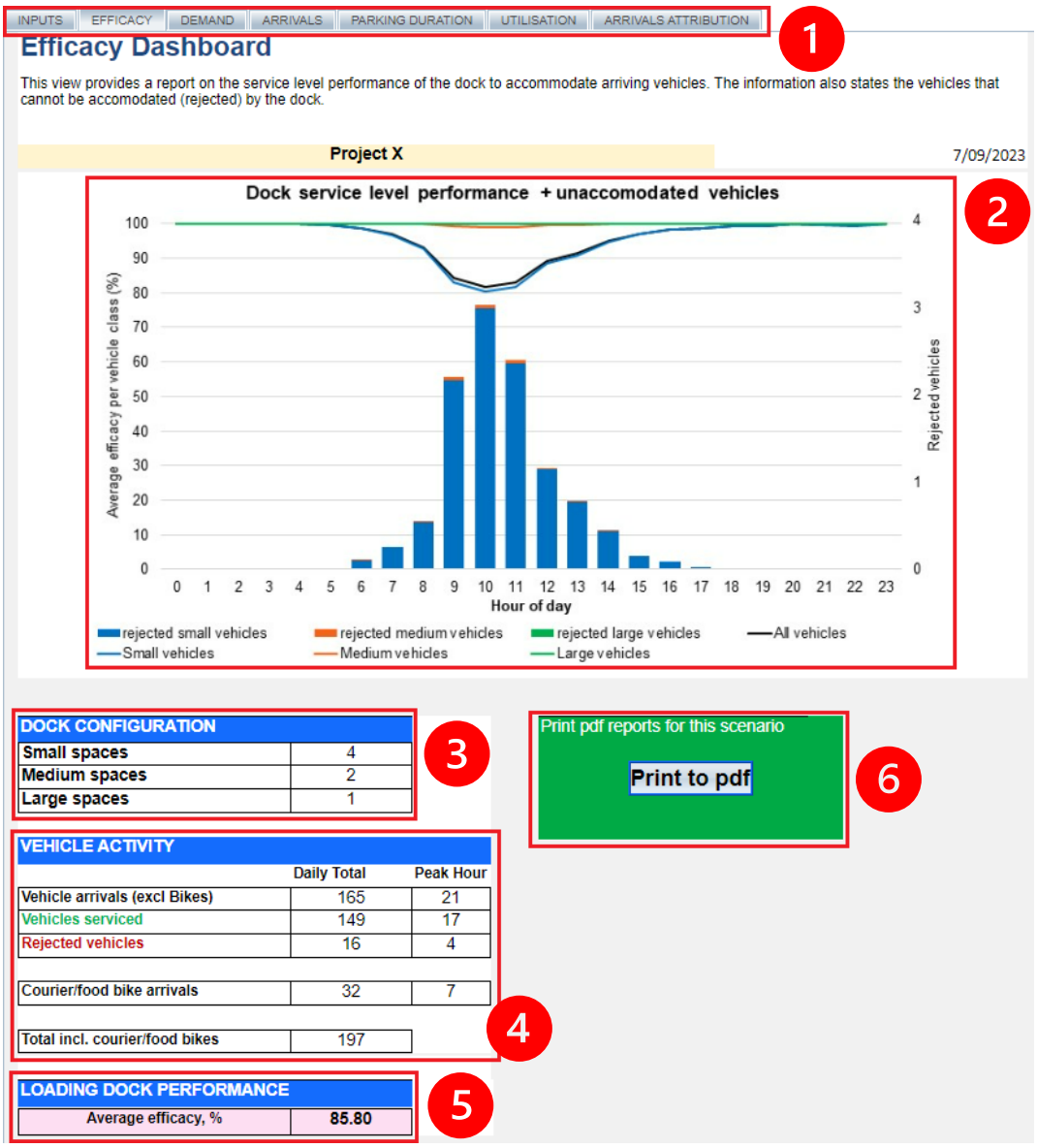
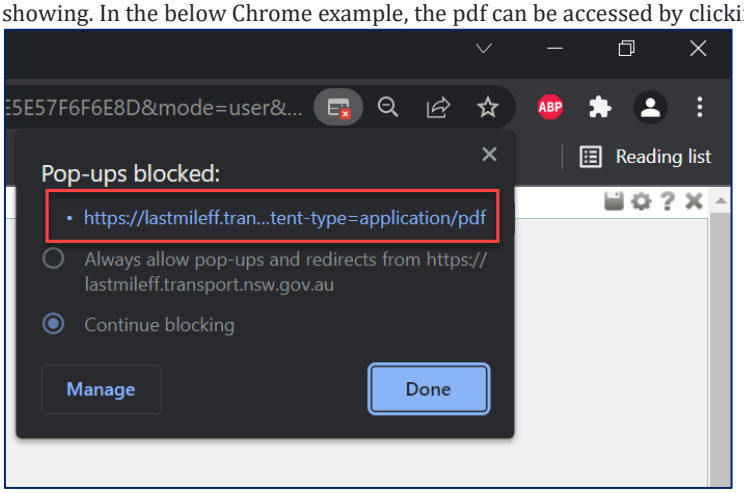


Figure 6: Efficacy tab

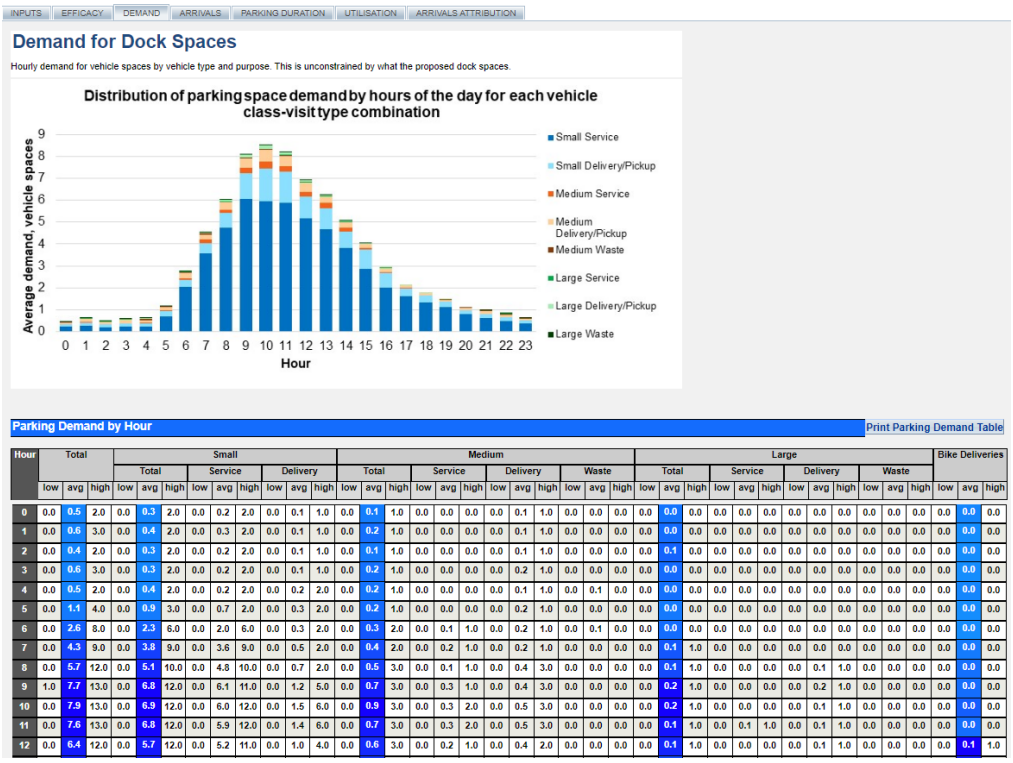
Reference	Explanation
1	All tabs of the model will now be available at this point in the process, including the 'Inputs' tab if some information needs to be changed
2	The main output of this page is the efficacy graph which plots two sets of data across an hourly profile. 1. The first vertical axis, *Average efficacy per vehicle class,* shows what percentage of each type of vehicle class was able to be serviced by the dock. Fig 6 shows 100% of large vehicles were able to be serviced by the dock (green line), however, only 80% of small vehicles (blue line) were able to be accommodated by the dock at 10am. 2. The second vertical axis, *Rejected vehicles,* shows the number of vehicles which arrived and were unable to be serviced due to space and time constraints. These are vehicles that would be turned back onto the public network, contributing to congestion, and on street parking demand. Due to the simulation sampling, this probability number may be a decimal. While efforts have been made to present this graph as a 'typical weekday' scenario, it's important to note this graph takes an average of a series of possibilities generated by a simulation.
3	A summary of loading dock space configuration entered on the 'Inputs' tab.
4	A summary of how many vehicles arrived and were able to be serviced and rejected during the day and busiest hour (i.e. peak hour). Also contains a daily total which includes bicycle/motorbike deliveries. These are reported on separately throughout the other output tabs as they don't tend to use full size dock parking facilities.
5	The average efficacy shows the overall percentage of vehicles (all sizes excluding bikes) able to be accommodated by the dock. The higher the number, the more effective the dock is.
6	There is an option to print this page to a pdf for record keeping or sharing. Please note, some organisations have security protocols that may block the pdf pop-up from showing. In the below Chrome example, the pdf can be accessed by clicking the link.  *Figure 7: Pop-Up Blocking in Chrome*

Demand

The demand tab shows the hourly breakdown of spatial demand required by the building. Spatial demand refers to the amount of parking spaces demanded by vehicle arrivals. Demand is further categorized by vehicle class and activity type. This is represented cumulatively per hour in the bar graph.

The tabulated form below the graph also gives low and high case scenarios which are based on the lowest/highest 5% of simulated possibilities. These can be manually changed via the Advanced Analytics section on the 'Inputs' tab.

There is a button located on the top right of the 'Parking Demand by Hour' table which can be used to print the tabular data to a PDF format.



Hour	Total			Small									Medium										Large										Bike Deliveries		
				Total			Service			Delivery			Total			Service			Delivery			Waste			Total			Service			Delivery			Waste					
	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high	low	avg	high
0	0.0	0.5	2.0	0.0	0.3	2.0	0.0	0.2	2.0	0.0	0.1	1.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.6	3.0	0.0	0.4	2.0	0.0	0.3	2.0	0.0	0.1	1.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.4	2.0	0.0	0.3	2.0	0.0	0.2	2.0	0.0	0.1	1.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.6	3.0	0.0	0.3	2.0	0.0	0.2	2.0	0.0	0.1	1.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.5	2.0	0.0	0.4	2.0	0.0	0.2	2.0	0.0	0.2	2.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	1.1	4.0	0.0	0.9	3.0	0.0	0.7	2.0	0.0	0.3	2.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	2.6	8.0	0.0	2.3	6.0	0.0	2.0	6.0	0.0	0.3	2.0	0.0	0.3	2.0	0.0	0.1	1.0	0.0	0.2	1.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	4.3	9.0	0.0	3.8	9.0	0.0	3.6	9.0	0.0	0.5	2.0	0.0	0.4	2.0	0.0	0.2	1.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	5.7	12.0	0.0	5.1	10.0	0.0	4.8	10.0	0.0	0.7	2.0	0.0	0.5	3.0	0.0	0.1	1.0	0.0	0.4	3.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.0
9	1.0	7.7	13.0	0.0	6.8	12.0	0.0	6.1	11.0	0.0	1.2	5.0	0.0	0.7	3.0	0.0	0.3	1.0	0.0	0.4	3.0	0.0	0.0	0.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.0
10	0.0	7.9	13.0	0.0	6.9	12.0	0.0	6.0	12.0	0.0	1.5	6.0	0.0	0.9	3.0	0.0	0.3	2.0	0.0	0.5	3.0	0.0	0.0	0.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.0
11	0.0	7.6	13.0	0.0	6.8	12.0	0.0	5.9	12.0	0.0	1.4	6.0	0.0	0.7	3.0	0.0	0.3	2.0	0.0	0.5	3.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.1	1.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.0
12	0.0	6.4	12.0	0.0	5.7	12.0	0.0	5.2	11.0	0.0	1.0	4.0	0.0	0.6	3.0	0.0	0.2	1.0	0.0	0.4	2.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.0	1.0

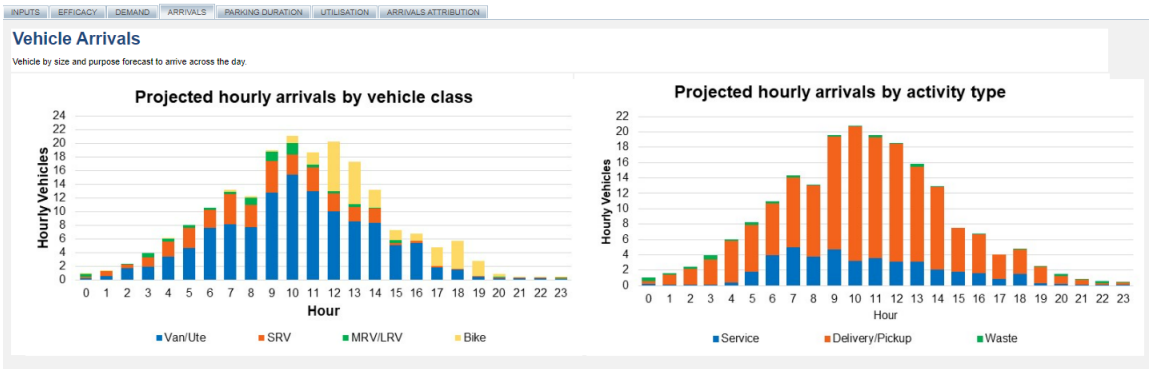
Figure 8: Demand tab

Figure 8 shows that for the hour of 10am, 6.9 parking spaces were demanded by all small vehicles. In total there is an average demand for 7.9 spaces within the hour.

Arrivals

Arrivals refer to the absolute number of freight & servicing vehicles arriving to the building for a delivery or service.

The two graphs on this tab display these numbers by vehicle class and activity type, with the tabulated form shown below.



Hour	Vehicle class				Total (excl Bikes)	Activity type			Total (incl Bikes)
	Bike	Van/Ute	SRV	MRV/LRV		Service	Delivery/Pickup	Waste	
0	0.01	0.22	0.27	0.36	0.84	0.18	0.38	0.48	1.04
1	0.01	0.59	0.66	0.09	1.33	0.13	1.26	0.24	1.63
2	0.00	1.66	0.57	0.05	2.27	0.14	2.01	0.30	2.45
3	0.00	1.89	1.42	0.63	3.94	0.10	3.28	0.52	3.90
4	0.01	3.40	2.19	0.40	5.99	0.36	5.45	0.22	6.03
5	0.00	4.67	2.98	0.38	8.03	1.79	6.06	0.41	8.26
6	0.00	7.61	2.61	0.35	10.57	3.91	6.81	0.27	10.98
7	0.41	8.11	4.50	0.24	12.85	4.97	9.11	0.25	14.33
8	0.14	7.72	3.30	1.08	12.09	3.80	9.18	0.14	13.12
9	0.18	12.80	4.68	1.32	18.80	4.73	14.68	0.15	19.57
10	1.09	15.43	2.91	1.69	20.03	3.16	17.57	0.10	20.83
11	1.73	12.97	3.52	0.45	16.93	3.54	15.72	0.27	19.53
12	7.36	10.02	2.62	0.33	12.96	3.07	15.36	0.07	18.50
13	6.22	8.55	2.10	0.50	11.14	3.08	12.39	0.34	15.81
14	2.71	8.33	2.13	0.10	10.56	2.05	10.75	0.05	12.85
15	1.54	5.04	0.36	0.41	5.81	1.78	5.71	0.00	7.49
16	1.02	5.36	0.31	0.05	5.72	1.64	5.04	0.03	6.71
17	2.75	1.81	0.26	0.00	2.06	0.87	3.15	0.00	4.02
18	4.09	1.54	0.09	0.00	1.63	1.48	3.20	0.02	4.70
19	2.23	0.42	0.09	0.03	0.53	0.31	2.09	0.14	2.54
20	0.48	0.23	0.15	0.03	0.40	0.16	1.09	0.25	1.50
21	0.12	0.27	0.07	0.03	0.36	0.14	0.60	0.07	0.81
22	0.05	0.20	0.12	0.00	0.33	0.14	0.19	0.21	0.54
23	0.03	0.14	0.09	0.09	0.32	0.07	0.28	0.18	0.53
Totals	*32.19*	*118.96*	*37.96*	*8.57*	*165.49*	*41.60*	*151.34*	*4.73*	*197.67*

Figure 9: Arrivals tab

Parking Duration

The 'Parking Duration' tab shows a table of average dwell times by vehicle class/activity type for vehicles that arrive within that hour. Time is expressed in minutes.

#N/A values that appear in this table mean there is insufficient data to perform the calculation based on the inputs and simulated outcomes.

INPUTS | EFFICACY | DEMAND | ARRIVALS | PARKING DURATION | UTILISATION | ARRIVALS ATTRIBUTION

Parking Duration

The duration that vehicles are in the dock. The model considers variance across the day based on research. Values are in minutes.

Hour	Small	Medium	Large	Service	Delivery	Waste	Bikes
0	27.41	13.17	45.20	38.34	10.63	7.07	3.65
1	12.86	8.78	25.57	19.25	5.25	3.26	2.00
2	3.60	2.00	5.60	5.33	2.02	2.00	2.00
3	11.92	5.83	21.09	19.13	5.32	3.38	2.00
4	14.16	11.05	18.59	22.97	6.19	3.78	2.11
5	16.05	9.85	6.94	20.95	5.88	4.06	2.11
6	19.58	11.21	25.29	22.46	6.46	4.07	2.26
7	22.43	18.36	21.09	25.27	7.05	4.91	2.53
8	27.14	19.56	23.18	30.52	8.88	5.81	3.08
9	18.51	16.39	13.51	21.58	6.13	3.85	2.17
10	25.39	23.03	19.47	30.80	8.54	5.49	3.08
11	21.87	19.07	23.22	26.33	7.22	5.18	2.63
12	18.82	16.15	18.06	22.03	6.18	3.94	2.21
13	31.00	31.23	29.00	36.71	9.83	7.29	3.67
14	23.44	20.07	19.14	27.40	7.50	4.81	2.76
15	23.00	21.11	22.53	28.58	7.46	6.43	2.89
16	18.34	13.63	31.66	23.20	6.11	#NA	2.34
17	21.20	15.94	36.02	25.04	6.66	#NA	2.53
18	21.40	9.14	11.72	24.87	6.75	4.37	2.56
19	22.32	9.77	12.01	25.55	7.03	4.48	2.62
20	17.49	6.55	#NA	20.49	5.87	3.60	2.11
21	21.86	9.60	21.98	26.65	7.77	4.98	2.70
22	26.94	10.72	46.91	34.74	10.03	6.08	3.52
23	97.46	38.74	84.65	124.48	35.37	23.95	12.60
Average	23.02	17.42	21.96	27.36	7.62	5.81	3.00
Max	97.46	38.74	84.65	124.48	35.37	23.95	12.60

Note: "#NA" implies the estimated parking demand is Zero for this particular vehicle type or activity type, making parking duration irrelevant during this hour interval

Figure 10: Parking Duration tab

Utilisation

The graph on this tab shows how much dock space capacity was used throughout the day, expressed in percentages.

Beneath the utilisation graph is a table showing how many parking spaces were used when factoring smaller vehicles occupying empty larger spaces.

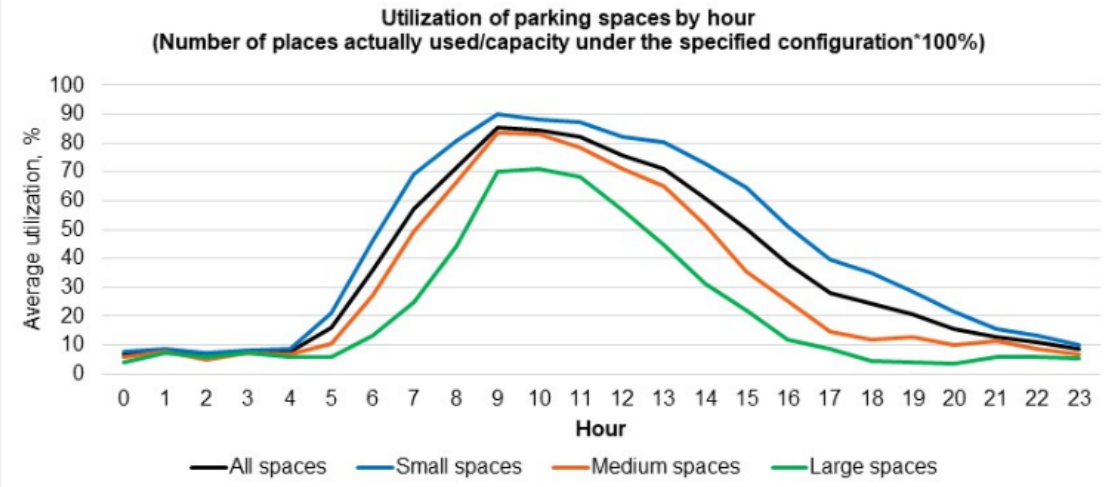
This graph and data as shown in Figure 11 look similar to the demand figures in Figure 8. This shows how many spaces are being used when factoring for smaller vehicles occupying larger spaces (optimisation), whereas the demand figures illustrate how much parking space is demanded by arrivals.

Further profiles of this information are included in the output print function (from the 'Efficacy' tab).

INPUTS | EFFICACY | DEMAND | ARRIVALS | PARKING DURATION | UTILISATION | ARRIVALS ATTRIBUTION

Utilisation of dock spaces

Summary of the dock spaces planned to be used across the day. Demand tab illustrates requirements. Information in this tab considers the dock spaces planned.



Number of parking spaces actually used, by hour

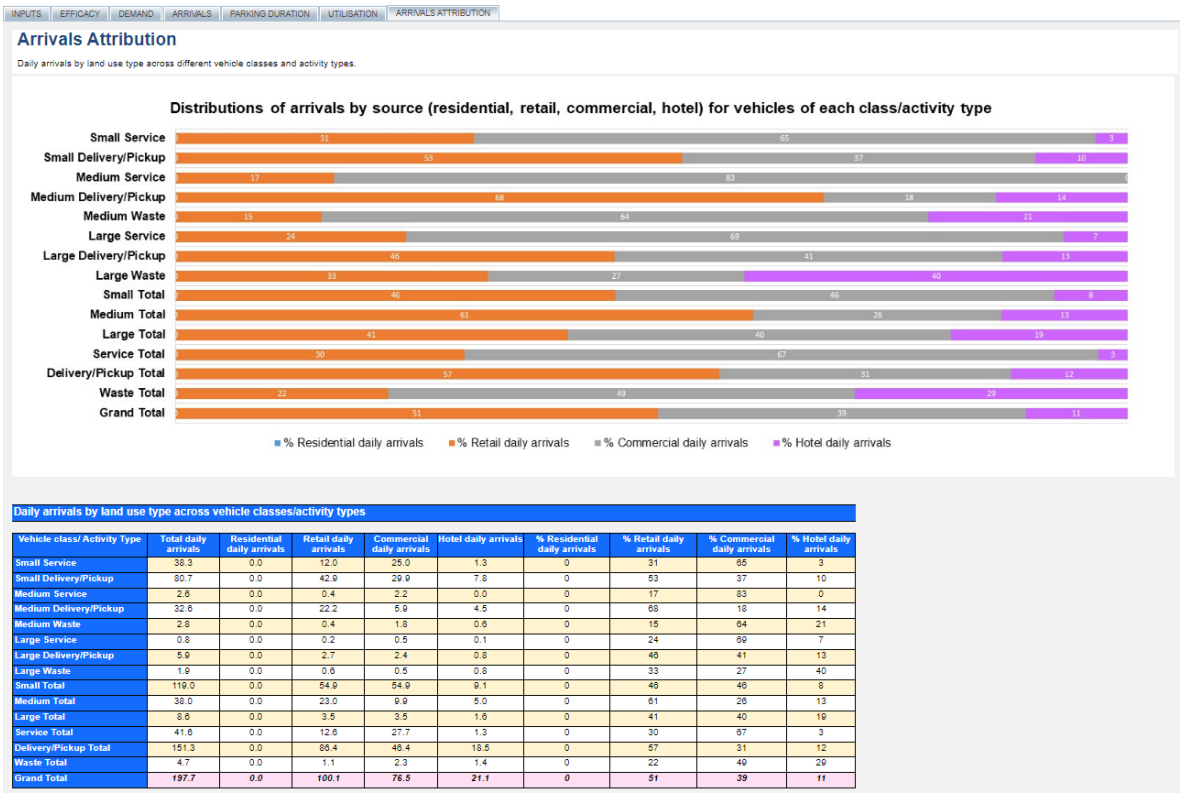
Hour	All spaces			Small spaces			Medium spaces			Large spaces		
	low	avg	high	low	avg	high	low	avg	high	low	avg	high
0	0.0	0.5	2.0	0.0	0.3	2.0	0.0	0.1	1.0	0.0	0.0	0.0
1	0.0	0.6	3.0	0.0	0.4	2.0	0.0	0.2	1.0	0.0	0.1	1.0
2	0.0	0.4	2.0	0.0	0.3	2.0	0.0	0.1	1.0	0.0	0.1	1.0
3	0.0	0.6	3.0	0.0	0.3	2.0	0.0	0.1	1.0	0.0	0.1	1.0
4	0.0	0.5	2.1	0.0	0.4	2.0	0.0	0.1	1.0	0.0	0.1	1.0
5	0.0	1.1	4.0	0.0	0.8	3.0	0.0	0.2	2.0	0.0	0.1	1.0
6	0.0	2.5	7.0	0.0	1.9	4.0	0.0	0.5	2.0	0.0	0.1	1.0
7	0.0	4.0	7.0	0.0	2.8	4.0	0.0	1.0	2.0	0.0	0.3	1.0
8	0.0	5.0	7.0	0.0	3.2	4.0	0.0	1.3	2.0	0.0	0.4	1.0
9	1.0	6.0	7.0	0.0	3.6	4.0	0.0	1.7	2.0	0.0	0.7	1.0
10	0.0	5.9	7.0	0.0	3.5	4.0	0.0	1.7	2.0	0.0	0.7	1.0
11	0.0	5.7	7.0	0.0	3.5	4.0	0.0	1.6	2.0	0.0	0.7	1.0
12	0.0	5.3	7.0	0.0	3.3	4.0	0.0	1.4	2.0	0.0	0.6	1.0

Figure 11: Utilisation tab

Arrivals Attribution

'Arrivals Attribution' tab shows the distribution of all vehicle arrivals by land use type across different vehicle classes and activity types on a typical weekday.

The graph on this tab displays the percentage value of these daily arrivals and the tabulated form below displays both the number and percentage values of these daily arrivals.



Vehicle class/ Activity Type	Total daily arrivals	Residential daily arrivals	Retail daily arrivals	Commercial daily arrivals	Hotel daily arrivals	% Residential daily arrivals	% Retail daily arrivals	% Commercial daily arrivals	% Hotel daily arrivals
Small Service	38.3	0.0	12.0	25.0	1.3	0	31	65	3
Small Delivery/Pickup	80.7	0.0	42.9	29.9	7.8	0	53	37	10
Medium Service	2.6	0.0	0.4	2.2	0.0	0	17	83	0
Medium Delivery/Pickup	32.6	0.0	22.2	5.9	4.5	0	68	18	14
Medium Waste	2.8	0.0	0.4	1.8	0.6	0	15	64	21
Large Service	0.8	0.0	0.2	0.5	0.1	0	24	69	7
Large Delivery/Pickup	5.9	0.0	2.7	2.4	0.8	0	46	41	13
Large Waste	1.9	0.0	0.6	0.5	0.8	0	33	27	40
Small Total	119.0	0.0	54.9	54.9	9.1	0	46	46	8
Medium Total	38.0	0.0	23.0	9.9	5.0	0	61	26	13
Large Total	8.6	0.0	3.5	3.5	1.6	0	41	40	19
Service Total	41.6	0.0	12.6	27.7	1.3	0	30	67	3
Delivery/Pickup Total	151.3	0.0	86.4	46.4	18.5	0	57	31	12
Waste Total	4.7	0.0	1.1	2.3	1.4	0	22	49	29
Grand Total	*197.7*	*0.0*	*100.1*	*76.5*	*21.1*	*0*	*51*	*39*	*11*

Figure 12: Arrivals Attribution tab

Saving to your workspace and sharing results

Workspace enables you to save models and come back to them again later.

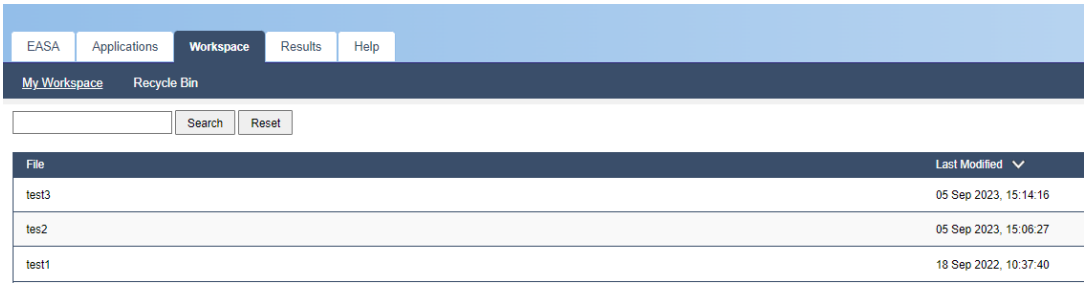


Figure 13: Workspace in EASA

To save the model to your workspace click on the small blue save icon at the top right of your screen. A message appears when you hover over the icon.

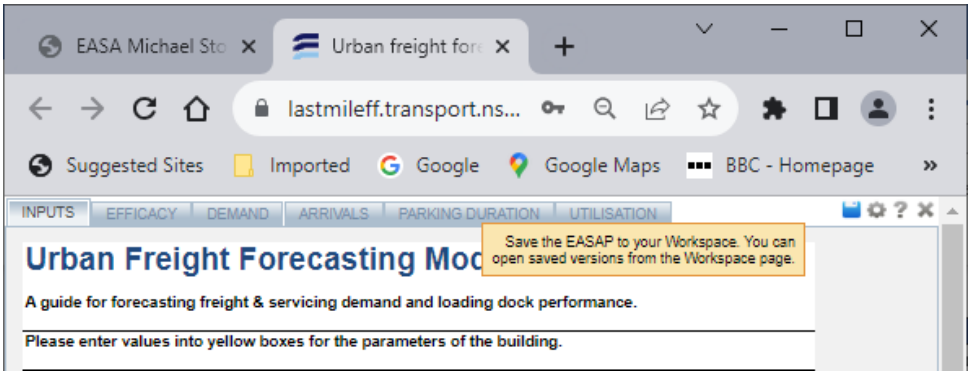


Figure 14: Saving the model to your Workspace

The program also enables you share saved models with colleagues in the same workgroup as yourself.

This requires a workgroup to be established. It requires you to contact us at **Freight@transport.nsw.gov.au** and ask for a workgroup to be created including which users you wish to be included.

Once set up a user in the same workgroup can click on the icon below EASAP in Results > All Results to open the model.

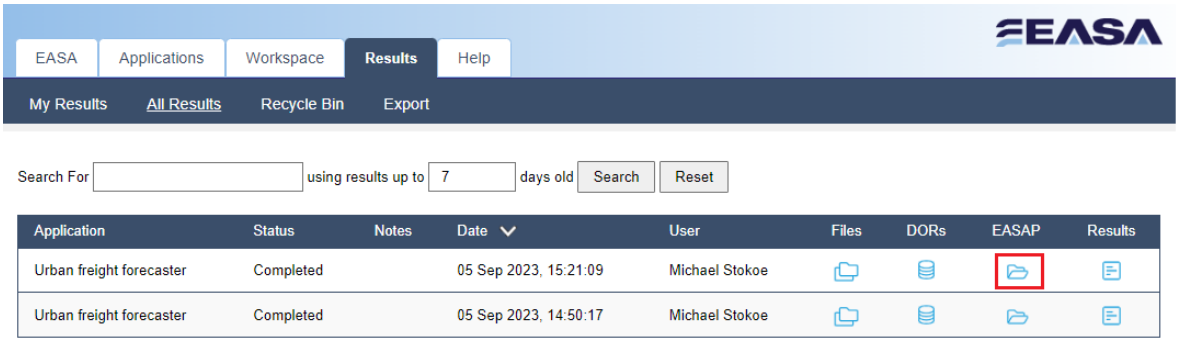


Figure 15: Opening a saved model

The icon to save to a group is the cog at the top right.

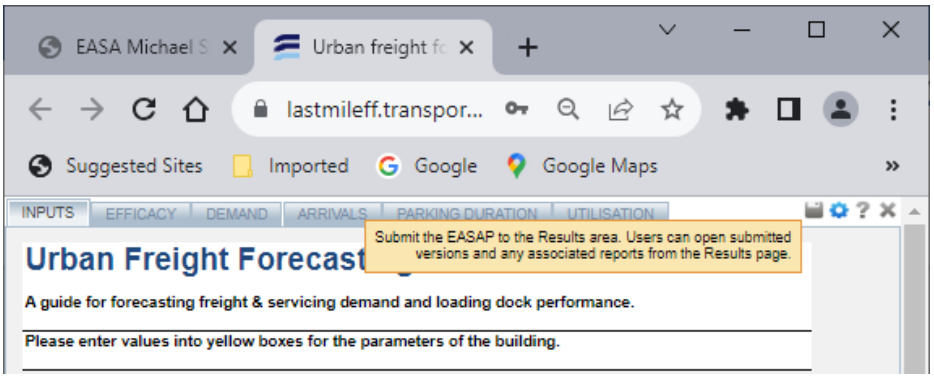


Figure 16 Saving your model to the results tab to share