



movement
strategies

Co-op Live Canalside Development

➔ Pedestrian Circulation Assessment

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Table of Contents

Section	Page
Executive Summary	04
Introduction and Scope	08
Assumptions	10
Scenario 1: Canalside Development only	22
Scenario 2: Canalside and Arena	34
Scenario 3: Canalside, Arena and Stadium	39
Summary of Arena and Stadium Event Days	45
Appendix A: Dynamic Modelling	46





Executive Summary

Executive Summary

Introduction and Scope

GHD's Movement Strategies team has been commissioned by Co-op Live to undertake a high-level assessment of the impact of the proposed Canalside Development on pedestrian circulation. The assessment has been undertaken with reference to *The Guide to Safety at Sports Grounds, 6th Edition*, considering the Canalside Development as part of an event space.

The key analysis from a crowd flow perspective is to provide evidence that supports the capacity calculations. The methods of analysis in this phase are static/spreadsheet modelling (which is the methodology applied to test designs in relation to *The Guide to Safety at Sports Grounds*) and the Etihad Campus SENSE network model.

A component dynamic model of the Arena and Joe Mercer Way has been constructed in order to better understand pedestrian merging on Joe Mercer Way by Arena Exit E and the extent of the queue footprint (if any). The scenario comprising Stadium departures followed by Arena departures 30 minutes later has been assessed.

The main purpose of this report is to present the proposed operation of the Canalside Development, including some operational interventions agreed, on event days when the Arena and / or Stadium are in operation.

Assumptions

The Co-op Live Arena has been assumed to host a full capacity event, with 23,500 spectators and 800 workforce on site.

For any scenarios including the Etihad Stadium, it has been assumed that the North Stand construction has been completed, with 60,790 spectators on site and up to 1,932 workforce.

For the purpose of SENSE network modelling an 8-minute Arena spectator departure has been assumed. This is in line with agreed parameters used for planning purposes in the wider Etihad Campus SENSE model runs.

Pedestrian surveys of the Arena in May, September, October, November and December 2024 indicate that 80% of spectators depart over 15 minutes, with a peak of around 35% departing over a 5-minute period. For all static calculations a departure profile of 100% of spectators over 15 minutes has been assumed.

Canalside Development only

The Canalside Development visitor population will be capped at 500 persons. For the purpose of assessments in this report, a visitor population of 520 persons has been assumed, based on the standing area estimated to be available.

A review of the proposed layout indicates:

- The head of stair barriers leading to Level -1 and Level -2 will be retained. These are existing structures, providing circulation widths of less than 1.20 metres at some locations. Given that these are existing structures, serving low numbers of visitors, it is assumed all routes will be in use.
- The layout of the stairs leading from Ground Level to Level -1 and Level -2 will be changed so one stair channel leads to Level -1 and one stair channel leads to Level -2. **The detail of the layout at this location is currently under development.**
- We understand that the existing concrete blocks on the side of the Arena building line are concrete doorstops. These are assumed to remain in place, with the associated loss of pedestrian circulation width available.
- The proposed Canalside Development will generally reduce the pedestrian circulation width available from 14 metres to 7.6 metres. At some locations, there will be minimum widths of 5.0 metres to 6.5 metres.

A review of the proposed arrivals operation indicates:

- Access to the lift and stairs leading to the First Floor will be managed
- Access to the stairs leading to Level -1 and Level -2 will be managed, but are generally expected to be used by relatively low numbers of people.
- Provision of a 1.20 metre (minimum) to 1.80 metre (desirable minimum for two-way wheelchair circulation) corridor would provide sufficient circulation width for all visitors to arrive over a 15-minute period.



Executive Summary

A review of the proposed facilities indicates:

- The lift provision is estimated to have capacity to accommodate 67 to 116 persons every 15 minutes or 22 to 29 wheelchairs every 15 minutes.
- The toilet provision is estimated to have capacity to accommodate 36 to 53 persons every 15 minutes or 4 to 5 wheelchair users every 15 minutes.
- The bar counters are estimated to have capacity to serve 129 to 432 persons every 15 minutes.
- The food counters are estimated to have capacity to serve 40 to 72 persons every 15 minutes.

A review of the proposed departures operation indicates:

- If visitors from the Ground Floor are directed via the pedestrian routes on the south side of the Canalside Development, some management may be required where these merge with visitors departing Level -1.
- The proposed arrangement for Level -2 includes using the existing stairs with dedicated stair channels. The onward capacity as visitors move away from the stairs is less than the channel capacity of the stairs. There are low numbers of people using these routes, but these may result in some queuing on exit.

A review of the proposed evacuation operation indicates:

- There are similar considerations as for the departure operation.
- Wheelchair users on the First Floor may need to be managed, if using the lift available



Proposed Canalside Development



Proposed Canalside Development



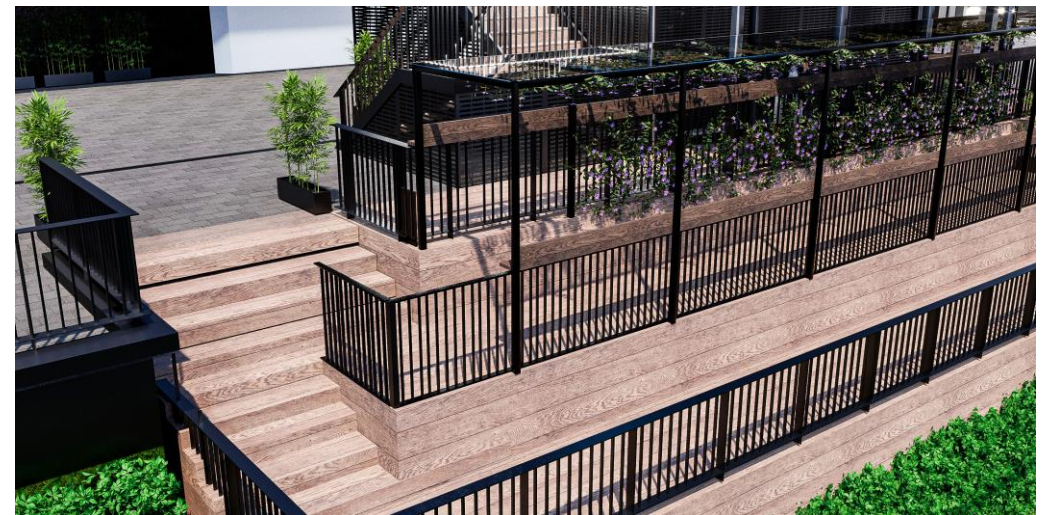
Executive Summary

Summary of Arena and Stadium event days

- During Arena arrivals periods, Arena and Canalside Development frontage operations will need to be considered but should not restrict pedestrian flow unless their combined footprint exceeds 2.0 metres at locations with minimum circulation widths available.
- During Arena departures periods (when the Canalside Development is assumed to be closed), **the frontage of the Canalside Development will be removed, in order to provide a circulation width of 6.58 metres. This will result in a maximum flow rate of 72 persons / minute / metre width.** This is in excess of the performance targets but less than the maximum permitted for one directional flow. Should additional circulation space be required, removal of the concrete doorstops could be considered (replaced with an alternative doorstep system).
- During Stadium and Arena event days, when there is an Arena departure (with the associated interventions in place) 30 minutes after a Stadium departure there may be queuing on Joe Mercer Way, although this is not shown as extending onto the Arena upper external concourse / podium by the Canalside Development. **Dynamic modelling for a superseded Canalside Development layout is presented in Appendix A. Whilst the unit layout is different, the model findings on how pedestrian flows merge on Joe Mercer Way should still provide an indication of the level of congestion to be expected.**
- During Stadium and Arena event days, when there is simultaneous Arena and Stadium departures **and** the Special Measures Operations are in place, the Canalside Development (with the Arena departures interventions in place) should not interfere with pedestrian movement.
- **The emergency evacuation assessment indicates the planned operation could be accommodated with the Canalside Development in place.** The sensitivity scenario highlights the importance of having Forge Lane Bridge (and potentially the emergency access onto Alan Turing Way) available as an alternative route.



Proposed Canalside Development



Proposed Canalside Development



Introduction and Scope



Introduction and Scope

Eastland Arena Limited (Co-op Live) is looking to construct a standalone (not attached to the Arena building line) Canalside Development (entertainment unit) on the south side of the Arena's upper external concourse / podium. The structure will be located between the fan services area and the canal (between Entrance E and Entrance F, to the west of Forge Lane Bridge).

GHD's Movement Strategies team has been commissioned by Co-op Live to undertake a high-level assessment of the impact of the proposed Canalside Development on pedestrian circulation. The assessment has been undertaken with reference to *The Guide to Safety at Sports Grounds, 6th Edition*, considering the Canalside Development as part of an event space.

The following modes of operation have been considered:

- Scenario 1: Canalside Development only (Co-op Live and Etihad Stadium are not in operation)
- Scenario 2: Canalside Development in operation on a Co-op Live event day (no Etihad Stadium in operation)
- Scenario 3: Canalside Development in operation on a Co-op Live and Etihad Stadium event day (a range of event timing scenarios)

The key analysis from a crowd flow perspective is to provide evidence that supports the capacity calculations. The methods of analysis in this phase are static/spreadsheet modelling (which is the methodology applied to test designs in relation to *The Guide to Safety at Sports Grounds*) and the Etihad Campus SENSE network model. Microsimulation modelling of a worst-case scenario identified has also been undertaken to understand the potential level of queuing on Joe Mercer Way.

The analysis undertaken looks to demonstrate the target capacity that can be achieved by assessing the Canalside Development and surrounding area for ingress capacity, normal egress time and emergency evacuation time.

The analysis will also aim to assist in identifying design and operational considerations associated with attendee's experience, particularly in the light of it being a premium offer.

This report has been structured as follows:

- **Executive Summary** – provides an overview of the key findings and recommendations
- **Introduction and Scope** – provides an overview of the scope of works undertaken
- **Assumptions** – provides a summary of input data and performance targets used to assess the proposed Canalside Development
- **Scenario 1: Canalside Development only** – an assessment of the proposed structure in terms of pedestrian circulation for arrivals, departures and emergency evacuation.
- **Scenario 2: Canalside and Arena** – an assessment of the impact of the proposed structure when the Arena is operating with 23,500 spectators in attendance.
- **Scenario 3: Canalside, Arena and Stadium** – an assessment of the impact of the proposed structure when the Arena and Stadium are operating with 23,500 spectators and up to 61,000 spectators in attendance, respectively.
- **Summary of Arena and Stadium Event Days** – a summary of the key findings to be considered.
- **Appendix A: Dynamic modelling** – an assessment of the Stadium post event departures followed by the Arena post event departures 30 minutes later, using Legion software. The purpose of this assessment is to determine the extent of queuing, if any, at the junction of Joe Mercer Way and Arena Exit E. It should be noted that the Canalside Development building layout used in the model has now been superseded. This should not detract from the model findings.

The main purpose of this report is to present the proposed operation of the Canalside Development, including some operational interventions agreed, on event days when the Arena and / or Stadium are in operation.



Assumptions



Performance Targets

Flow Rates (Unidirectional)

The following flow rates are used for the evacuation assessment:

- 66 people / minute / metre width on stepped surfaces
- 82 people / minute / metre width on flat surfaces

Source: SGSA, 2018; Guide to Safety at Sports Grounds, 6th edition

Flow Densities

Performance targets for flow densities are defined separately for walkways and queues during different periods.

For walkways, targets are set for flows occurring during Ingress, Interval or Dwell periods, Egress and Evacuation. Targets are set for queues, which may occur at turnstiles, F&B facilities, toilets, vomitories or pinch-points.

These are set within the context of an A-F scale known as Fruin's Level of Service, taken from Fruin, J. 1971; Pedestrian Planning and Design.

The Fruin Level of Service scale provides a measure of experience, density and congestion for people walking. This ranges from LoS A, the most free-flowing level of service, to LoS F, the most restrictive of conditions considered on this scale. Whilst this is the most familiar scale across the industry, it was originally intended to represent conditions in urban transport environments and is somewhat limited in how it reflects variation at higher densities.

See the following pages for more details on the proposed performance targets. These set out proposed targets by event phase and by client group, to better help understand how Hospitality and/or General Admission experience targets or expectations can be met.



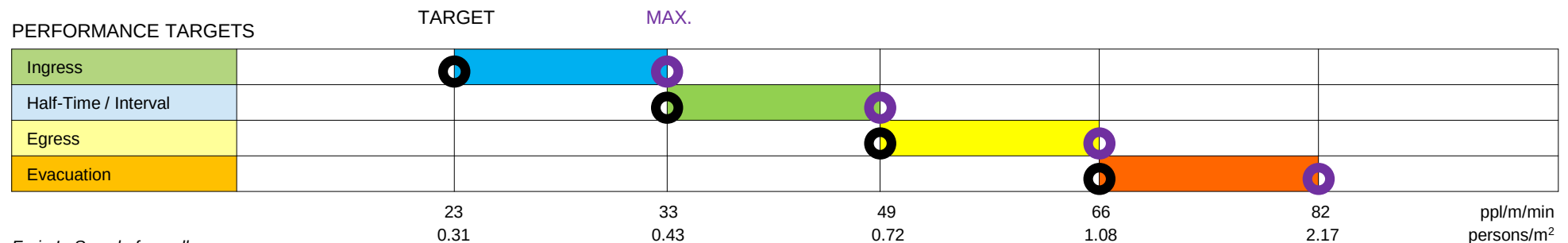
Performance Targets for Walkways

The Fruin 'Level of Service'* scale relates to conditions on walkways experienced by users



Description for walkways	Free circulation	For one directional flows, free circulation. For reverse and crossing flows, minor conflicts.	Some restriction in selection of walking speed and ability to pass others. High probability of conflict.	Restricted and reduced walking speed for most pedestrians. Difficulties in passing with momentary stoppages of flow.	Restricted and reduced walking speed for all pedestrians. Extreme difficulties in reverse or cross flows.	Circulation reduced to shuffling. Reverse and cross flows near impossible. Frequent contact. Sporadic forward flow.
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Walking LOS	A	B	C	D	E	F
Flow rate (people / m/ minute)	21 - 23	23 - 33	33 - 49	49 - 66	66 - 82	Restricted, lower than LoS E
Density (persons/m ²)	<0.31	0.31 - 0.43	0.43 - 0.72	0.72 - 1.08	1.08 – 2.17	>2.17



Fruin LoS scale for walkways



Performance Targets for Stairways

The Fruin 'Level of Service'* scale relates to conditions on stairways experienced by users



Description for stairways

Sufficient area is provided to freely select locomotion speed, and to bypass other slow moving pedestrians. No serious difficulties would be experienced with reverse traffic flows.

Virtually all persons may freely select locomotion speeds. However, in the lower range of area occupancy, some difficulties would be experienced in passing slower-moving pedestrians. Reverse flows would cause minor traffic conflicts.

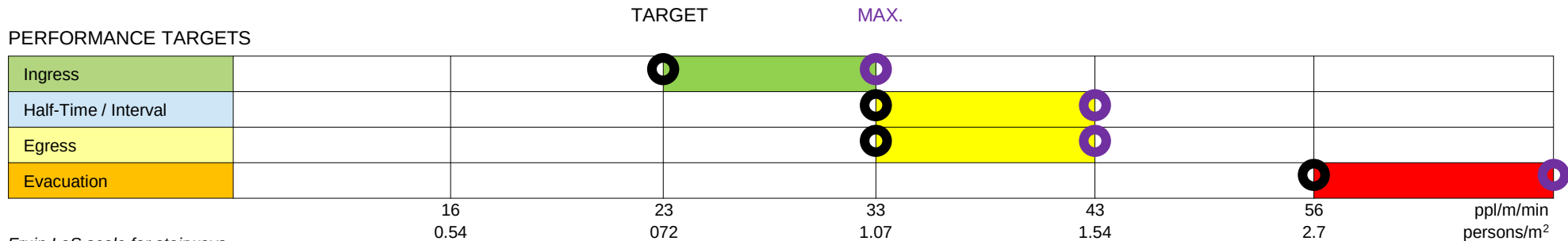
Locomotion speeds would be restricted slightly, due to an inability to pass slower-moving pedestrians. Minor reverse-traffic flows would encounter some difficulties.

Locomotion speeds are restricted for the majority of persons, due to the limited open tread space and inability to bypass slower-moving pedestrians. Reverse flows would encounter significant difficulties and traffic conflicts.

The minimum possible area for locomotion on stairs, virtually all persons would have their normal speeds reduced, because of the minimum tread length space and inability to bypass others. Intermittent stoppages are likely to occur, as the critical pedestrian density is exceeded.

Complete breakdown in traffic flow, with many stoppages. Forward progress would depend on movement of those in front.

Stairs LOS	A	B	C	D	E	F
Flow rate (people / m/ minute)	<16	16 -23	23 - 33	33 - 43	43 - 56	Restricted, lower than LoS E
Density (persons/m ²)	<0.54	0.54 – 0.72	0.72 – 1.07	1.07 – 1.54	1.54 – 2.7	>2.7



* Fruin, John J (1971) Pedestrian Planning and Design



Performance Targets for Queuing and Dwelling

The Fruin ‘Level of Service’* scale relates to conditions on queuing/dwelling areas experienced by users



Description for queuing and dwelling

Free circulation: Adequate area is provided for standing and free circulation through the queuing area without disturbing others.

Circulation zone: Adequate area is provided for standing and restricted circulation through the queuing area without disturbing others.

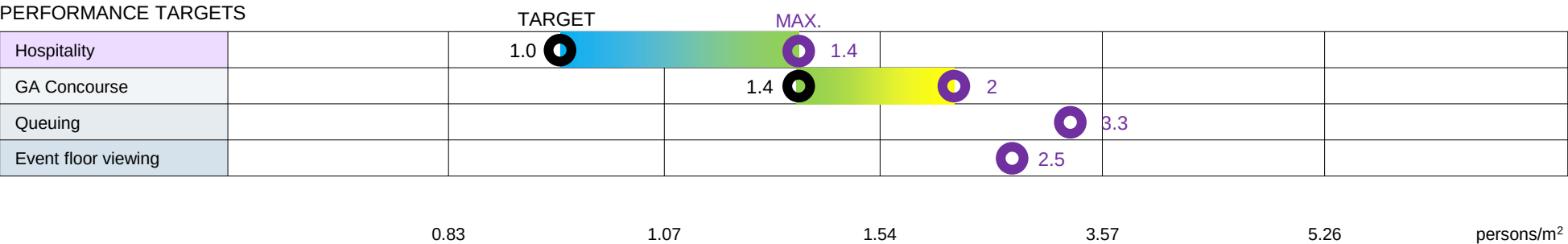
Comfort zone: Adequate area is provided for standing and free circulation through the queuing area by disturbing others.

No touch zone: This level of occupancy is not recommended for long periods of queuing.

Touch zone: The level of area occupancy can only be sustained for a short period of time.

Unavoidable physical contact: No movement is possible.

Dwelling/viewing LOS	A	B	C	D	E	F
Density (persons/m ²)	<0.83	0.83 – 1.07	1.07 – 1.54	1.07 – 3.57	3.57 – 5.26	>5.26



Fruin LoS scale for queuing and dwelling

* Fruin, John J (1971) Pedestrian Planning and Design



Dynamic Modelling Performance Targets (CLOSS)

The Guide to Safety at Sports Grounds, 6th Edition specifies maximum densities that are used for capacity setting and design guidance, specifically for sports grounds. A new scale has been developed to measure spectator density and reflect the conditions that are experienced around a stadium environment, in line with the densities specified in The Guide to Safety at Sports Grounds, 6th Edition. It allows the higher densities experienced in a modern stadium environment for walking, milling and standing to be distinguished, enabling a greater sense of the impact on safety to be visualised than with the Fruin scale.

Movement Strategies has developed the Consolidated Level of Service for Stadium (CLOSS) scale to measure spectator density and reflect the conditions that are experienced around a stadium. This spans the full Fruin scale and extends to the Green Guide maxima, to provide insight into the range of pedestrian movement conditions: in stations, on streets and for spectator access, circulation and egress. The CLOSS scale has been adopted on assessments at a number of UK venues and the SGSA are familiar with it.

The colour scheme in the adjacent table provides benchmarks between these density measures, using bounds at regular intervals where possible. The colours have been selected based on visibility and contrast for ease of comparison on density maps.

This scale is not in use for the static assessment but will apply to the microsimulation modelling.

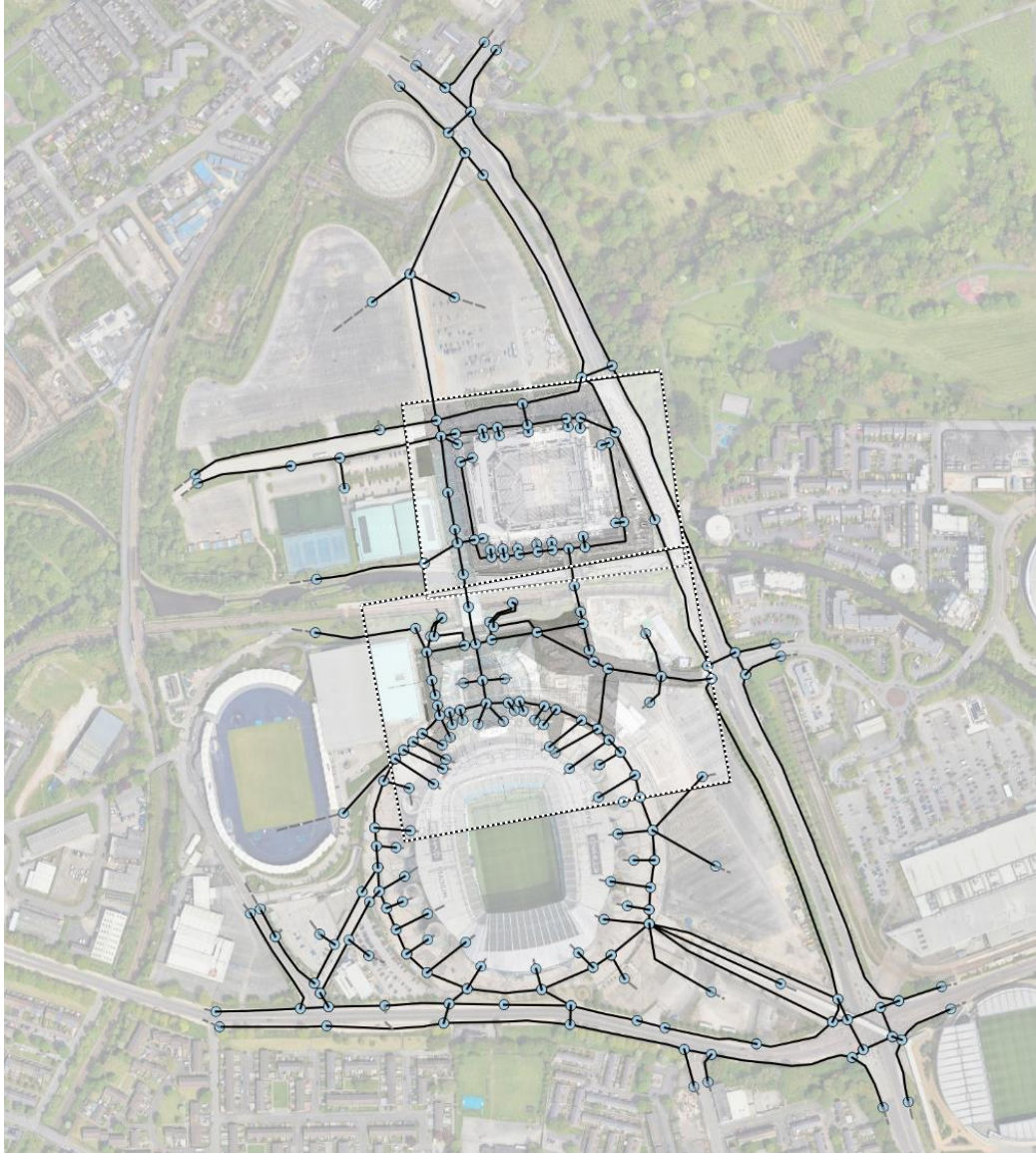
Colour	Value Range	Description	Comment
	< 1 person / m ²	Majority of spectators would have their normal walking speeds restricted and reduced in one-way flow, due to difficulties in bypassing slower-moving pedestrians.	The upper bound of Fruin Level of Service D for Walkways.
	1 - 2 people / m ²	Almost all spectators would have their normal walking speeds restricted and reduced.	The upper bound of Fruin Level of Service E for Walkways.
	2 - 3 people / m ²	All spectators have their walking speed restricted and progress may only be made by shuffling.	Fruin Level of Service F for Walkways.
	3 - 4 people / m ²	Spectators can stand in space without personal contact with others but circulation through this area is severely restricted. Forward movement is only possible as a group.	The upper bound is suggested maximum density for calculating capacity and informing design in Green Guide 6, Level of Service D for Queuing.
	4 - 4.7 people / m ²	Spectators can stand in space but personal contact with others is likely. Circulation through this space is difficult.	The upper bound is the absolute maximum density for calculating capacity in Green Guide 6, Level of Service E for Queuing.
	4.7 - 5.38 people / m ²	Spectators can stand in space but personal contact with others is unavoidable and uncomfortable and can only be experienced for a short period of time.	The upper bound of Fruin Level of Service F for Queuing.
	> 5.38 people / m ²		

Consolidated Level of Service for Stadia



Etihad Campus SENSE Network Model

Modelled pedestrian network



Basemap source: Google Earth

●—● Pedestrian Routes

SENSE Network Model

The Etihad Campus has a SENSE™ pedestrian network model that reflects pedestrian routes assumed to be available within the Campus and immediate surroundings.

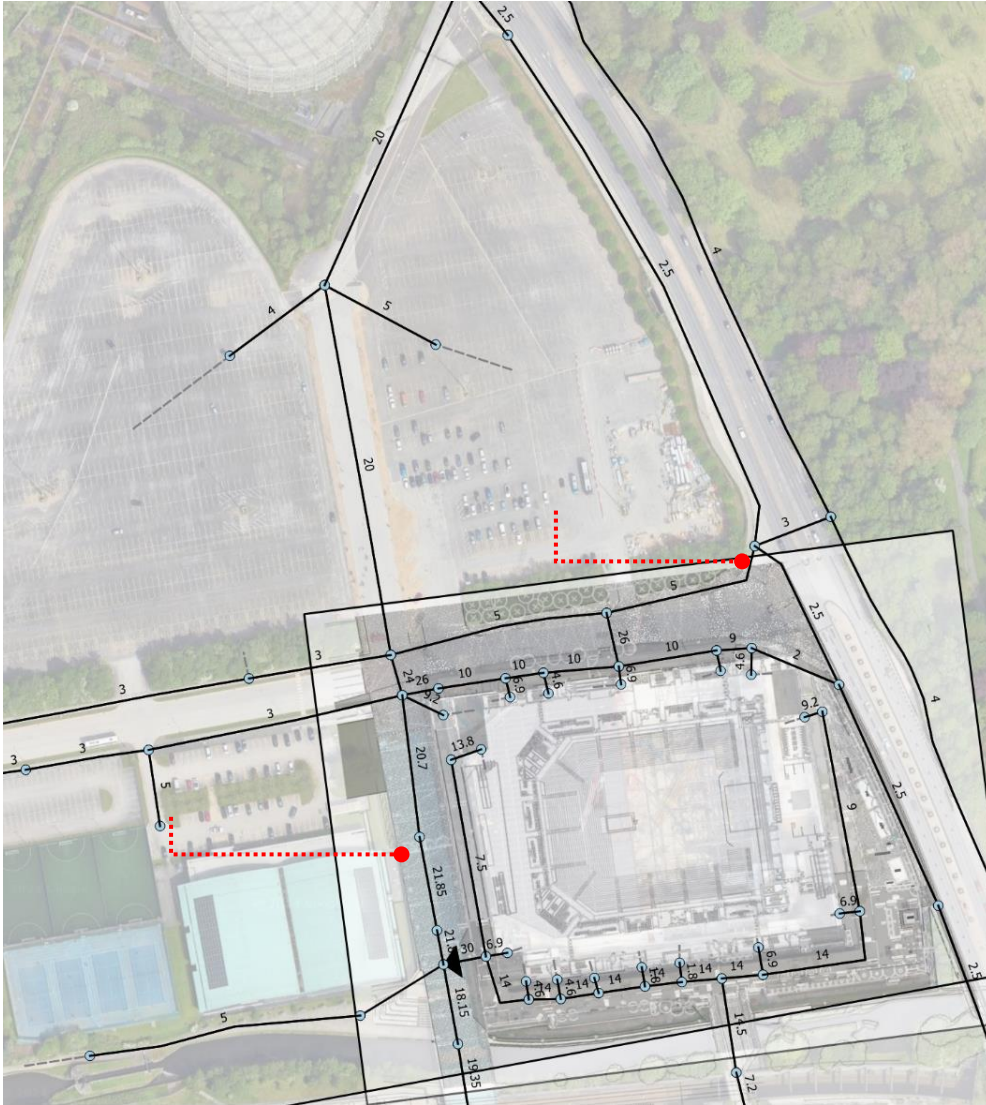
SENSE™ is a proprietary network-based GIS modelling tool that can be deployed across large pedestrian networks to assess the dynamics of crowds dispersing, merging and capacity constraints.

Outputs have a more direct link to UK Guidance / Standards and are visually colour-coded for each pedestrian link, in line with the performance targets introduced on previous slides.

The pedestrian network shown in the adjacent image is assumed to be available to pedestrians attending the Etihad Campus.

Etihad Campus SENSE Network Model

Modelled pedestrian network



Basemap source: Google Earth

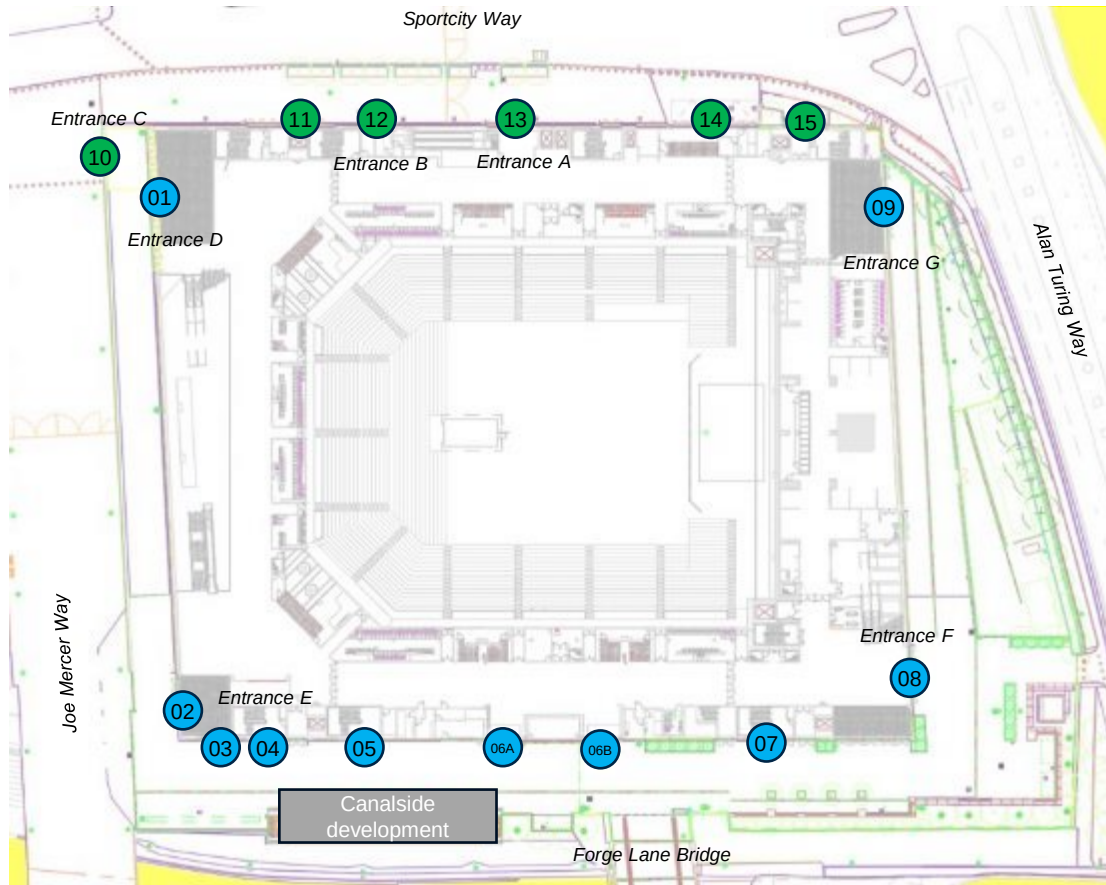
SENSE Network Model

The adjacent figure summarises the minimum circulation widths (in metres) assumed to be available in the vicinity of the Arena.

It should be noted that these widths assume no Canalside Development is in place.



Arena Pedestrian Entry and Exit Points



Source: BRA-POP-ZZ-ZZ-DR-L-8111.dwg

Arena Building Line Entry and Exit Points

-  Level 01 exits
-  Ground Floor exits

In scenarios where the Co-op Live Arena is in operation, it has been assumed to host a full capacity event, with 23,500 spectators and 800 workforce on site.

Spectator demand per Arena entry / exit point has been extracted from the latest version of the Data Book (record of assumptions) agreed with Etihad Campus stakeholders.

The next page sets out the number of spectators assumed to use each entry and exit point during the pre-event arrivals (ingress), post-event departures (egress) and emergency evacuation phases.

It should be noted that the values presented for the post-event departures (egress) are for the full population (i.e. not adopting the assumption that 50% of Hospitality spectators stay within the building for an extended period).

For any scenarios including the Etihad Stadium, it has been assumed that the North Stand construction has been completed, with 60,790 spectators on site and up to 1,932 workforce.



Arena Pedestrian Population

Pedestrian population assumed to use each Arena entry and exit point, for a 23,500-spectator event.

Arena Entry / Exit	
Ref	Name
L01E01	Entrance D
L01E02	Exit E
L01E03	-
L01E04	Entrance E
L01E05	-
L01E06A	-
L01E06B	-
L01E07	-
L01E08	Entrance F
L01E09	Entrance G
L00E10	Entrance C
L00E11	-
L00E12	Entrance B
L00E13	Entrance A
L00E14	-
L00E15	-
TOTALS	

Pre-event Arrivals (Ingress)		
Spectators	Staff	Totals
8,073	0	8,073
0	0	0
0	0	0
235	0	235
0	0	0
0	0	0
0	0	0
0	0	0
4,816	0	4,816
0	0	0
8,494	0	8,494
0	0	0
57	0	57
1,825	0	1,825
0	0	0
0	0	0
23,500	0	23,500

Post-event Departures (Egress)		
Spectators	Staff	Totals
2,515	0	2,515
2,520*	0	2,520
804	0	804
123	0	123
952*	0	952
565	0	565
660	0	660
2,026	0	2,026
1,556	0	1,556
1,225	0	1,225
2,393*	0	2,393
749	0	749
1,600	0	1,600
75	0	75
4,786*	0	4,786
951	0	951
23,500	0	23,500

Emergency Evacuation		
Spectators	Staff	Totals
2,515	57	2,572
2,368	87	2,455
879	0	879
85	42	127
852	57	909
565	45	610
660	45	705
2,101	69	2,170
1,556	57	1,613
1,225	89	1,314
2,140	43	2,183
824	40	864
2,425	0	2,425
0	57	57
4,279	43	4,322
1,026	69	1,095
23,500	800	24,300

50% Hospitality assumed to remain in the venue – L01E02: 2,364 persons, L01E04: 117 persons, L01E05: 849 persons, L00E10: 2,134 persons, L00E12: 1,590 persons and L00E14: 4,267 persons. This brings the total demand to 22,447 persons exiting the building



Arena Surveyed Departure Profiles

It should be noted that for the purpose of SENSE network modelling, an 8-minute departure profile has been assumed. This is in line with agreed parameters used for planning purposes in the wider Etihad Campus SENSE model runs.

Etihad Campus stakeholders have commissioned various pedestrian surveys in the Etihad Campus on days when the Arena was in operation. In May 2024, four events were surveyed. These showed a peak departure profile (at one location) of approximately 90% of spectators departing the venue over a 15-minute period. The average departure profile observed was between 70% and 80% over a 15-minute period.

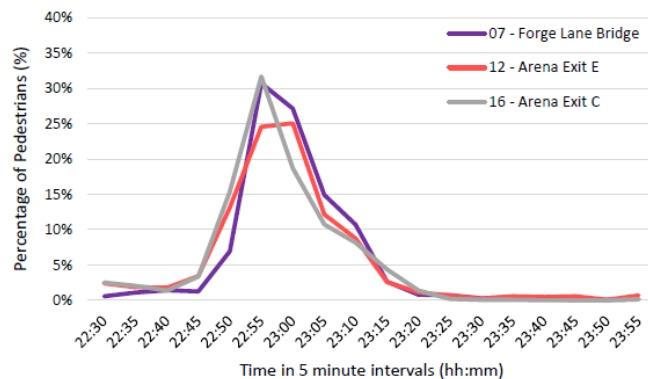
From September to December 2024 more detailed pedestrian surveys were undertaken at the Arena exit points. These indicated peak departure profiles of up to 80% of spectators over a 15-minute period.

For the purpose of static and dynamic calculations, a departure profile of 100% of spectators departing over a 15-minute period has been assumed.

May 2024 Event Day Pedestrian Surveys

Date	Artist	Surveyed % departure in 15 minutes
Saturday 18 May 2024	Eric Clapton	70% - 79%
Sunday 19 May 2024	Barry Manilow	50% - 61%
Friday 24 May 2024	Peter Kay	74% - 91%
Saturday 25 May 2024	Nicki Minaj*	65% - 77%

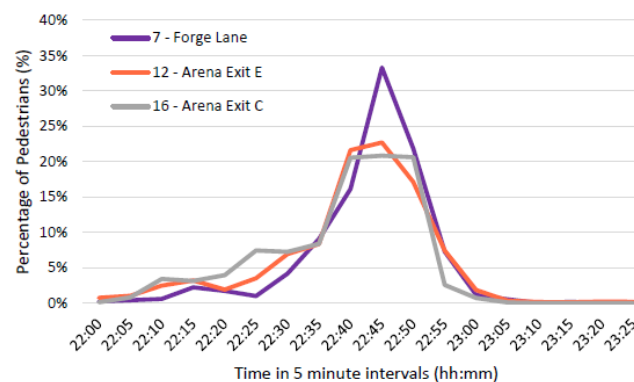
*event cancelled with spectators inside the venue



Percentage of overall pedestrian demand exiting the Arena in 5-minute intervals

15 December 2024, Paul McCartney

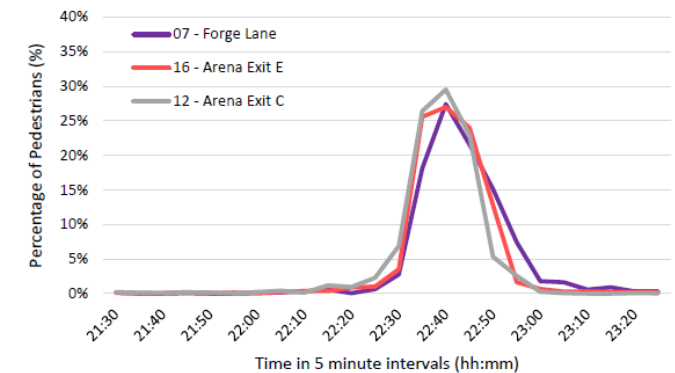
% Departures: 31% in 5 mins, 65% in 15 mins



Percentage of overall pedestrian demand exiting the Arena in 5-minute intervals

23 November 2024, Hits Radio Live

% Departures: 33% in 5 mins, 71% in 15 mins



Percentage of overall pedestrian demand exiting the Arena in 5-minute intervals

26 November 2024, Sleep Token

% Departures: 29% in 5 mins, 78% in 15 mins



Documents References

The following documents have been referenced in this report

Canalside Structure

- Turnkey 2 - Canalside V3 copy 2.pdf (layout and operation)
- BGP040 elevations.dwg
- BGP040 GF.dwg
- BGP040 FF.dwg
- BGP040 site plan.dwg
- BGP040-01k Canalside container layout - ground floor.pdf
- BGP040-02h Canalside Container layout - first floor.pdf
- JPG images 1, 2, 3, 4 and image.

Etihad Campus

- Etihad Campus, Site Wide Crowd Modelling, Performance of Pedestrian Circulation Routes, December 2024
- Co-op Live, Crowd Movement Assessment, Crowd Modelling Analysis on Joe Mercer Way for Scenario 9: Stadium Departures and Arena Arrivals, October 2024.
- Co-op Live, Crowd Movement Assessment, Crowd Modelling Analysis on Joe Mercer Way for Scenario 5: Stadium and Arena Simultaneous Departures, November 2024
- Etihad Campus Coincidental Events, Crowd Modelling Analysis, REPORT 01 – Data Book summary, May 2024
- Etihad Campus Coincidental Events, Crowd Modelling Analysis, REPORT 02 – Arena (14,099 spectators and Stadium), May 2024
- Etihad Campus Coincidental Events, Crowd Modelling Analysis, REPORT 03 – Arena (18,000 spectators and Stadium), May 2024

- Etihad Campus Coincidental Events, Crowd Modelling Analysis, REPORT 04 – Arena (23,500 spectators and Stadium), May 2024
- Etihad Campus Coincidental Events, Crowd Modelling Analysis, REPORT 05 – Evacuation Arena and Stadium, May 2024

Event Day Surveys

- Etihad Campus, Pedestrian Surveys May 2024, Stadium and Arena Event Day Surveys
- Co-op Live and Etihad Stadium Simultaneous Event Day – Pedestrian circulation survey on Sunday 22 September 2024
- Co-op Live and Etihad Stadium Simultaneous Event Day – Pedestrian circulation survey on Saturday 26 October 2024
- Co-op Live and Etihad Stadium Simultaneous Event Day – Pedestrian circulation survey on Saturday 23 November 2024
- Co-op Live and Etihad Stadium Simultaneous Event Day – Pedestrian circulation survey on Tuesday 26 November 2024
- Co-op Live and Etihad Stadium Simultaneous Event Day – Pedestrian circulation survey on Sunday 15 December 2024

Relevant Guidance

- Guide to Safety at Sports Grounds (“Green Guide”), 6th Edition, 2018 (Sports Grounds Safety Authority, UK), which provides guidance for the safe design of sports grounds;
- Pedestrian Planning and Design (J.J. Fruin, 1971), defining a quantified scale of ‘Levels of Service’ related to crowd movement on walkways, stairs and in queuing areas.



Scenario 1: Canalside Development only



Canalside Development - Elevation



First Floor

Ground Floor

The Canalside Development will be spread over four levels, all of which can be accessed by pedestrians:

- **Ground Floor** – this zone will be located on the Arena’s external upper concourse / podium with level access available (Dwell Area 1 in the following page). This zone will provide visitors with access to bar, food and merchandising opportunities.
- **First Floor** – this zone will be located above the Ground Floor and will be accessed via two sets of stairs, either side of the development, or a lift on the east side of the development (Dwell Area 4 in the following page). This will be a dwell area for visitors making use of the development.
- **Level -1** – this zone will be in view of the canal and will be accessed via the existing stairs on the east and west side of the Canalside Development (Dwell Areas 2 in the next page). This will be a dwell area for visitors making use of the development.
- **Level -2** – this zone will be in view of the canal and will be accessed via the existing stairs on the east and west side of the Canalside Development (Dwell Area 3 in the next page). This will be a dwell area for visitors making use of the development.



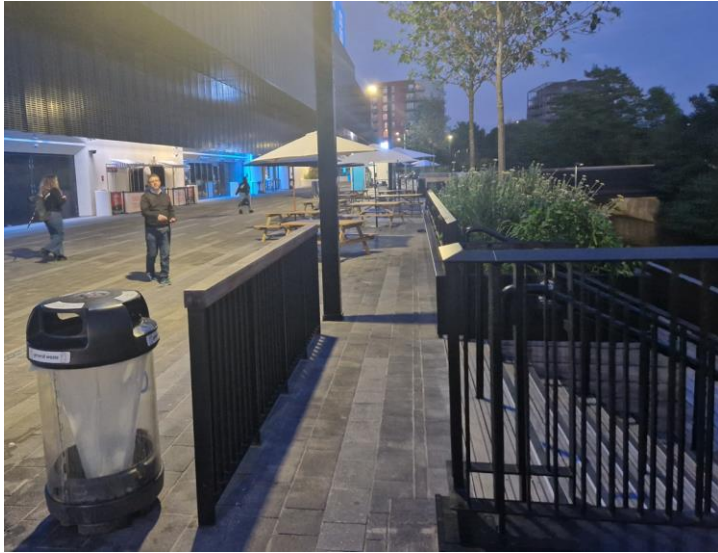
Level -1

Level -2

Proposed Canalside Development



Canalside Development – Circulation Widths



Existing head of stair barriers, 20 May 2025



Source: image.jpg

Stair access to Level -1 and Level -2

Some of the existing infrastructure on site will be retained and may have an impact on the effective circulation width available to pedestrians. These include:

- The head of stair barriers leading from Ground Level to Level -1 and Level -2 will be retained. These are existing structures, providing circulation widths of less than 1.20 metres at some locations. Given that these are existing structures, serving low numbers of visitors, it is assumed all routes will be in use.
- The layout of the stairs leading from Ground Level to Level -1 and Level -2 will be changed so one stair channel leads to Level -1 and one stair channel leads to Level -2. The detail of the layout at this location is currently under development.
- We understand that the existing concrete blocks on the side of the Arena building line are concrete doorstops. These are assumed to remain in place, with the associated loss of pedestrian circulation width available.

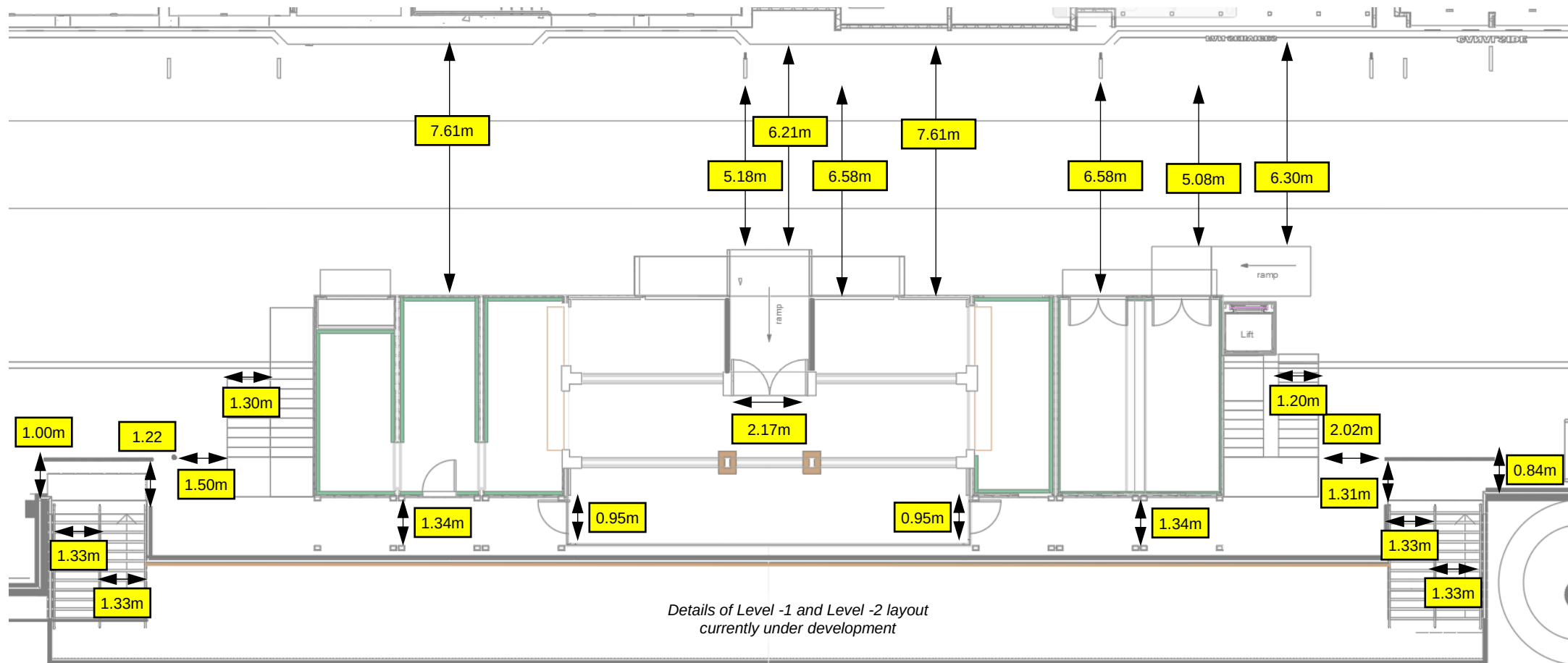


Existing concrete doorstops, 20 May 2025



Canalside Development – Circulation Widths

The figure below sets out the minimum pedestrian widths assumed to be available along each of the pedestrian corridors inside and around the Canalside Development. In general terms, the Canalside Development will reduce the pedestrian circulation width available between unit building line and the Arena building line, from **(approximately) 14 metres to 7.61 metres**. At some locations, the provision of new ramps together with the existing concrete doorstops, will result in the minimum widths reducing to **(approximately) 5.2 metres to 6.5 metres**.

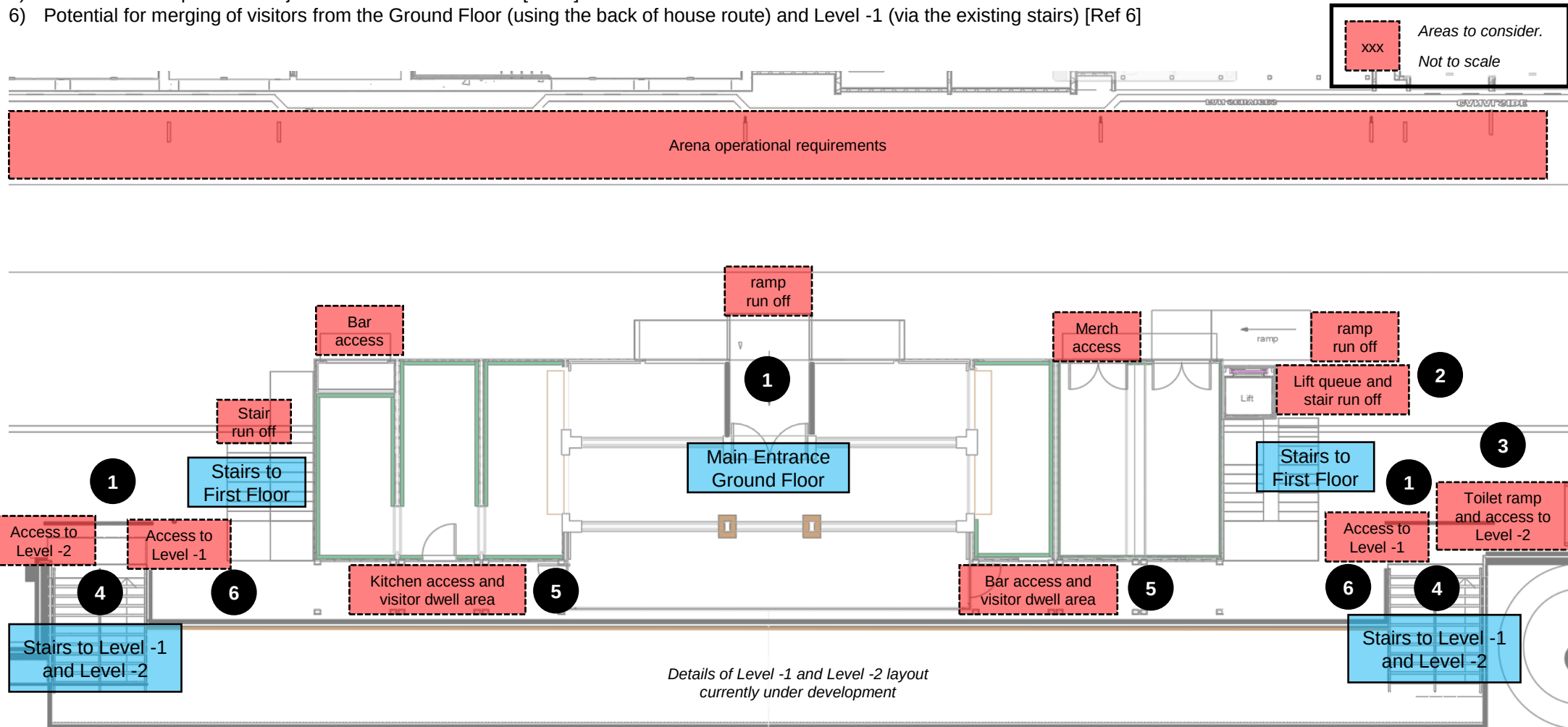




Canalside Development – Operation

The operation of the Canalside Development will consider visitor movement in an around the units. Items to be developed as part of the operational planning include:

- 1) Ticket scanning and security search, if required [Ref 1]
- 2) Management of the lift queue and stair run off [Ref 2]
- 3) Wheelchair access to the ramp leading to the accessible toilet [Ref 3]
- 4) Visitor access via the existing head of stair barriers [Ref 4]
- 5) Back of house operations adjacent to visitor dwell areas [Ref 5]
- 6) Potential for merging of visitors from the Ground Floor (using the back of house route) and Level -1 (via the existing stairs) [Ref 6]

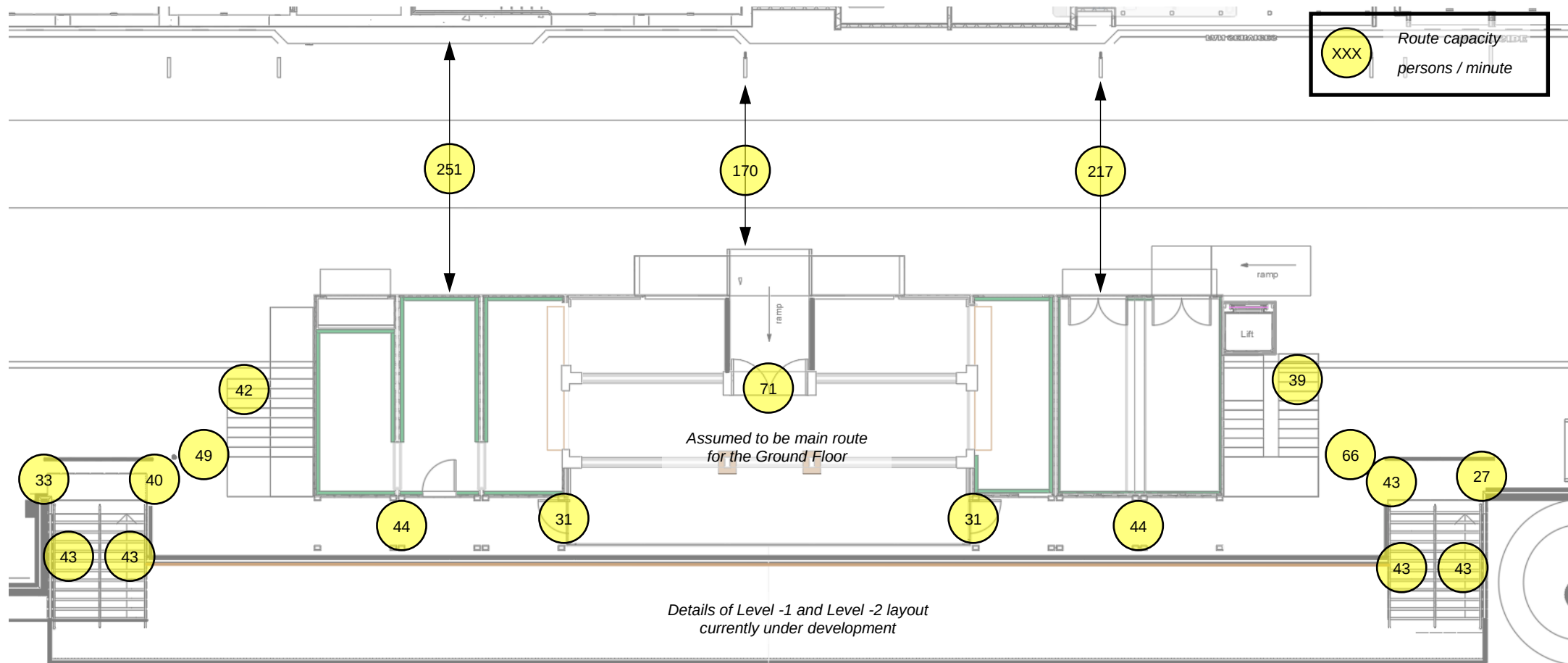




Canalside Development – Ingress (Arrivals)

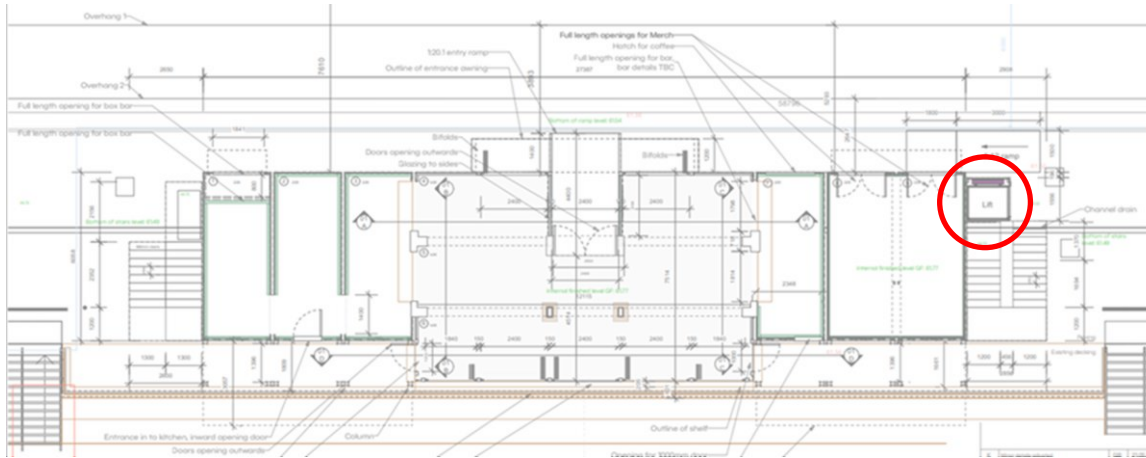
Based on the arrival maximum flow rate of 33 persons / minute / metre width on stairs and on flat surfaces, the routes to each of the dwell areas can accommodate the expected visitor demand in approximately 1 to 3.25 minutes (with the First Floor taking 3.25 minutes, excluding the lift capacity available). The capacity available exceeds the minimum requirement associated with a typical arrival profile of 40% of spectators arriving over a 15-minute period. It should be noted that the capacity calculations do not account for any ticket check or security screening requirements.

- Provision of a 1.20 metre (minimum) to 1.80 metre (desirable minimum for two-way wheelchair circulation) corridor would provide sufficient circulation width for all visitors to arrive over a 15-minute period.



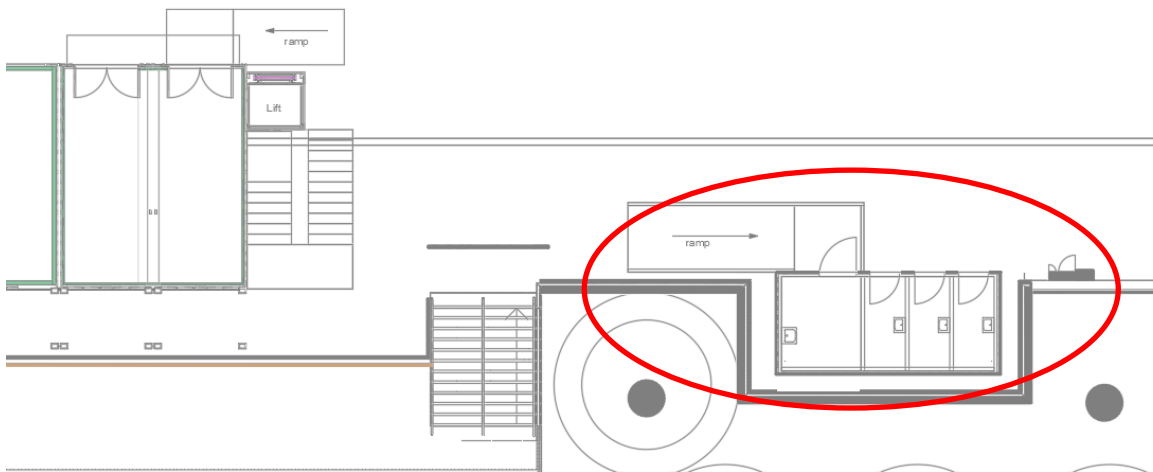


Canalside Development – Facilities



Source: BGP040-01k Canalside container layout - ground floor.pdf

Lift between Ground Floor and First Floor



Source: BGP040 site plan.dwg

Toilet provision

Lift Capacity

The lift capacity has been calculated based on the performance targets, rather than a manufacturer stated capacity. The lift has an area of 1.57 m² and travels approximately 3.2 metres between levels per cycle.

Based on a pedestrian capacity of 2 to 5 persons per lift cycle (dependant on the target density), it is estimated the lift has capacity for 67 to 116 persons every 15 minutes. That equates to 26% - 46% of the First Floor assumed visitor population every 15 minutes.

Based on a capacity of 1 to 2 wheelchairs per lift cycle (dependant on wheelchair dimensions), it is estimated the lift has capacity for 22 to 29 wheelchairs every 15 minutes.

Toilet Capacity

The toilet capacity has been calculated based on the provision of four toilets and a 50% male : 50% female split of visitors, with each female taking 90 seconds per visit and each male taking 45 - 60 seconds per visit.

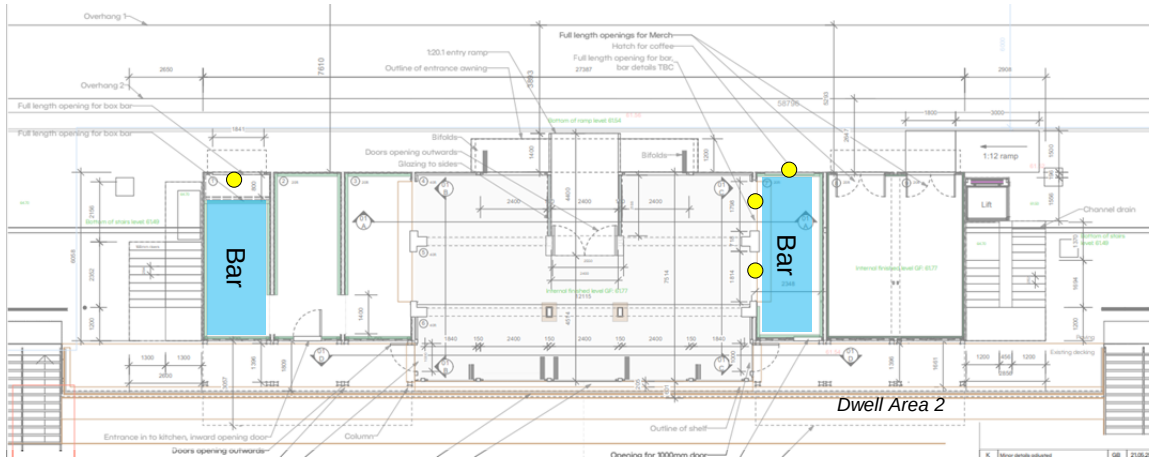
Based on the above, it is estimated that that the provision of three toilets could accommodate 36 - 40 persons every 15 minutes and the provision of four toilets could accommodate 48 - 53 persons every 15 minutes. That equates to 6% - 10% of the assumed visitor population every 15 minutes.

Based on a wheelchair user taking 185 seconds per visit, it is estimated that one (accessible) toilet could accommodate 4 to 5 wheelchair users every 15 minutes.



Canalside Development – Facilities

● Service points



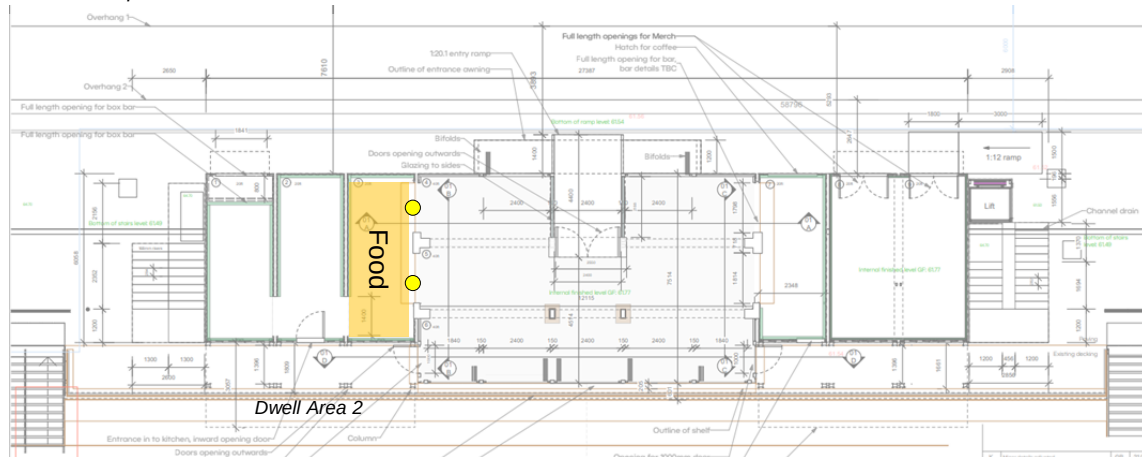
Source: BGP040-01k Canalside container layout - ground floor.pdf

Canalside Development Lower Levels

Beverage Points of Sale

Based on the counter space available (approximately 7 metres spread across four windows), it is estimated that four points of sales (POS) may be available to serve visitors. Assuming each transaction takes 15 to 50 seconds and serves 1.8 visitors, it is estimated that 129 to 432 persons can be served every 15 minutes at the counters. That equates to 24% to 83% of the assumed visitor population every 15 minutes.

● Service points



Source: BGP040-01k Canalside container layout - ground floor.pdf

Canalside Development Lower Levels

Food Points of Sale

Based on the counter space available (approximately 3.5 metres spread across two windows), it is estimated that two points of sales (POS) may be available to serve visitors. Assuming each transaction takes 45 to 80 seconds and serves 1.8 visitors, it is estimated that 40 to 72 persons can be served every 15 minutes at the counters. That equates to 7% to 13% of the assumed visitor population every 15 minutes.

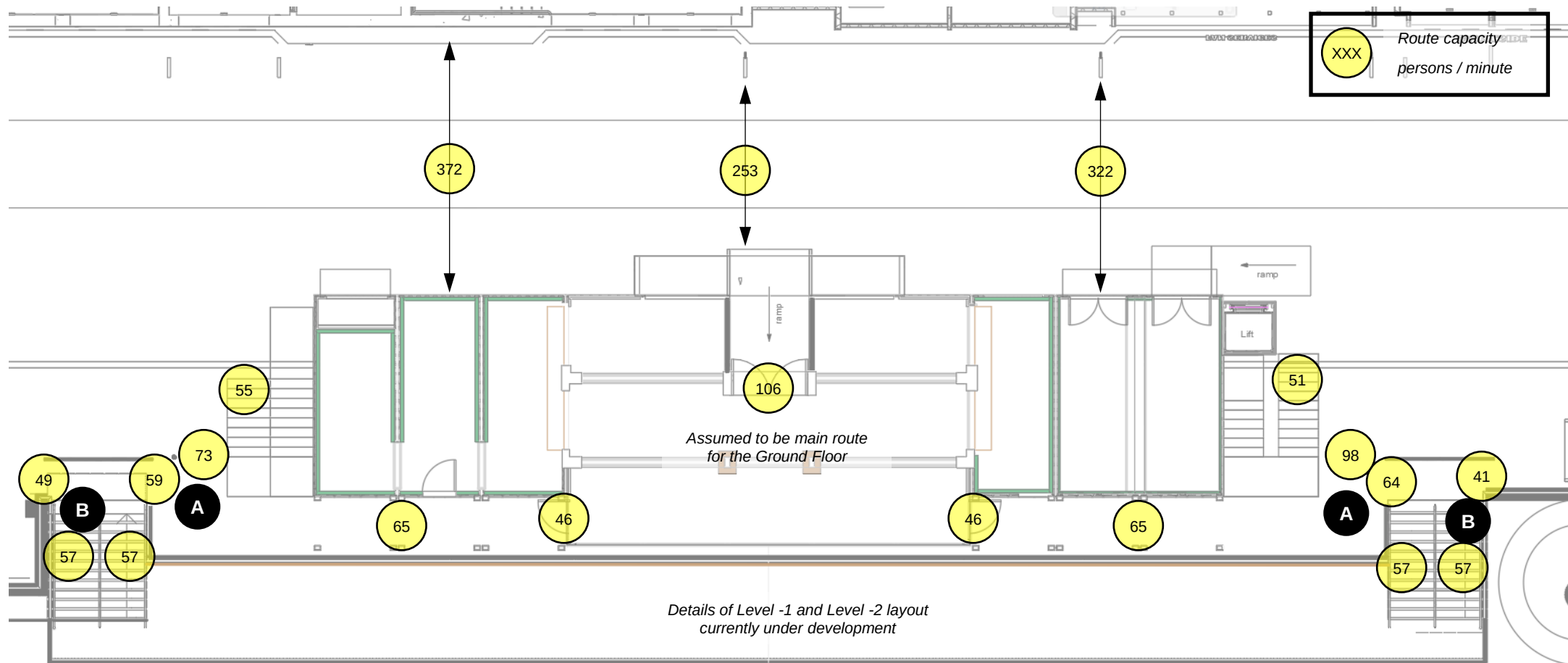


Canalside Development – Egress (Departures)

Based on a target flow rate of 49 persons / minute / metre width on the flat and 43 persons / minute / metre width on stairs, the routes from each of the dwell areas can accommodate the expected visitor demand in approximately 1 to 2.5 minutes (with the First Floor taking 2.5 minutes, excluding the lift capacity available). The capacity available exceeds the minimum requirement associated with a surveyed departure profile of a 15-minute period.

If visitors from the Ground Floor are directed via the pedestrian routes on the south side of the Canalside Development, some management may be required where these merge with visitors departing Level -1 (locations marked 'A' in the figure below).

The proposed arrangement for Level -2 includes using the existing stairs with dedicated stair channels (locations marked 'B' in the figure below). The onward capacity as visitors move away from the stairs is less than the channel capacity of the stairs. There are low numbers of people using these routes, but these may result in some queuing on exit.



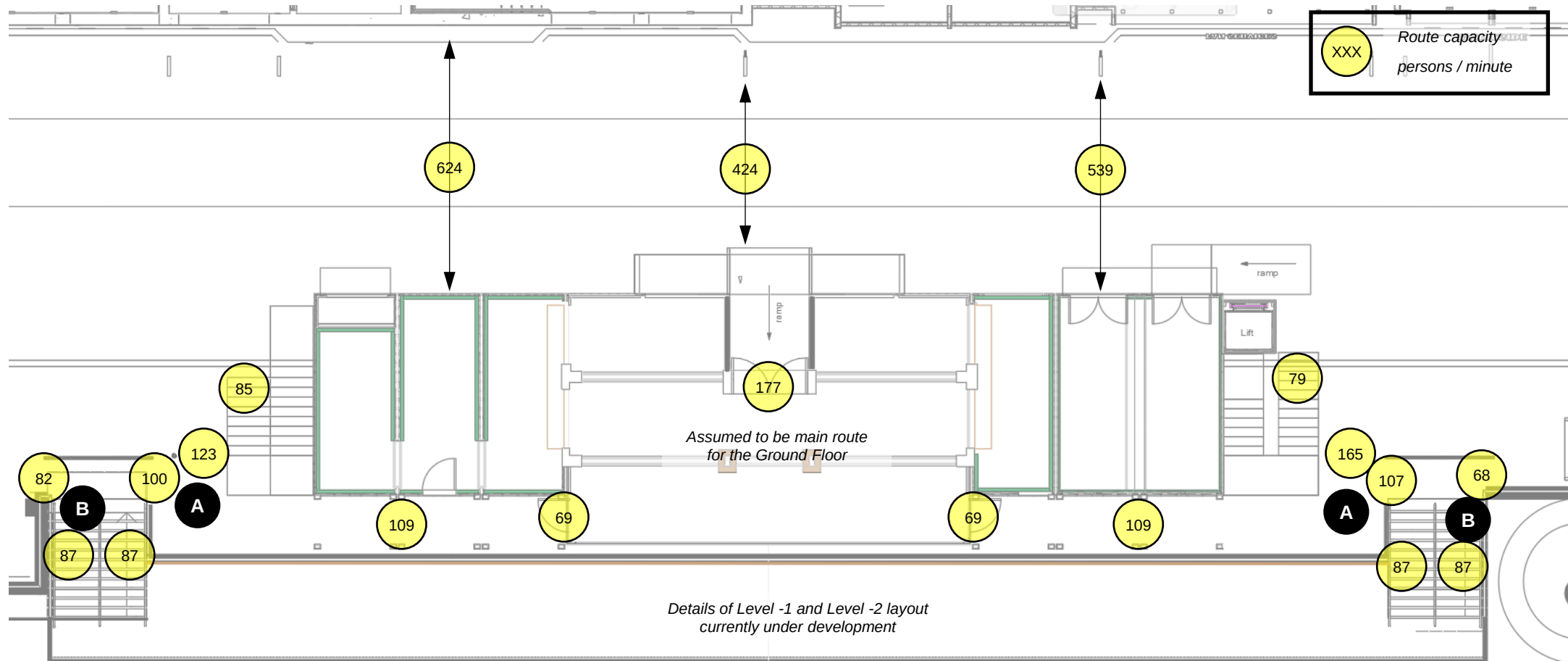


Canalside Development – Evacuation

For the purpose of this assessment, it has been assumed that 50 workforce are within the Canalside Development (20 persons on the First Floor, 20 persons on the Ground Floor, 5 persons on Level -1 and 5 persons on Level -2). Based on an evacuation maximum flow rate of 82 persons / minute / metre width on the flat and 66 persons / minute / metre width on stairs, the routes from each of the dwell areas have capacity to evacuate a dwelling population in less than 2.0 minutes. This evacuation time should be considered against the fire rating(s) of the unit, although is less than the 2.5 minutes presented in *The Guide to Safety at Sports Grounds* for high-risk areas. Wheelchair users on the First Floor will need to be managed if using the lift route

If visitors from the Ground Floor are directed via the pedestrian routes on the south side of the Canalside Development, some management may be required where these merge with visitors departing Level -1 (locations marked 'A' in the figure below).

The proposed arrangement for Level -2 includes using the existing stairs with dedicated stair channels to (locations marked 'B' in the figure below). The onward capacity as visitors move away from the stairs is less than the channel capacity of the stairs. There is low numbers of people using these routes, but these may result in some queuing on exit.





Canalside Development – Evacuation

In order to provide more detail on the evacuation capacity of the Canalside Development, each level has been assessed separately, including assumed number of spectators and workforce.

Dwell Area 4 (First Floor)

- Based on a population of 252 visitors and 20 staff (272 persons in total) if one set of stairs is available (A1), there is capacity to exit in less than 3.5 minutes, if two sets of stairs are available (A1 + A2) there is capacity to exit in less than 1.75 minute.

Dwell Area 1 (Ground Floor)

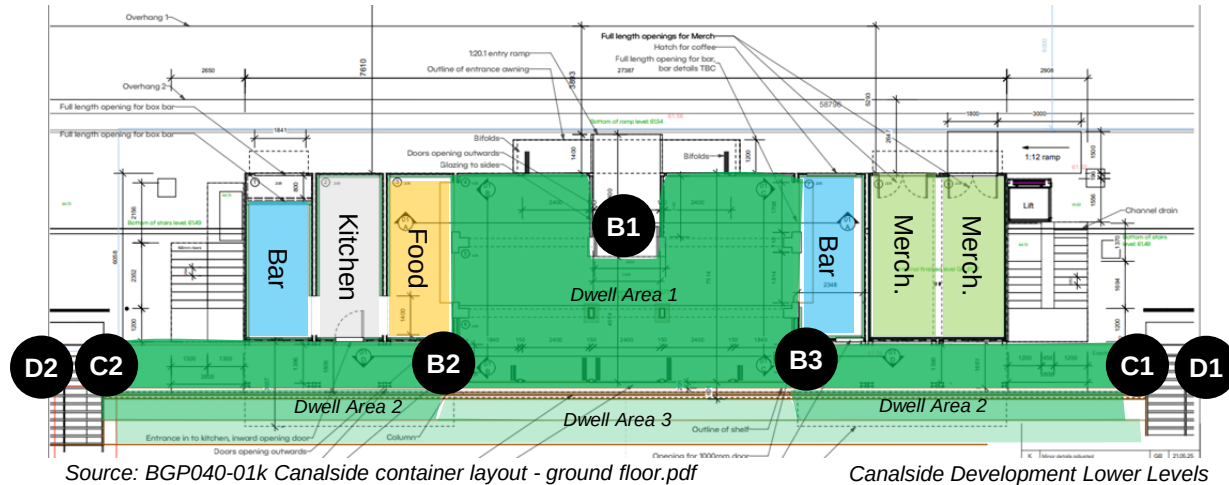
- Based on a visitor population of 145 visitors and 20 staff (165 persons in total), if only the Main Exit (B1) is available, there is capacity to exit in less than 1 minute. If only the southern side routes are available (B2 + B2), there is capacity to exit in less than 1.25 minutes.

Dwell Area 2 (Level -1)

- Based on a visitor population of 56 persons and 5 staff (61 persons in total) spread over two zones, with each zone having **one exit route only**, (C1 and C2) with sufficient stair exit capacity to exit in less than 1 minute. This will be subject to the detailed layout of this area once finalised.

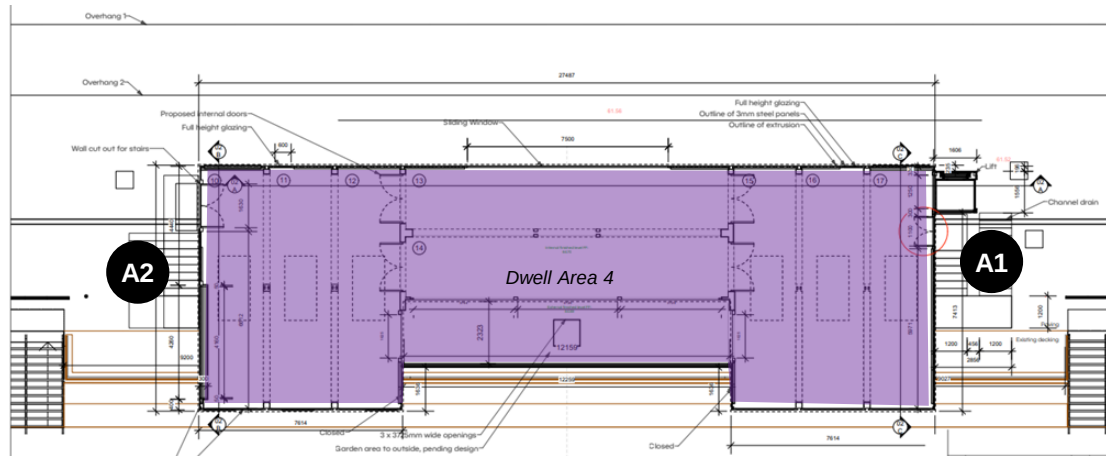
Dwell Area 3 (Level -2)

- Based on a visitor population of 67 persons and 5 staff (72 persons in total), if only one exit route is available (D1), there is capacity to exit in 1.25 minutes. If both exit routes are available (D1 + D2), there is exit capacity to exit in less than one minute. This will be subject to the detailed layout of this area once finalised.



Source: BGP040-01k Canalside container layout - ground floor.pdf

Canalside Development Lower Levels



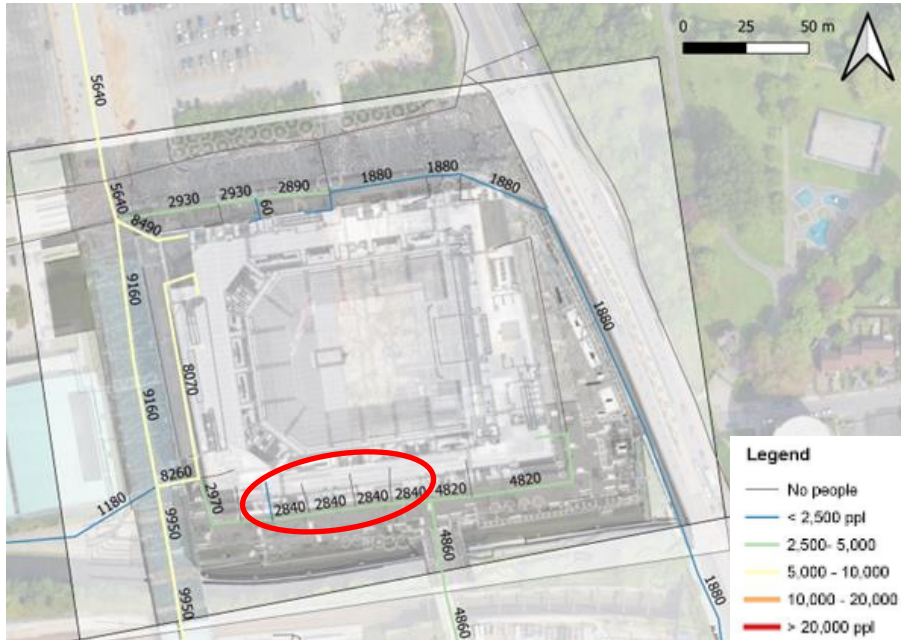
Source: BGP040-02h Canalside Container layout - first floor



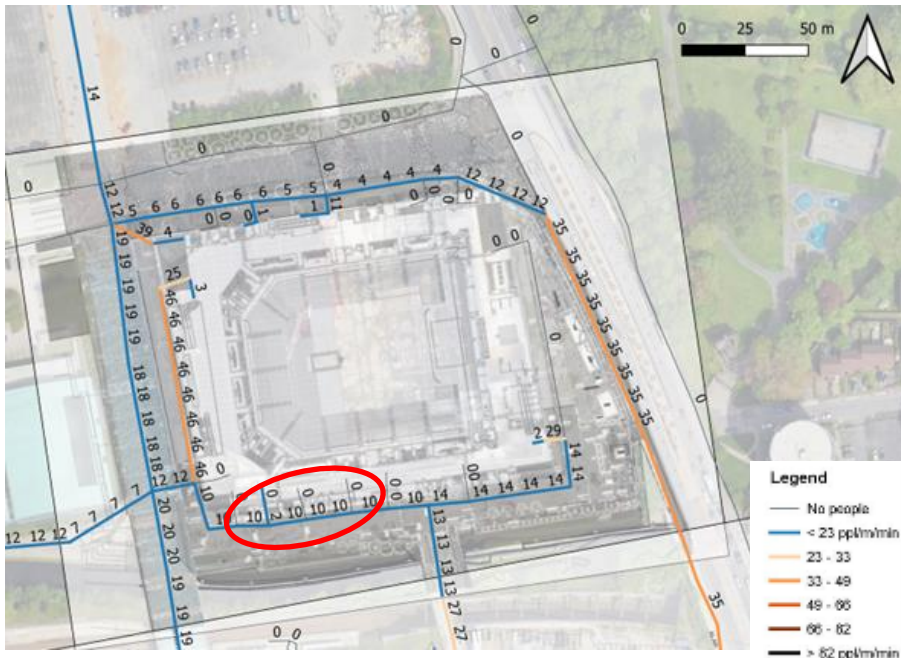
Scenario 2: Canalside and Arena



Arena Ingress (Arrivals)



Static assignment per link



35 Maximum flow rate per link (ppl/m/min)

The Etihad Campus SENSE model has been interrogated for an Arena Ingress (pre-event arrivals) scenario based on existing distribution assumptions and profiles.

For a 23,500-spectator event, the model shows a pedestrian demand of 2,840 persons using the route adjacent to the proposed Canalside Development, with a peak flow rate of 10 persons / minute / metre width during the arrivals period, based on the existing width available (approximately 14 metres).

It can be inferred that:

- Reducing the width available by 50% (to approximately 7 metres) would increase the peak flow rate to 20 persons / minute / metre width.
- Reducing the width available by 66% (to approximately 5 metres) would increase the peak flow rate to 30 persons / minute / metre width.

This would suggest that the proposed route could accommodate Arena 'background' spectator demand and Canalside Development visitor demand and remain within target levels of service.

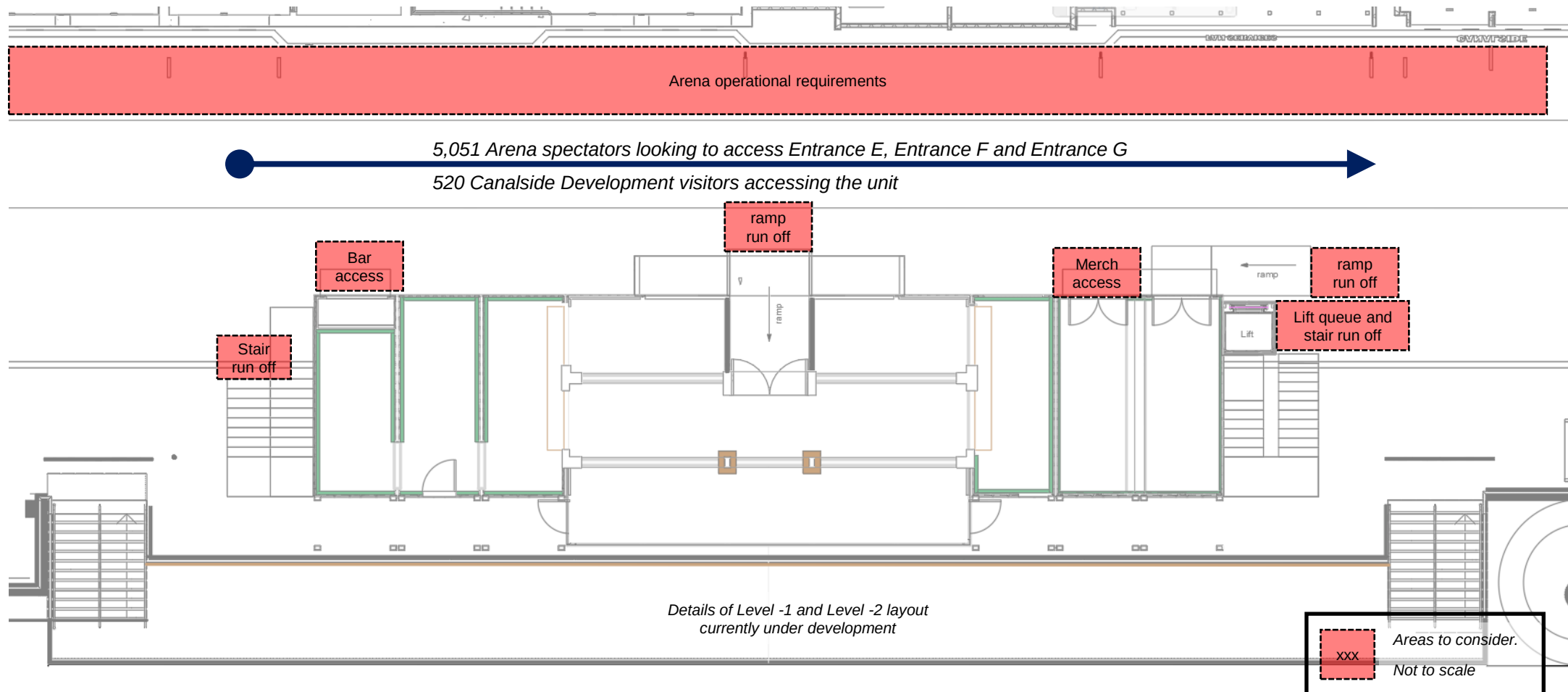


Arena Ingress (Arrivals) – Sensitivity

As a sensitivity analysis we have assumed that Forge Lane Bridge is closed to Arena spectators during the arrival period. We have assumed that all spectators accessing Entrance E, Entrance F and Entrance G (5,051 persons) look to use the pedestrian route between the Canalside Development and the Arena, at the same time as the Canalside Development visitors (520 persons), with an arrival profile of 40% over a 15-minute period (with peak surveyed arrivals generally in the region of up to 30% over a 15-minute period).

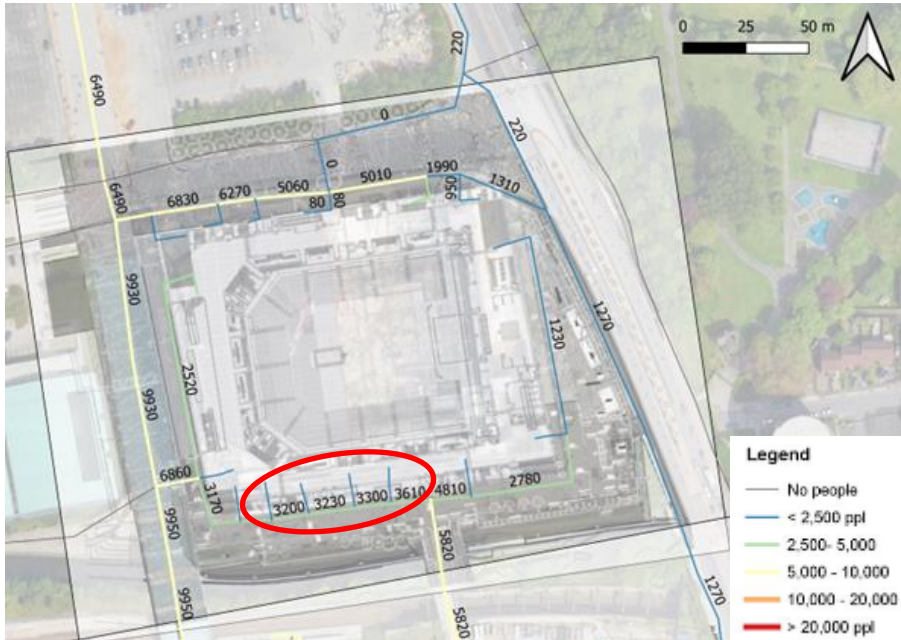
- Based on an **arrival maximum flow rate of 33 persons / minute / metre width**, this flow will **require 4.5 metres of the 5.18 metres available**
- Based on an **interval maximum flow rate of 49 persons / minute / metres width**, this flow will **require 3.1 metres of the 5.18 metres available**

Arena and Canalside Development frontage operations will need to be considered but should not restrict pedestrian flow unless their combined footprint exceeds 2.0 metres at locations with minimum circulation widths available. Should it be required, at locations where the Arena operation requires additional space, removal of the concrete doorstops could be considered (replaced with an alternative doorstop system).

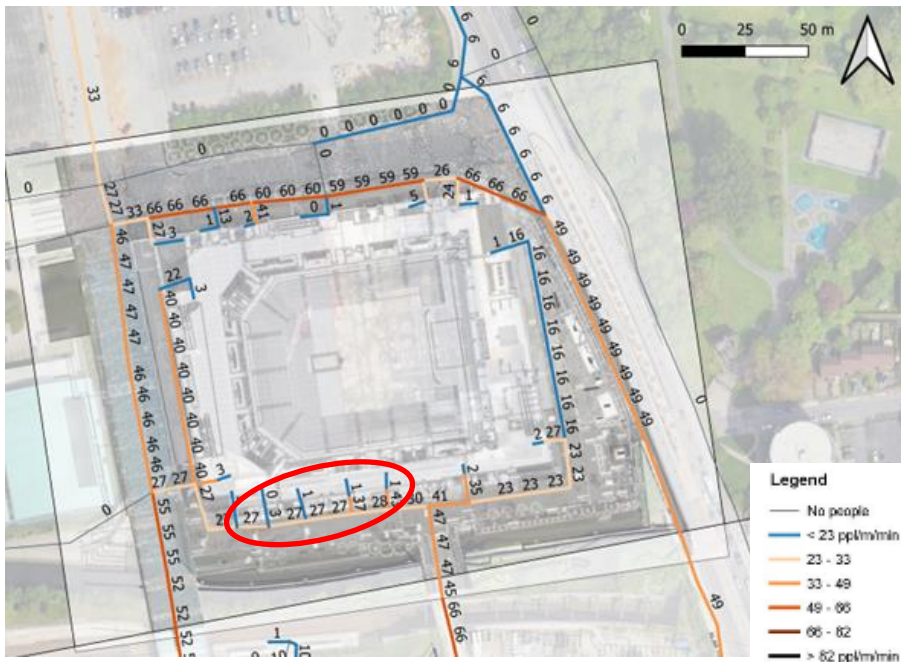




Arena Egress (Departures)



Static assignment per link



Following discussions with the Co-op Live we understand the Canalside Development would be closed during the Arena egress (post-event departures) period.

The Etihad Campus SENSE model has been interrogated for an Arena Egress (post event departures) scenario based on existing distribution assumptions and profiles.

For a 23,500-spectator event, the model shows a pedestrian demand of 3,300 persons using the route adjacent to the proposed Canalside Development, with a peak flow rate of 28 persons / minute / metre width during the departures period, based on the existing width available (approximately 14 metres).

It can be inferred that:

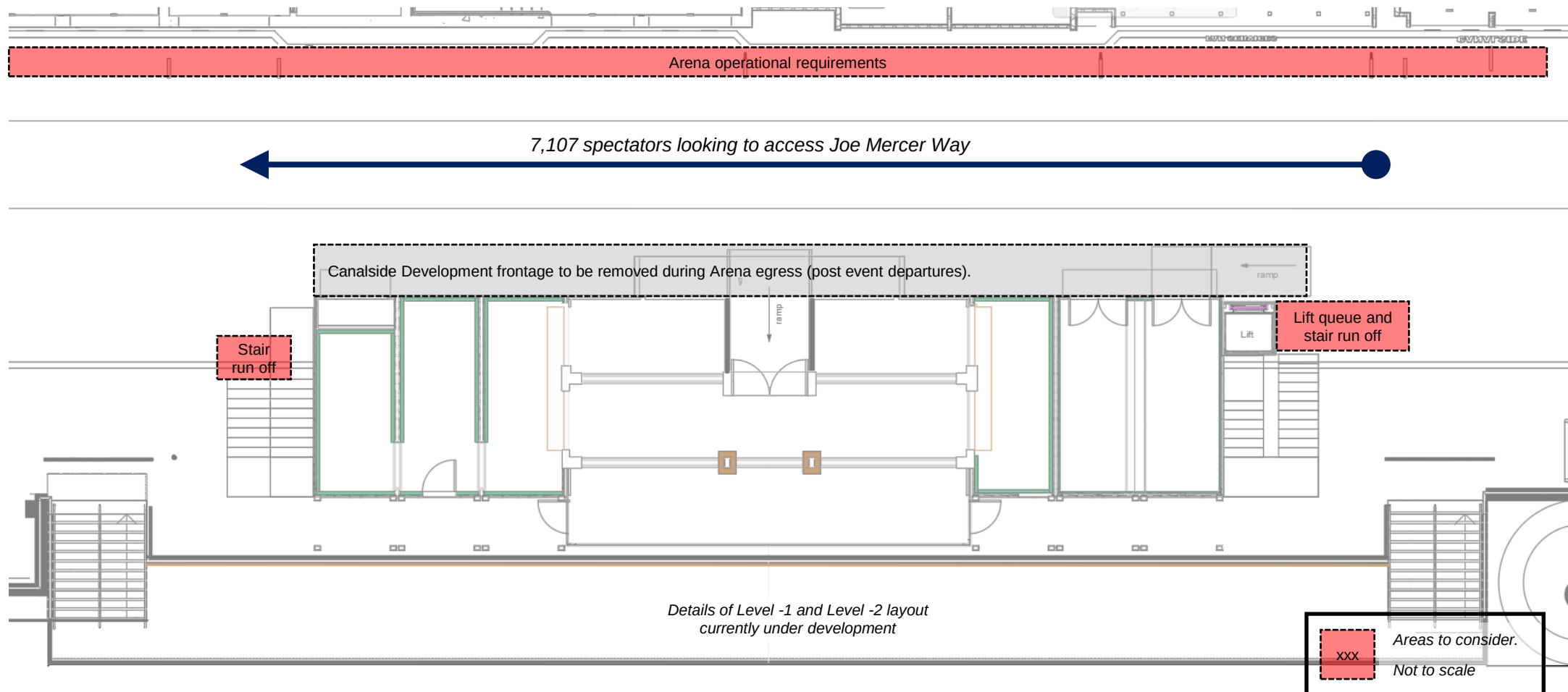
- Reducing the width available by 50% (to approximately 7 metres) would increase the peak flow rate to 56 persons / minute / metre width.
- Reducing the width available by 66% (to approximately 5 metres) would increase the peak flow rate to 84 persons / minute / metre width. **This is in excess of the maximums permitted.**

This would suggest that the proposed route could accommodate Arena spectator demand **but the pedestrian route between the Canalside Development and the Arena building line would likely need to be kept clear.**

m Arena Egress (Departures) – Sensitivity

Following discussions with the Co-op Live we understand the Canalside Development would be closed during the Arena egress (post-event departures) period. As a sensitivity analysis we have assumed that Forge Lane Bridge is closed to Arena spectators during the departure period. We have assumed that all spectators from the east side of the Arena external upper concourse / podium (7,107 persons) will look to access Joe Mercer Way via the pedestrian route between the Canalside Development and the Arena, with a departure profile of 100% over a 15-minute period. Based on a **departures maximum flow rate of 66 persons / minute / metre width**, this flow will **require 7.18 metres, in excess of the 5.18 metres available**. At a maximum permissible one-directional flow rate of 82 persons / minute / metre width, a circulation width of 5.77 metres would be required.

Following discussions with the Co-op Live, we understand an operational intervention (rather than a design change) and exceeding the performance targets (whilst remaining within the maximums permitted) is the operator's choice. During Arena Egress (post event departures) the frontage of the Canalside Development will be removed, in order to provide a circulation width of 6.58 metres. This will result in a maximum flow rate of 72 persons / minute / metre width.. Should additional circulation space be required, removal of the concrete doorstops could be considered (replaced with an alternative doorstop system).



Source: BGP040 site plan.dwg

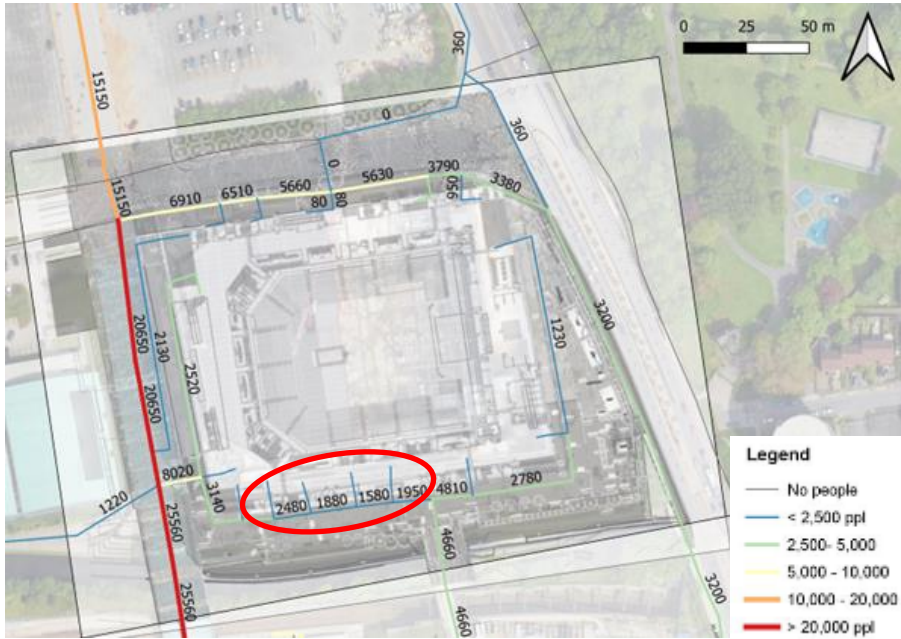
Canalside Development Minimum Circulation Widths



Scenario 3: Canalside, Arena and Stadium

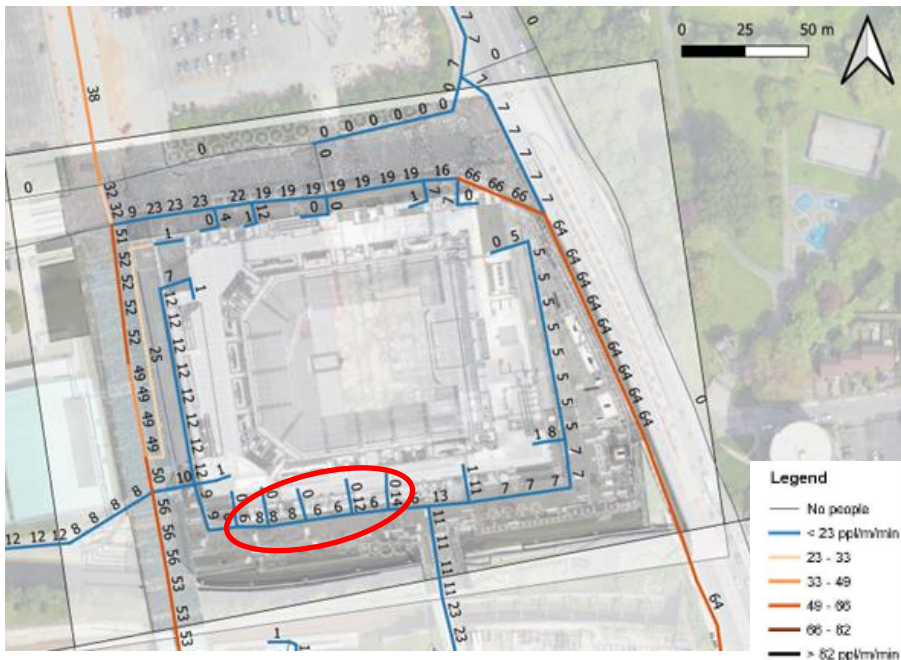


Stadium Hard Egress, Arena Ingress

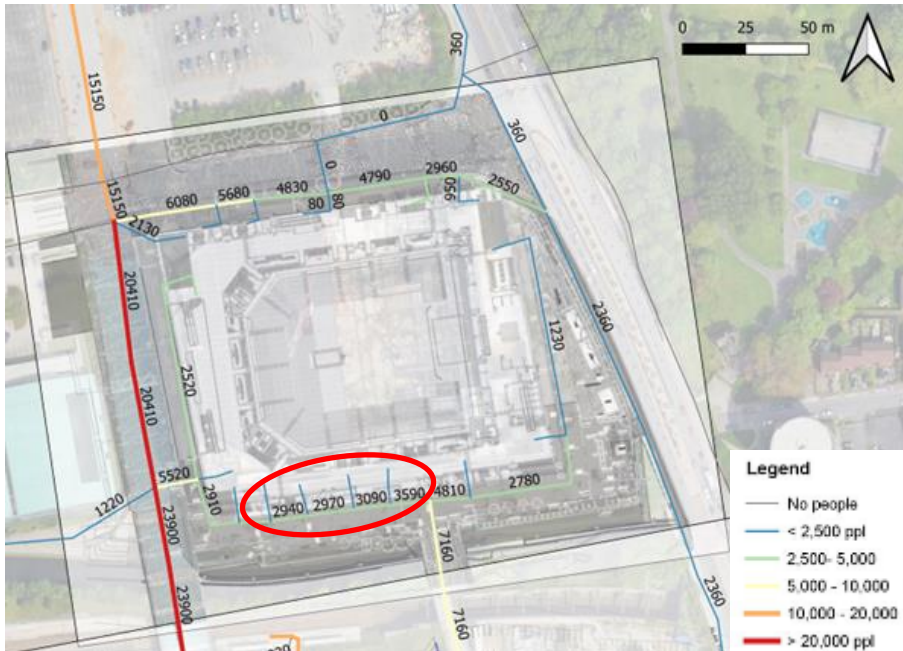


The Etihad Campus SENSE model has been interrogated for an Arena Ingress (pre-event arrivals) and Stadium Hard Egress (post-event departures) scenario based on existing distribution assumptions and profiles.

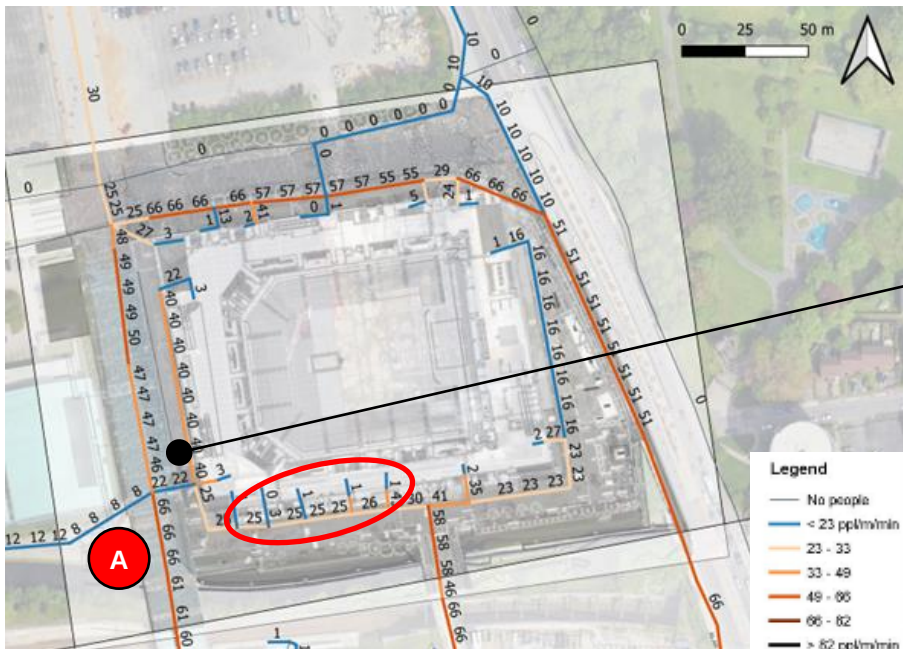
The results are in line with the findings for the Arena Ingress model. This would suggest that the proposed route could accommodate Arena spectator demand and Canalside Development visitor demand.



m Stadium and Arena Egress (30 min delay)



Static assignment per link



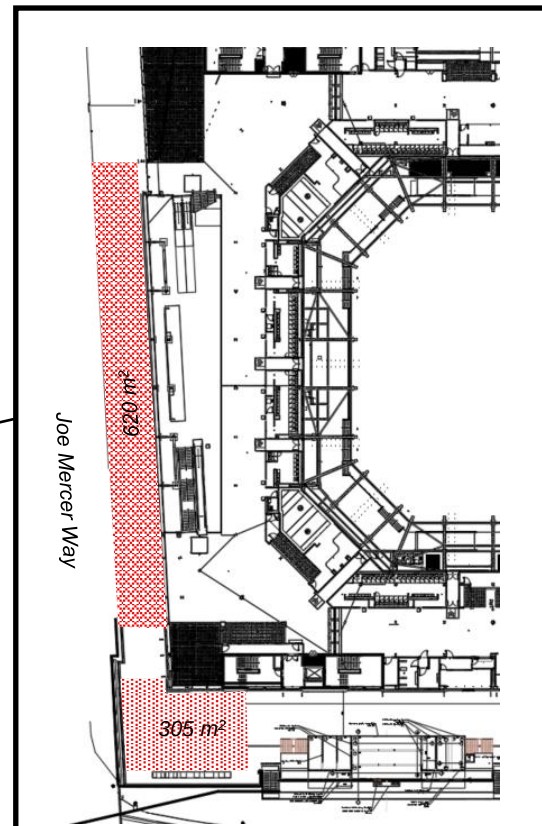
Maximum flow rate per link (ppl/m/min)

The Etihad Campus SENSE model has been interrogated for an Arena Egress (post-event departures) 30 minutes after a Stadium Hard Egress (post-event departures) scenario based on existing distribution assumptions and profiles.

The results on the Arena upper external concourse/podium are in line with the findings for the Arena Egress model.

It should be noted that the modelling indicates the potential for queuing on Joe Mercer Way (location A in the adjacent figure), although it does not extend onto the Arena upper concourse podium. This will be investigated further using microsimulation modelling.

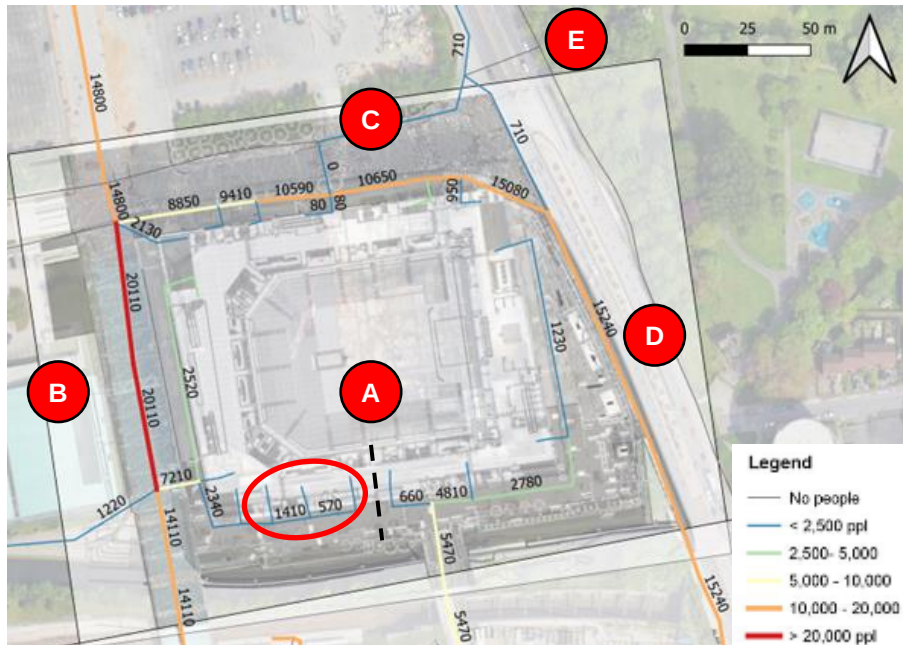
Initial measurements indicate there is approximately 925 m² of queue area between the Arena building line and Joe Mercer Way. This area could queue an estimated 2,300 – 3,000 people



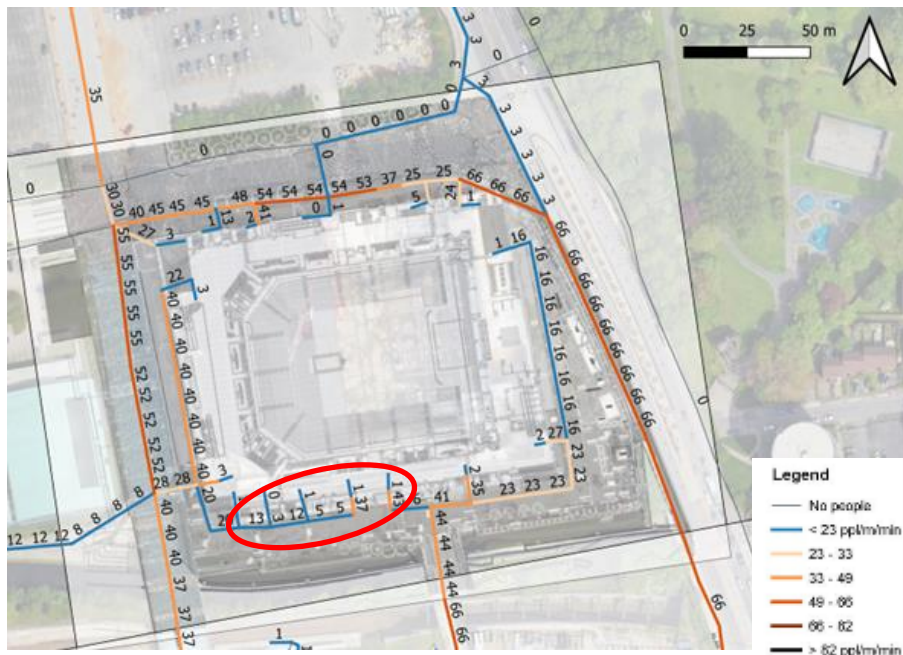
Arena external concourse / podium queue areas



Stadium and Arena Egress (Simultaneous)



Static assignment per link



Maximum flow rate per link (ppl/m/min)

The Etihad Campus SENSE model has been interrogated for a Stadium and Arena Simultaneous Egress (post event departures) scenario based on existing distribution assumptions and profiles.

For this scenario, it is assumed that the Special Measures Operation is in place. This includes:

- Spectators on the East side of the Stadium accessing Ashton New Road are directed south
- Spectators exiting the Arena upper concourse cannot directly access Alan Turing Way
- Spectators exiting the Arena external upper concourse / podium are directed to Forge Lane Bridge or Joe Mercer Way, based on where they emerge from the building (location A in the adjacent figure)
- Joe Mercer Way will be northbound only, with operational interventions not impacting on pedestrian route capacity (location B in the adjacent figure)
- Sport City Way will be closed to vehicle traffic (location C)
- Alan Turing Way will have road lanes available for pedestrian circulation, resulting in 7.5 metres of width available (location D)
- Spectators accessing other destinations will be managed to cross Alan Turing Way (location E)

For a 23,500 spectator event, the model shows a pedestrian demand of 1,410 persons using the route adjacent to the proposed Canalside Development, with a peak flow rate of 12 persons / minute / metre width during the departures period, based on the existing width available (approximately 14 metres).

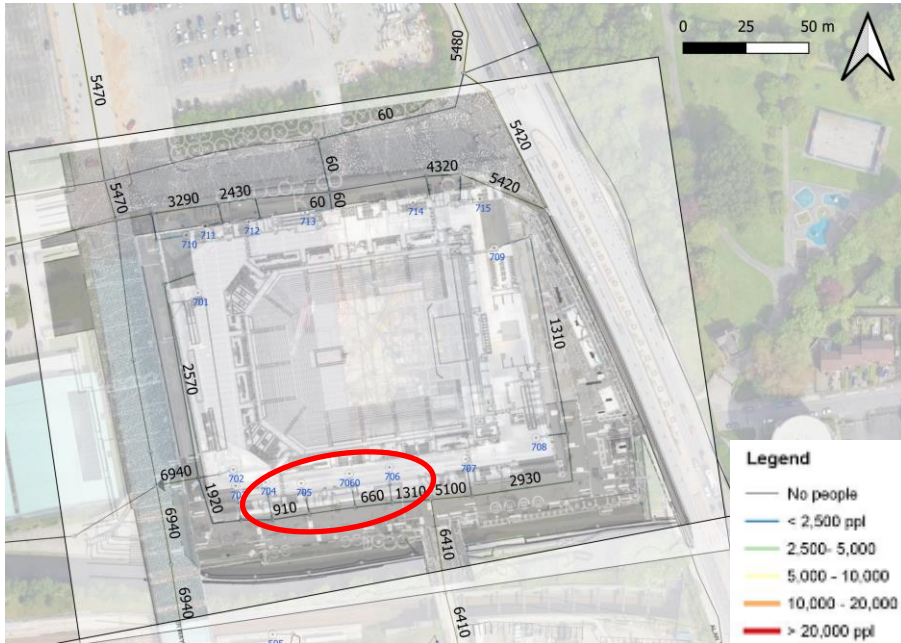
It can be inferred that:

- Reducing the width available by 50% (to approximately 7 metres) would increase the peak flow rate to 24 persons / minute / metre width.
- Reducing the width available by 66% (to approximately 5 metres) would increase the peak flow rate to 36 persons / minute / metre width.

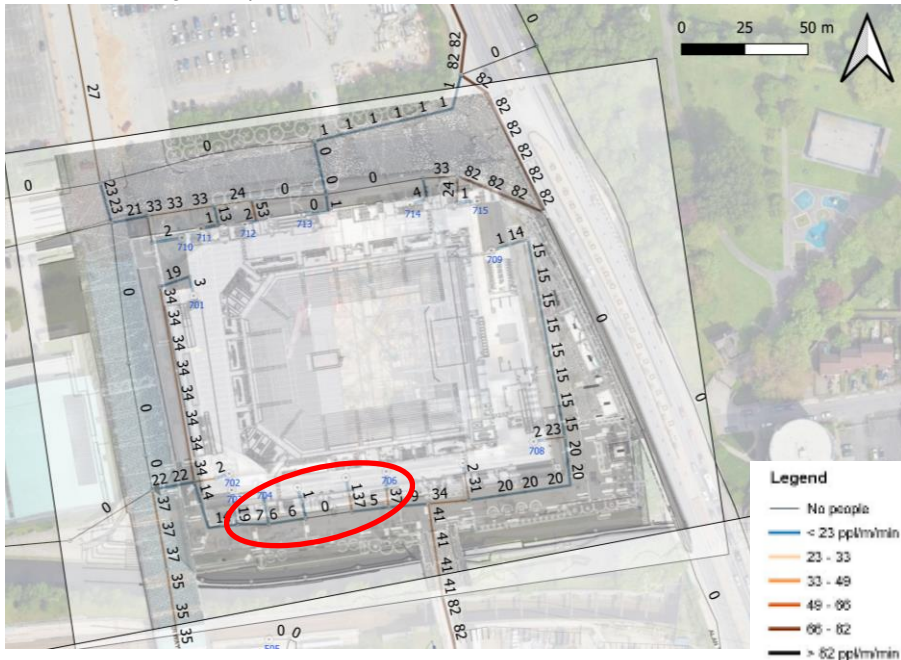
This would suggest that the proposed route could accommodate Arena spectator demand.



SENSE Stadium and Arena Evacuation



Static assignment per link



43 maximum flow rate per link (ppl/m/min)

The Etihad Campus SENSE model has been interrogated for an Arena Evacuation scenario based on existing distribution assumptions and profiles.

The model shows a pedestrian demand of 1,646 persons using the route adjacent to the proposed Canalside Development, with a peak flow rate of 15 persons / minute / metre width during the evacuation period, based on the existing width available (approximately 14 metres).

It can be inferred that:

- Reducing the width available by 50% (to approximately 7 metres) would increase the peak flow rate to 30 persons / minute / metre width.
- Reducing the width available by 66% (to approximately 5 metres) would increase the peak flow rate to 45 persons / minute / metre width.

This would suggest that the proposed route could accommodate Arena spectator demand.

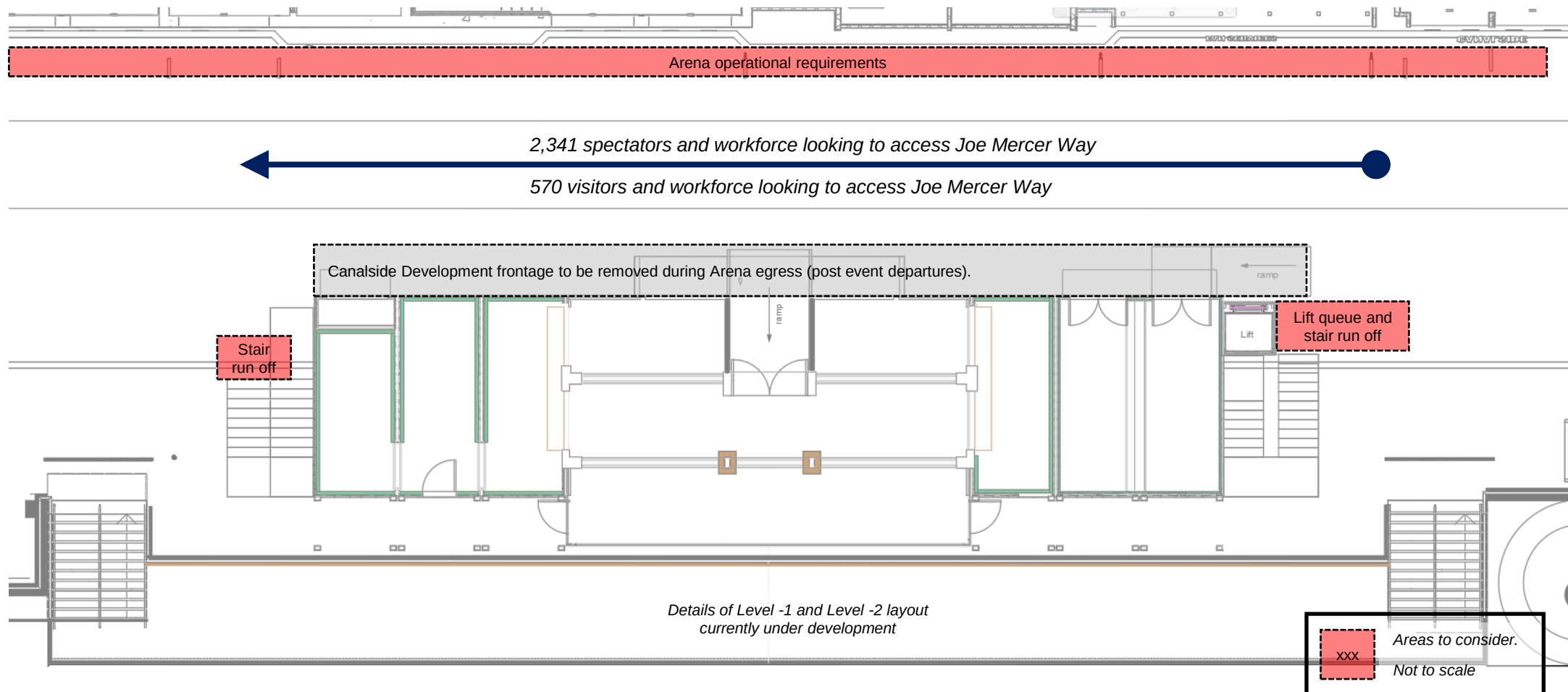
It should be noted that the emergency access route onto Alan Turing Way is also available but not considered in this assessment.



Arena Evacuation – Sensitivity

As a sensitivity analysis we have assumed that spectators and workforce using Arena Exits 04, 05, 6A and 6B (2,351 persons) and Canalside Development visitors and workforce (570 persons) use the pedestrian route between the unit building line and the Arena building line (2,971 persons in total) over an 8-minute period. Spectators and workforce using Arena Exits 07, 08 and 09 are assumed to use the routes available via Forge Lane Bridge and Alan Turing Way (as per the planned operation).

- Based on minimum width of 5.18 metres, the **peak flow rate achieved will be 72 persons / minute / metre width**. This is less than the maximum on directional flow rate of 82 persons / minute / metre width permitted.
- Should the evacuation take place when the Canalside Development frontage is removed, or were the concrete doorstops removed, the flow rate would reduce to 56 to 60 persons / minute / metre width.



Source: BGP040 site plan.dwg

Canalside Development Minimum Circulation Widths



Summary of Arena and Stadium Event Days

During Arena arrivals periods, Arena and Canalside Development frontage operations will need to be considered but should not restrict pedestrian flow unless their combined footprint exceeds 2.0 metres at locations with minimum circulation widths available.

During Arena departures periods, the proposed removal of the Canalside Development frontage will provide additional circulation width for spectators leaving the site. With the frontage removed, flow rates will exceed the targets but remain below the maximum permitted for one directional flow (as decided by the operator). Should additional space be required, removal of the concrete doorstops could be considered (replaced with an alternative doorstep system).

During Stadium and Arena event days, when there is an Arena departure (with the associated interventions in place) 30 minutes after a Stadium departure there may be queuing on Joe Mercer Way, although this is not shown as extending onto the Arena upper external concourse / podium by the Canalside Development. **Dynamic modelling for a superseded Canalside Development layout is presented in Appendix A. Whilst the unit layout is different, the model findings on how pedestrian flows merge on Joe Mercer Way should still provide an indication of the level of congestion to be expected.**

During Stadium and Arena event days, when there is simultaneous Arena and Stadium departures and the Special Measures Operations are in place, the Canalside Development (with the Arena departures interventions in place) should not interfere with pedestrian movement.

The emergency evacuation assessment indicates the planned operation could be accommodated with the Canalside Development in place. The sensitivity scenario highlighted the importance of having Forge Lane Bridge (and potentially the emergency access onto Alan Turing Way) available as an alternative route.



Proposed Canalside Development



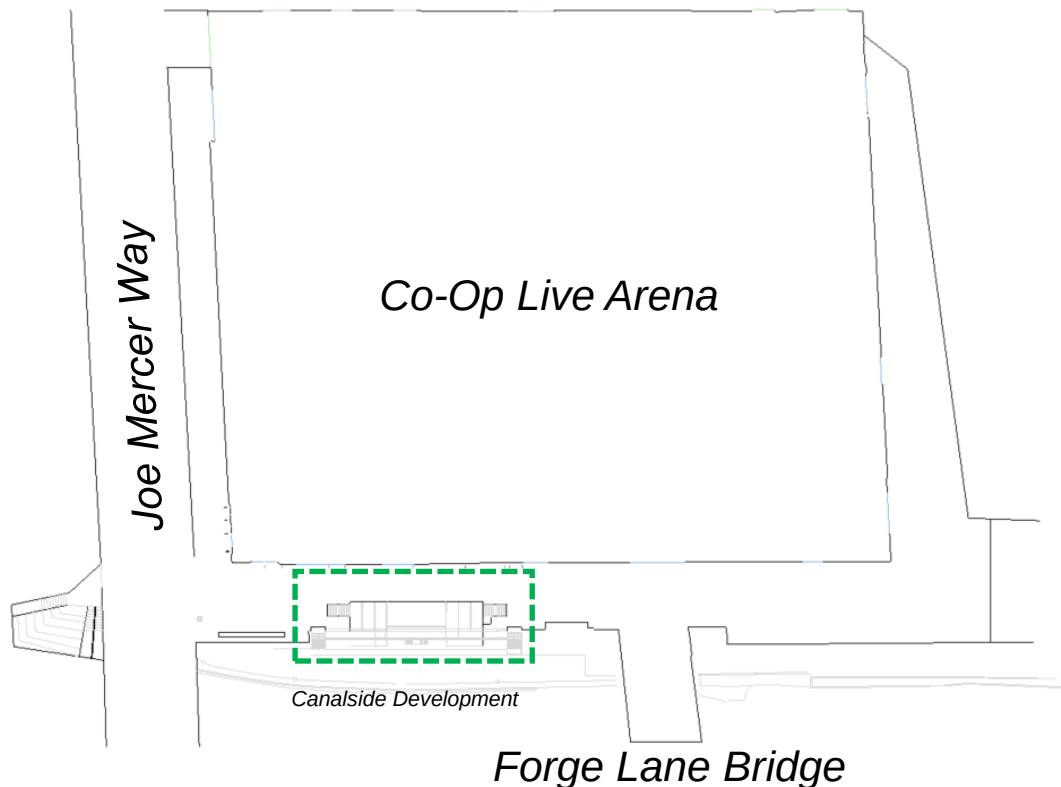
Proposed Canalside Development



Appendix A: Dynamic modelling

m Dynamic modelling

Dynamic Model Extent



Basemap source: BGP040 GF.dwg

A component dynamic model of the Arena and Joe Mercer Way was constructed in order to better understand pedestrian merging on Joe Mercer Way by Arena Exit E and the extent of the queue footprint (if any). The scenario comprising Stadium departures followed by Arena departures 30 minutes later has been assessed (previously referred to as part of Scenario 3: Canalside, Arena and Stadium in this report)

The component model has been constructed using pedestrian outputs from the SENSE model. Spectator routing on the Arena upper external concourse, has been amended to increase the number of spectators using the exit route via Joe Mercer Way. These amendments are explained in the following pages.

For the purpose of this assessment, we have used Legion, a recognized microsimulation tool used to simulate pedestrian movements, flow and behaviour in a number of pedestrian environments.

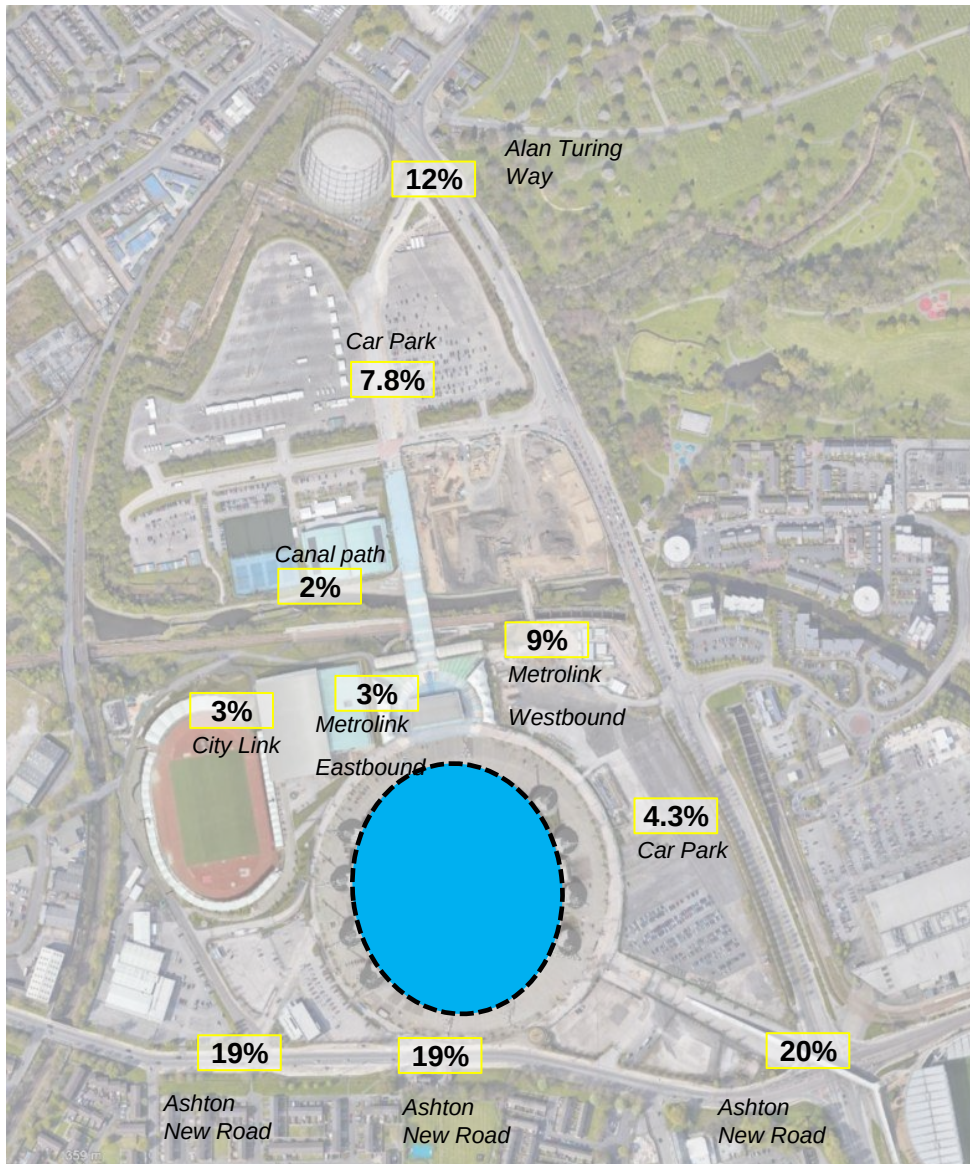
Legion software enables the user to model individual pedestrians within the model environment to see how they interact with other pedestrians (comfort), the infrastructure around them (space that is accessible to them) and their objectives (where they are going). The cumulative movement of individuals generates an emergent pattern of movement for the crowd, that allows the user to assess the performance of the pedestrian space against agreed criteria, identify bottlenecks on pedestrian queues and identify queue footprints required at various locations.

A key consideration for selecting this software was the ability to analyse and represent large volumes of two-way pedestrian flow (i.e. pedestrians travelling clockwise and anticlockwise simultaneously). A number of micro-simulation software available may perform well under one directional flow, but not under two-way flow, which can be a typical occurrence at stadiums for post-event departures periods.

The software initially generates 2D outputs of the pedestrian environment modelled but can create 3D visualizations of the modelling outputs. This option has not been included in the proposed scope of works, given that this feature does not add any analytical value.

It should be noted that the dynamic model was built to reflect a layout of the Canalside Development that has now been superseded. That said, the model findings on how pedestrian flows merge on Joe Mercer Way should still provide an indication of the level of queuing to be expected, if any.

m Stadium spectator departure distribution



Source: Google Earth

Stadium spectator distribution for post event departures

Pedestrian survey data for Manchester City matches was analyzed in order to develop assumed spectator post event departure distributions.

The adjacent image presents the latest Stadium spectator post event departure distribution assumed, as agreed prior to the Arena opening in May 2024.

Stadium spectators are assumed to depart the venue building line using the following profile:

- 75% of spectators depart over a 15-minute period after the final whistle
- 25% of spectators depart of the following 15-minute period (a 30-minute departure period in total)

XX% Stadium demand



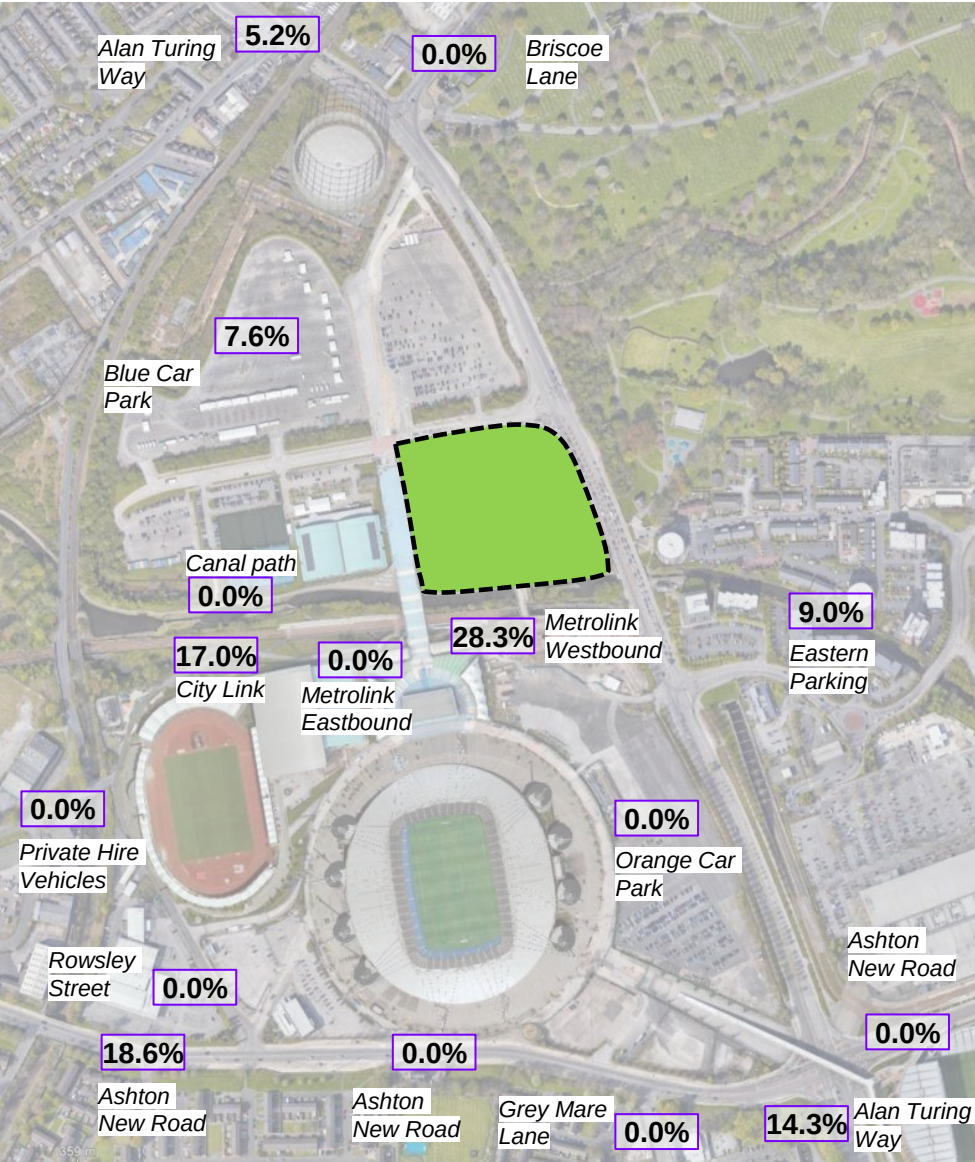
Arena spectator departure distribution

Once an Arena Event has finished, spectators will depart the building line and make their way to the transport opportunities available to depart the site.

Etihad Campus stakeholders agreed an assumed Arena spectator departure distribution prior to the Arena opening in May 2024 (presented in the adjacent image). This distribution has been used to determine spectator direction of travel around the Arena building line, Joe Mercer Way and Forge Lane Bridge.

Arena spectators are assumed to depart the venue building line using the following profile:

- 100% of spectators depart over a 15-minute period
- Arena spectator departures will start 25 minutes after the start of the Stadium departure period



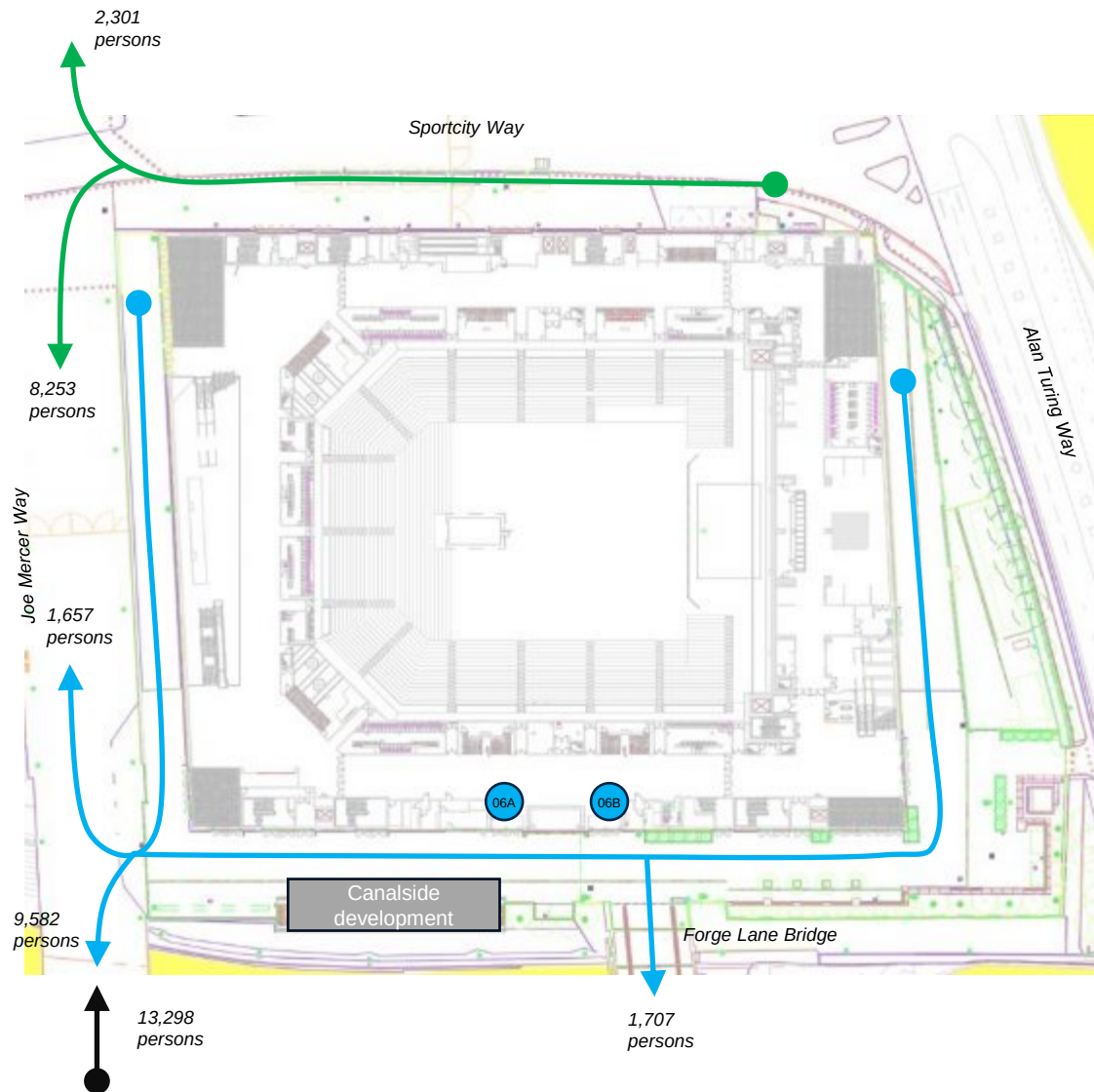
Source: Google Earth

Arena spectator distribution for post event departures

XX% Arena demand



Dynamic model spectator routing



Source: BRA-POP-ZZ-ZZ-DR-L-8111.dwg

Arena Building Line Entry and Exit Points

The SENSE (pedestrian network) modelling assumes spectators travel via the shortest route available. In order to assess a robust scenario in the dynamic model, most spectators in the Arena upper external concourse/podium have been assumed to use Joe Mercer Way.

To determine the potential queue footprint on the Arena external concourse/podium, the following Arena spectator routing assumptions have been applied:

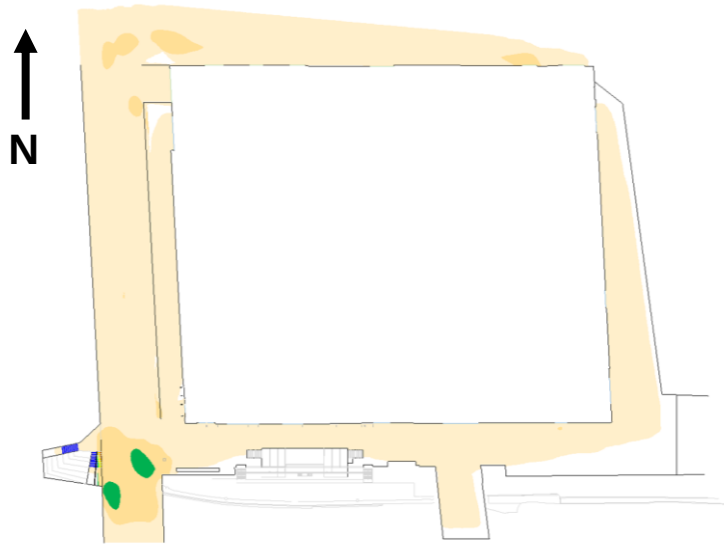
- Arena spectators on the upper external concourse/podium travelling northbound (Alan Turing Way or Blue Car Park) will exit onto Joe Mercer Way and travel northbound (that equates to **1,657 persons**);
- Arena spectators on the upper external concourse/podium to the east of exit 6A, going to the Metrolink westbound service will use Forge Lane Bridge (**1,707 persons**);
- Arena spectators on the upper external concourse/podium travelling to any other destination will exit onto Joe Mercer Way and travel southbound (**9,582 persons**);
- Arena spectators on ground level (by Sportcity Way) travelling northbound or eastbound will travel northbound on Joe Mercer Way (**2,301 persons**);
- Arena spectators on ground level (by Sportcity Way) travelling to any other destination will travel southbound on Joe Mercer Way (**8,253 persons**);
- There will be 61,000 spectators at the Stadium, of which 21.8% are travelling northbound on Joe Mercer Way (**13,298 persons**).

In aggregate, this equates to a combined pedestrian flow on Joe Mercer Way (by Arena Exit E) of:

- 17,835 spectators travelling southbound
- 14,955 spectators travelling northbound



Dynamic modelling outputs (15-minute period)



Stadium and Arena departure overlap (15 minutes)
Cumulative Mean Density map (CLOSS)

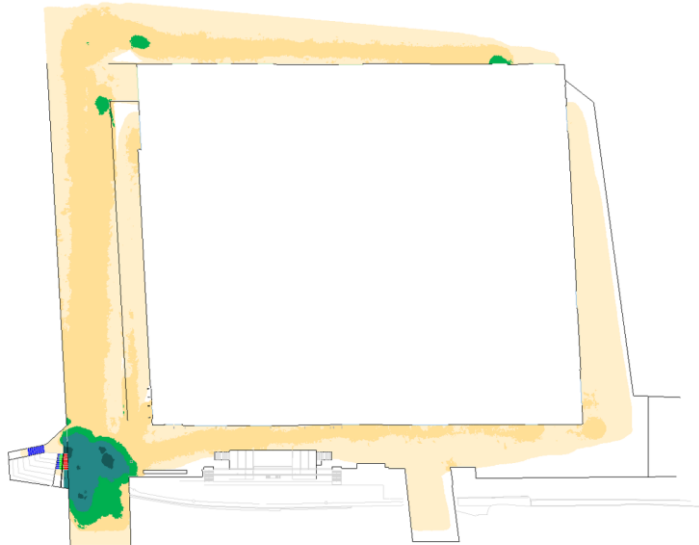
Level of Service	Density	
	people/m ²	
	Lower	Upper
A		1.00
B	1.00	2.00
C	2.00	3.00
D	3.00	4.00
E	4.00	4.70
F	4.70	5.38
F+	5.38	

Key

CLOSS is a Level of Service (LOS) indicator that describes conditions experienced by pedestrians on walkways.

The 15-minute period considered comprises the overlap of Stadium and Arena spectators departing the site. The heatmaps show the following:

- The Cumulative Mean Density map shows the average density recorded at each location over the model run time. It shows some congestion forming at the junction of Joe Mercer Way and Arena Exit E, but these do not exceed CLOSS LOS C (3 persons / m²) and does not extend to the Arena upper external concourse / podium.
- The Cumulative Maximum Density map shows the maximum density recorded at each location at any point during the model run time (not necessarily at the same time). At the junction of Joe Mercer Way and Arena Exit E, it mostly shows CLOSS LOS D (4 persons / m²), with some instances of CLOSS LOS E (in excess of 4 persons / m²). The peak congestion does not extend on the Arena upper external concourse / podium but shows potential for Joe Mercer Way to be close to capacity. This has been investigated further in the next page by assessing peak 5-minute intervals.
- A review of the Legion model video outputs shows continuous pedestrian flow at the Joe Mercer Way and Arena Exit E junction.
- In summary, based on the assumptions presented in this report, **the reduction in pedestrian circulation width between the Arena and the canal, resulting from the proposed Canalside Development (approximately 14 metres to 7.7 metres), should not impact on any potential queue footprint requirements for the scenario assessed** (Stadium post event departures followed by Arena post event departures 30 minutes later). **If there are any further reductions in the width available, these conclusions may not apply.**

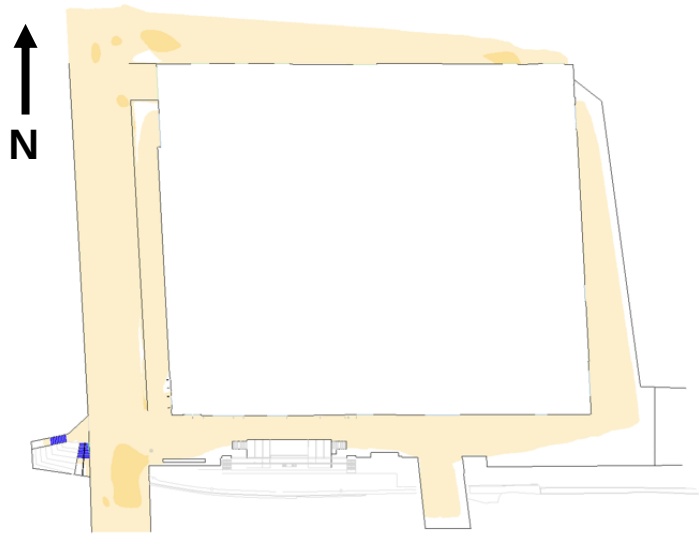


Stadium and Arena departure overlap (15 minutes)
Cumulative Maximum Density map (CLOSS)

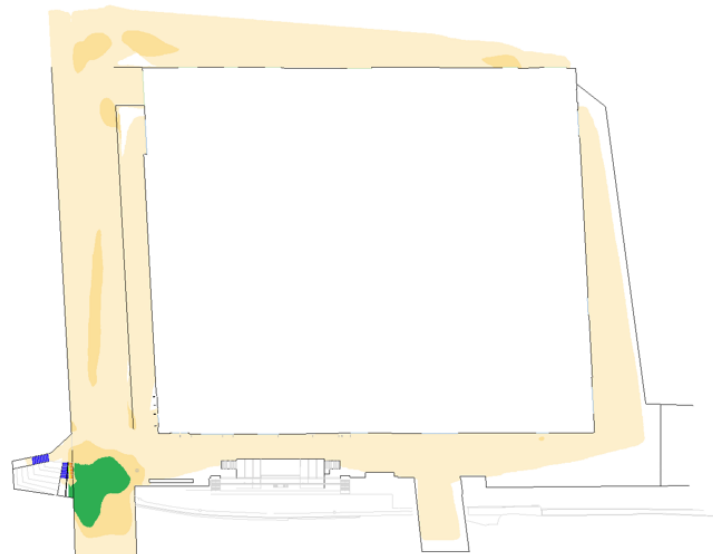
Basemap source: BGP040 GF.dwg



Dynamic modelling outputs (5-minute periods)



30 minutes post Stadium departure and
5 minutes post Arena departure

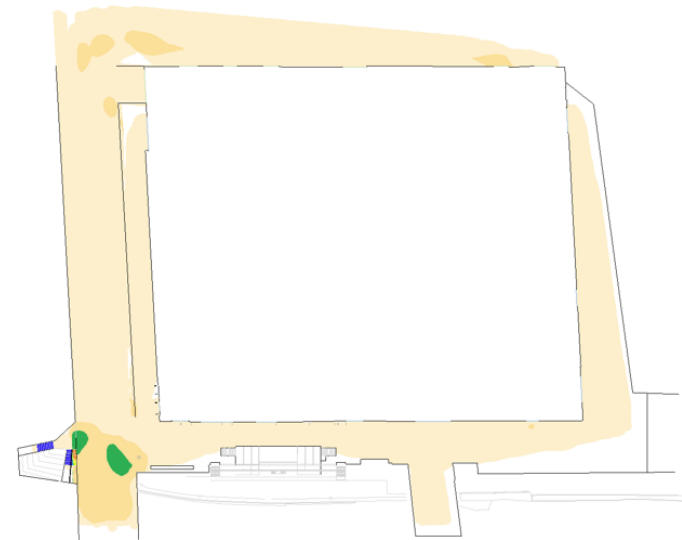


35 minutes post Stadium departure and
10 minutes post Arena departure

Level of Service	Density	
	people/m ²	
	Lower	Upper
A		1.00
B	1.00	2.00
C	2.00	3.00
D	3.00	4.00
E	4.00	4.70
F	4.70	5.38
F+	5.38	

The 15-minute model period considered, has been reviewed in 5-minute intervals to better understand the build up of congestion at the Joe Mercer Way and Arena Exit E junction during the departure period. Each of the adjacent images present Cumulative Mean Density Maps for each 5-minute interval.

- At 30 minutes, the beginning of the Arena and Stadium departure overlap period, there is CLOSS LOS B (2 persons / m²)
- At 35 minutes, there is CLOSS LOS D (3 persons / m²). This is the 5-minute period that shows most congestion but does not extend onto the Arena upper external concourse/podium.
- At 40 minutes, the area has mostly returned to CLOSS LOS B (2 persons / m²).



40 minutes post Stadium departure and
15 minutes post Arena departure

Basemap source: BGP040 GF.dwg



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