Executive Summary

Background and Scope

Pedestrian modelling study was undertaken in September 2010 for the RIBA E layout of Tottenham Court Road station using the 2026 forecast passenger demand from CPFR 5.0. The Legion modelling assumptions, results and conclusions from this study were reported in C134-OVE-T3-RAN-N105-00004.

Following a review of the modelling results presented in the RIBA E Legion modelling report, C134 was further instructed by Crossrail to asses the impact of the Project Assure proposal of omitting the Western Ticket Hall to Central Line Link at TCR station.

As a result of the above structural change, the Western Entrance was reconfigured, allowing circulation from the ticket hall level directly to a new concourse at Crossrail Platform level. The mezzanine level of the Western TH (as shown in RIBA E design) was omitted.

Various design options were proposed by C134 in relation to the reconfiguration of the Western entrance and the Platform/ Passageway layouts. From a series of reviews, Option D1.8 was identified as the Preferred Design Option to be progressed and developed further.

In all the options, the ticket hall has been subject to minimal change such as the removal of a ticket gate and a PRM lift. The mezzanine level of the Western Ticket hall was omitted. As a result, the six escalators from the mezzanine level were also removed. PRM circulation between lifts was maintained through an open passageway adjacent to the escalator bank at the mezzanine level promoting equality of experience as far as possible between PRMs and escalator users. The single PRM lift at the Crossrail platform level faces onto the concourse and has a recessed lobby.

The purpose of this study is to assess the operational capacity of Option D1.8 at TCR West resulting from the permanent omission of the Central Line Link. The Legion models used in this study are from TCR Station's RIBA E design stage and have been jointly audited by CRL/LU.

Modelling Inception Meeting

An inception meeting was held with London Underground on 30th January 2011 to discuss the modelling methodology and assumptions for the Legion modelling study of Option D1.8. In the meeting, it was agreed that the 2026 passenger demand matrices in CPFR 5.0 will be adjusted to allow for the omission of the Central Line Link and subsequent re-routing of passengers. The Central line to/from Western Entrance passengers were moved to the Eastern Entrance. In addition, 3,150 passengers were added to the Western Entrance due to the excess variation in flows from the two Crossrail platforms.

The revised passenger demand matrices were supplied by Crossrail and were agreed with LU prior to modelling. Revised Matrices and a note from Crossrail are attached in Appendix A.

Modelling Outputs

The following Legion modelling outputs are presented in this report:

- Cumulative Mean Density (CMD) maps
- Cumulative High Density (CHD) maps
- Desire Line Diagrams

Cumulative Mean Density (CMD) maps are based on Fruin's Levels of service (LoS) for walkways, queuing and stairways for the peak 15 minutes.

Cumulative High Density (CHD) maps show the total time the passenger density exceeds a given threshold (1.08 passengers/m^2 and 1.54 passengers/m^2 as requested by LU).

The Level of Service maps produced by Legion were assessed using LU's 1-371 Standard and Crossrail's Station Planning: Platforms, CR-STD-305, V6, to ensure the station layout satisfies the design criteria.

3 Model Layout

Figure 2 shows C134's Tottenham Court Road station layout in RIBA E design stage, which consists of the two ticket halls, Northern Line, Central Line and Crossrail platforms and the interchange connections. The layout also includes the London Underground's proposed TCR upgrade scheme.

Figure 2: Tottenham Court Road Station Layout - Stage E

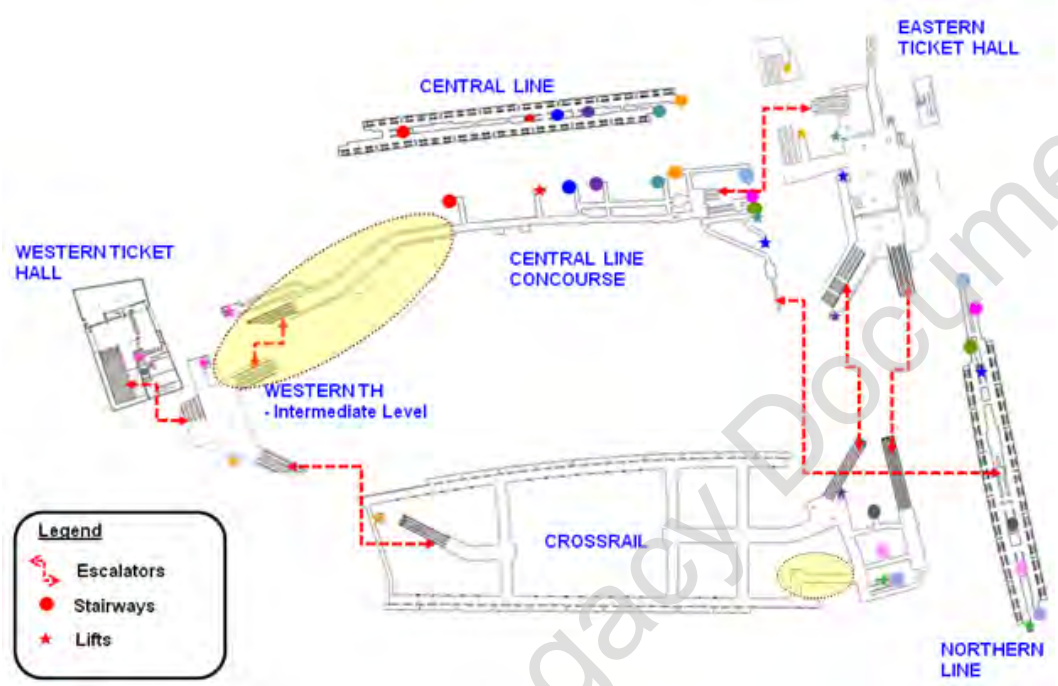


Figure 3 shows the Option D1.8 layout modelled in this study.

The main structural changes to the Stage E layout are as below:

- Deletion of the Western Ticket Hall to Central Line Link
- Omission of the mezzanine level of the Western Ticket Hall

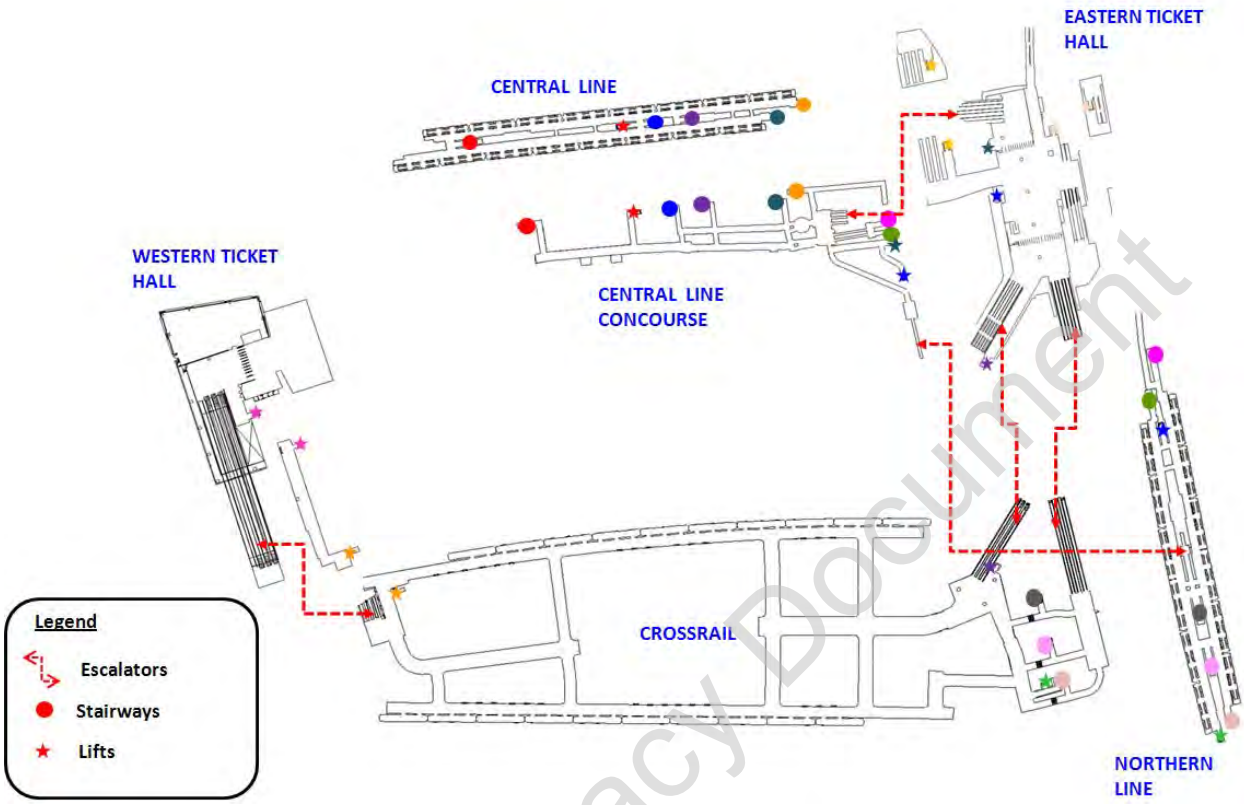
Following the above structural changes, the Western Entrance was reconfigured, allowing circulation from the ticket hall level directly to a new concourse at Platform level.

Various design options were considered in relation to the reconfiguration of the Western entrance and the Platform/ Passageway layouts. From a series of reviews, Option D1.8 was identified as the Preferred Design Option to be progressed and developed further.

In the options proposed for the omission of the Central Line Link, the Western Ticket Hall has only been subject to minimal change such as the removal of a ticket gate and a PRM lift. The mezzanine level of the Western Ticket hall was omitted. As a result, the six escalators from the mezzanine level were also removed. PRM circulation between lifts was maintained through an open passageway adjacent to the escalator bank at the mezzanine level promoting equality of experience as far as possible between PRMs and escalator users.

The extended bank of escalators from the Western Ticket Hall arrive at a new concourse at Platform level. The single PRM lift faces onto the concourse and has a recessed lobby.

Figure 3: Tottenham Court Road Station Layout - Option D1.8



4 Key Changes to the Modelling Assumptions

The updated ACS (Assumptions Cover Sheets) for the 2026 +28% scenarios modelled were issued to CRL/LU. The ACS include all the key inputs and modelling assumptions such as boarding/alighting profiles, passenger arrival profiles, delay times for ticketing facilities, train timetables and so on.

Prior to commencing the Legion modelling study using the adjusted CPFR 5.0 demand, the following modelling assumptions were discussed with LU and CRL in an inception meeting and were agreed to be revised in the models.

4.1 Central Line

With the deletion of the Western Ticket Hall to Central Line link, the western most staircase on the Central Line platforms was redundant. Therefore, the staircase logic around the Central Line platform entry/exit points was re-assessed and agreed with LU and CRL prior to modelling. The proposed changes to the routing assumptions of Central Line stairways are shown in **Figure 4**.

Alighting passengers from the first two carriages of the Central Line westbound train, 50% passengers alighting from the seventh carriage and 100% from the eighth carriage of the Eastbound train to use the westernmost stair to exit the platforms as highlighted in Figure 4.

15% of the total passengers previously using the stairway adjacent to the lift will now use the westernmost staircase to access the Central Line platforms as agreed with LU.

Figure 43: 2026 PM Peak +28% (17:45 - 18:00 hours) CMD Staircase – Central Line