West London Orbital

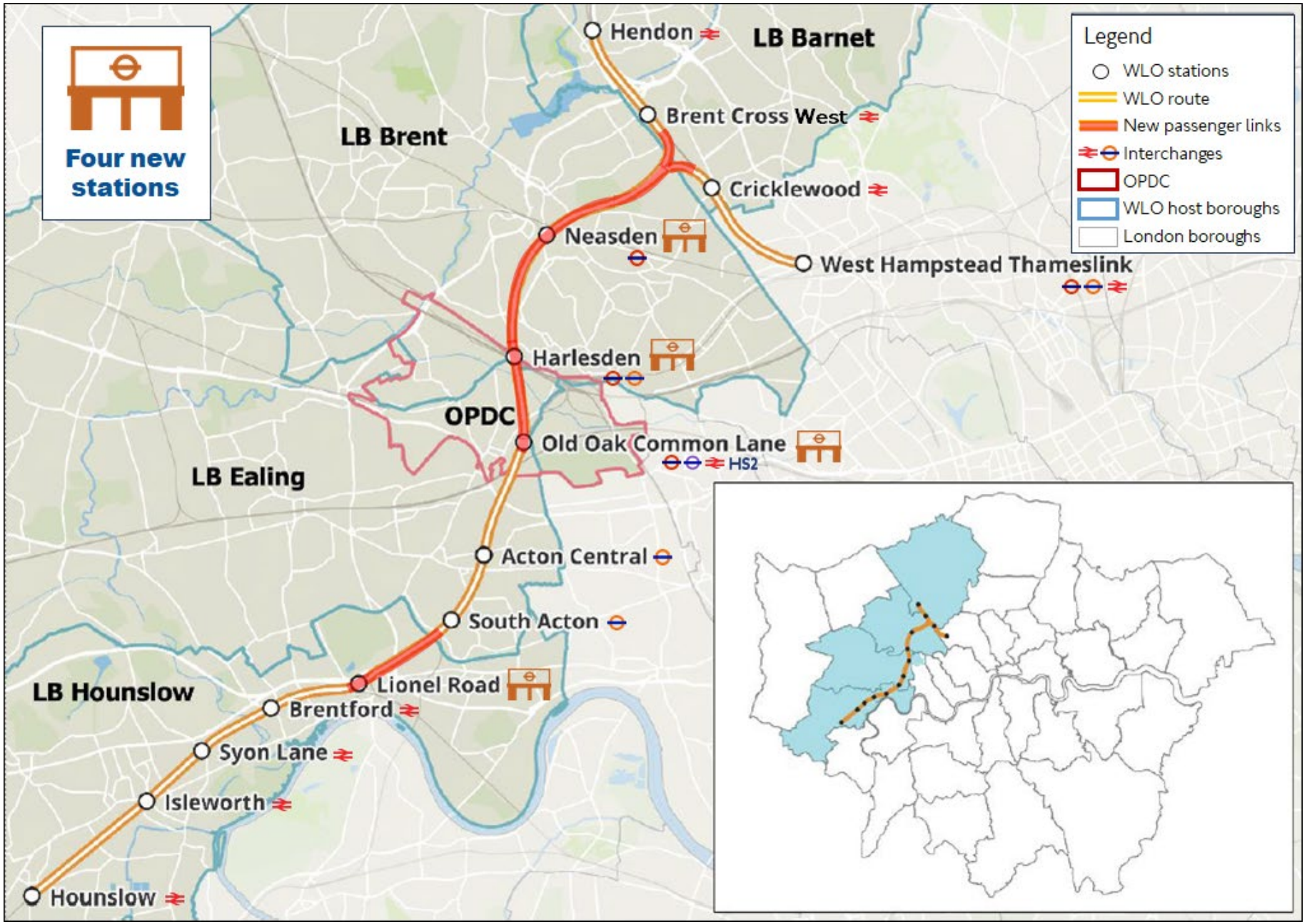
Progress and Feasibility – PWI Presentation

David Mansfield – DEM Overground

March 12th 2025

WLO route

- TfL is working jointly with the West London Alliance of boroughs on developing the WLO scheme
- The scheme has four core objectives focused on:
  1) Enhancing orbital public transport connectivity
  2) Enabling and optimising the delivery of new homes and jobs
  3) Enhancing public transport capacity to relieve pressure on existing corridors
  4) Delivering wider economic, environmental and social benefits, reducing inequalities
- We have been working with Network Rail who have undertaken timetable assessment, traction power modelling and internal sponsorship activities for the scheme



The case for the scheme

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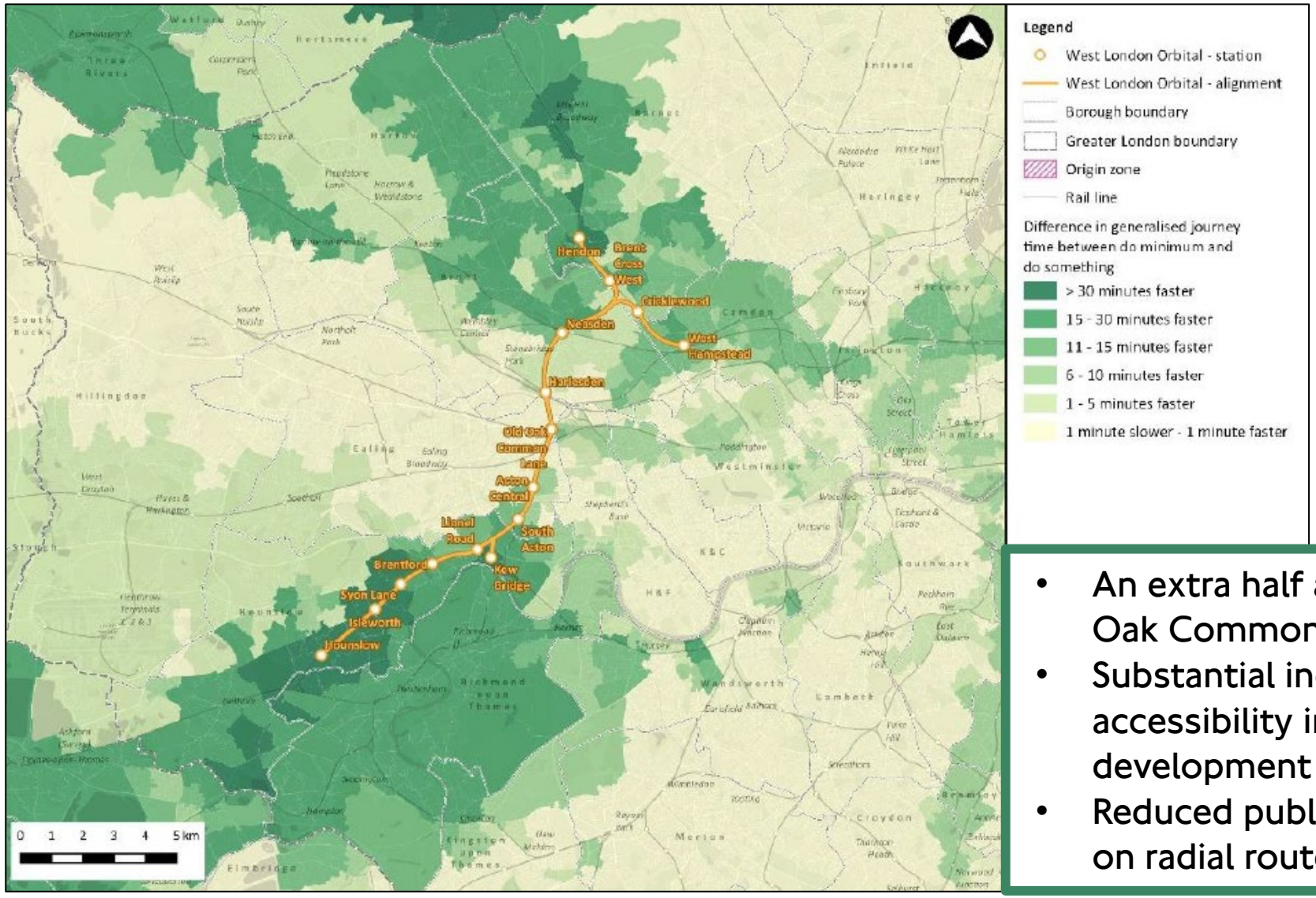
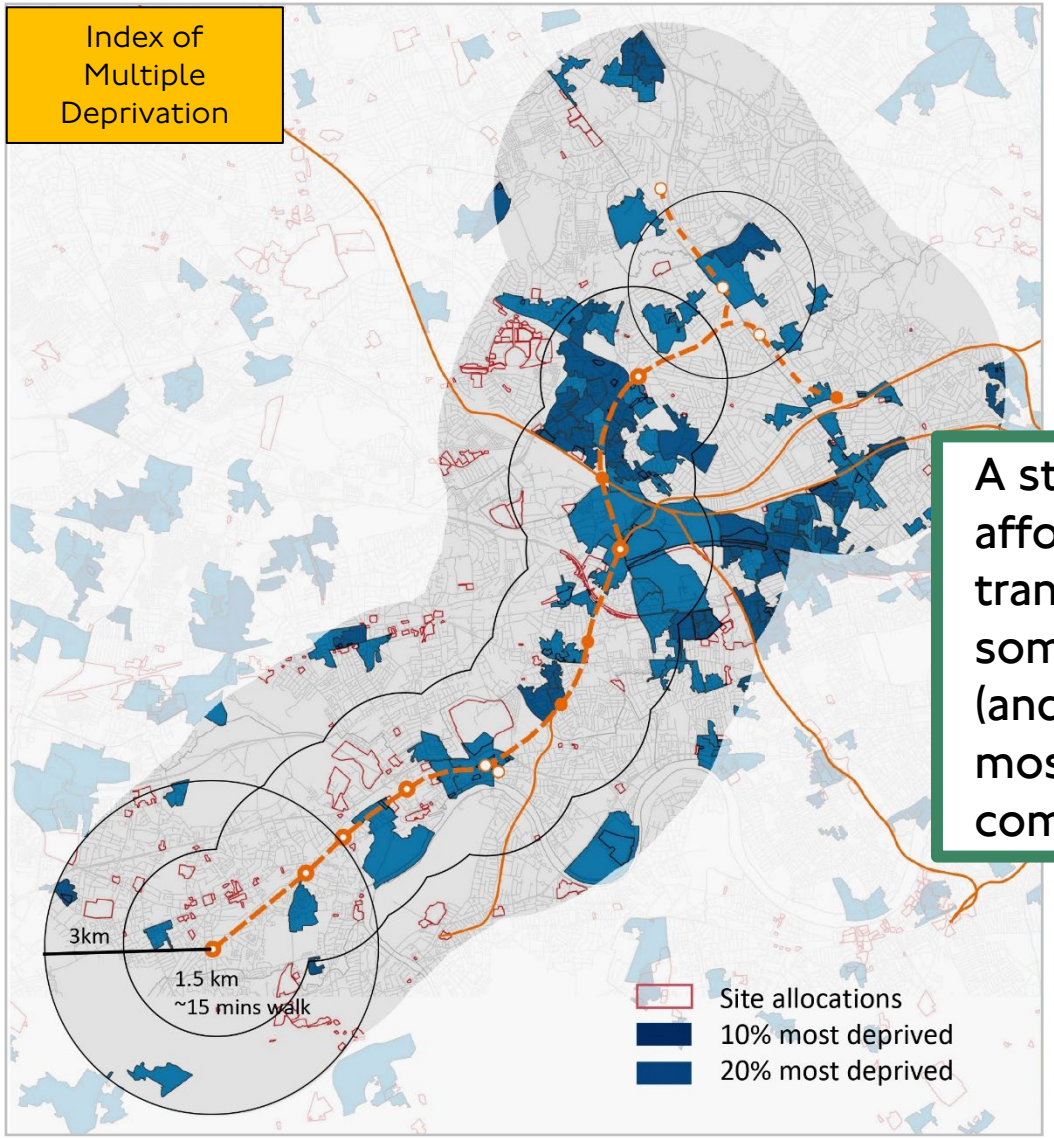
WLO would deliver a substantial increase in public transport connectivity in west London



The map shows improvements in journey times to Old Oak Common

- An extra half a million people can reach Old Oak Common within an hour
- Substantial increase in public transport accessibility improving scale, rate and value of development
- Reduced public transport crowding, particularly on radial routes

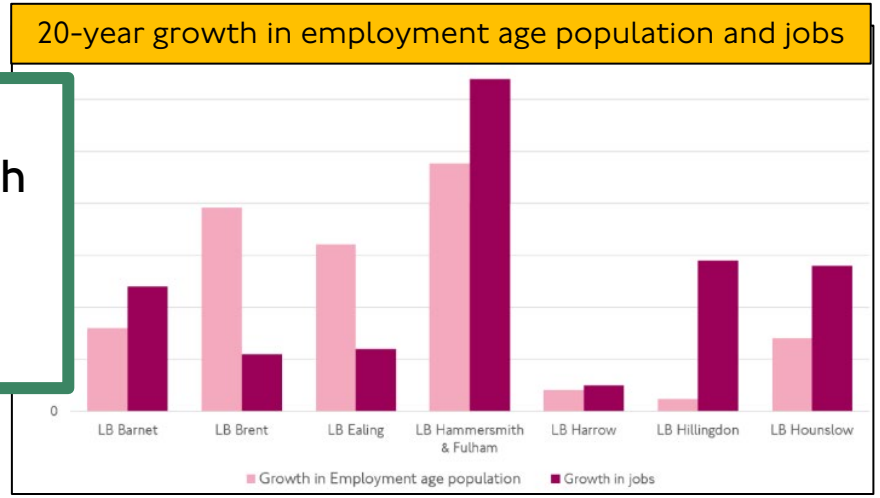
WLO is well aligned with local, Mayoral and national policies



Connecting boroughs with high jobs growth to those with high homes growth

A step-free and affordable transport link for some of London's (and England's) most deprived communities

Mode shift from car trips, helping reduce congestion



WLO would support the delivery of around 25,300 new homes and directly connect five Opportunity Areas

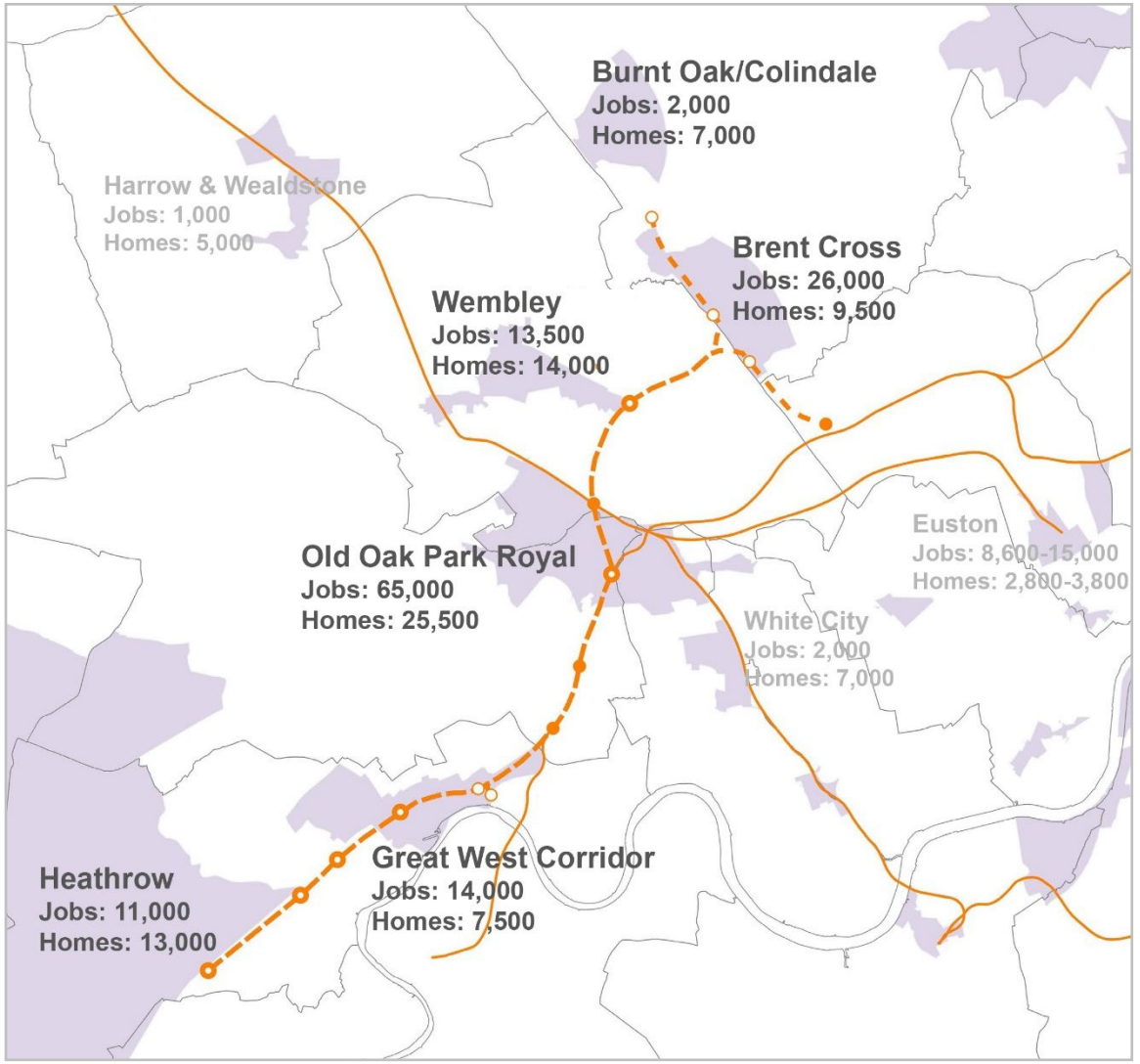
Brent Cross Opportunity Area
around Cricklewood, Hendon and Brent Cross stations

Wembley Opportunity Area
around Neasden station

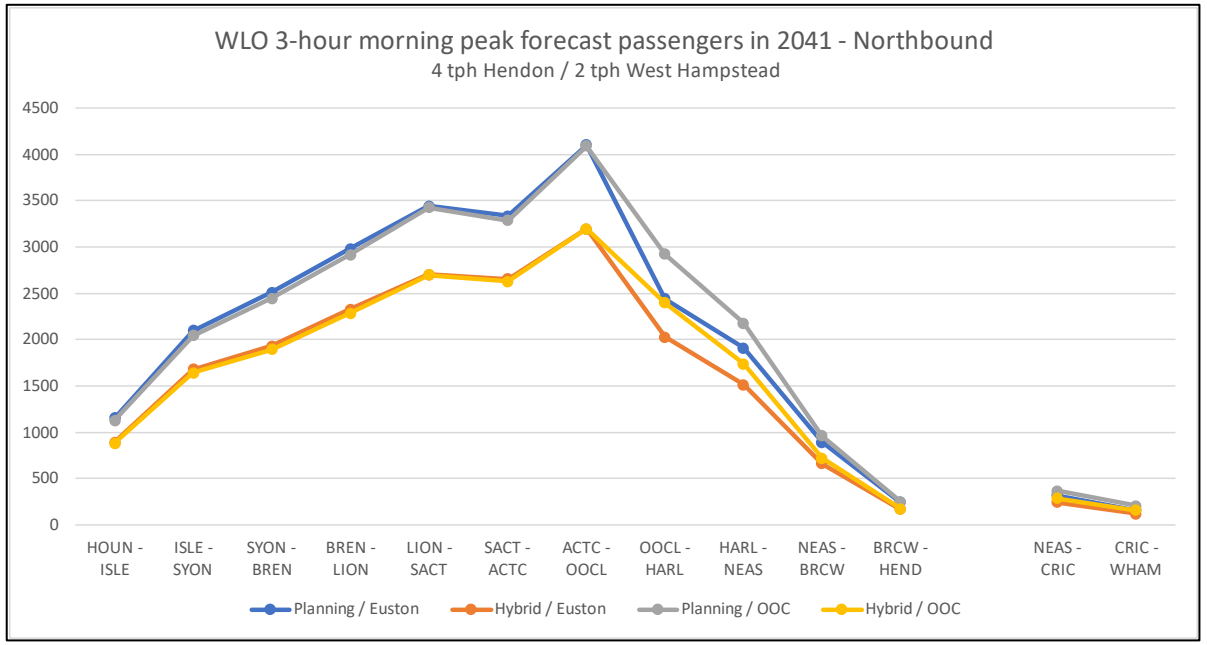
Old Oak Park Royal Opportunity Area
around Harlesden and Old Oak Common stations

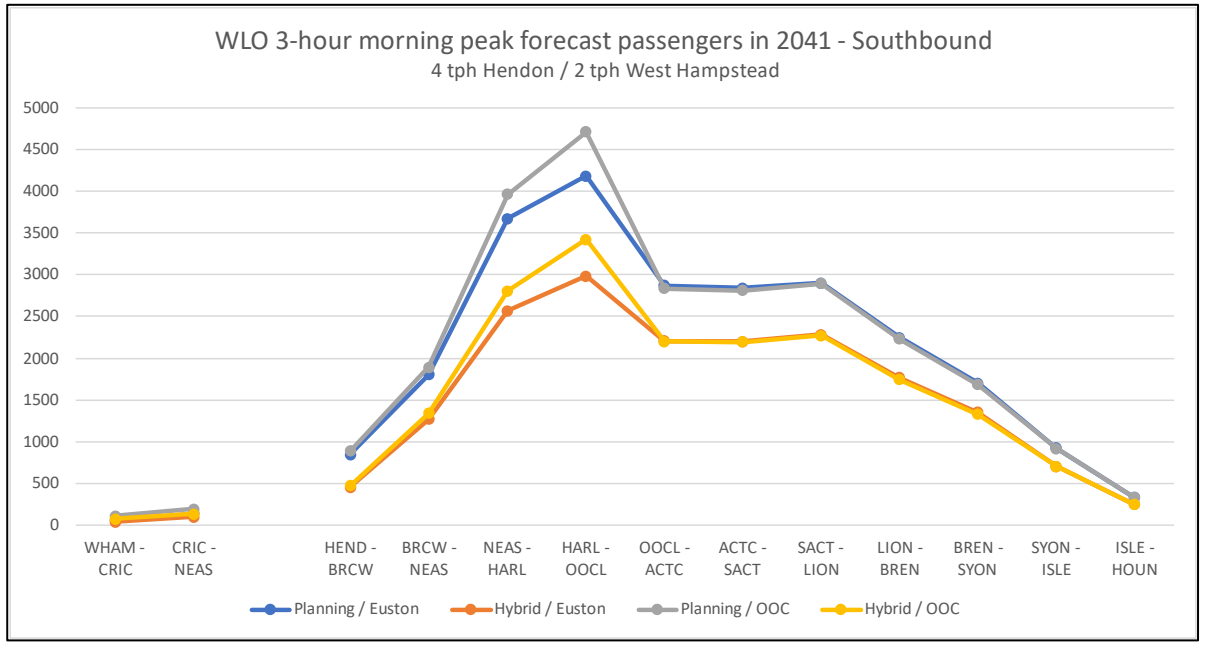
Great West Corridor Opportunity Area
around Lionel Road, Kew Bridge and Brentford stations

Heathrow Opportunity Area
around Hounslow and Isleworth stations



Forecast demand for WLO services





- Two forecasts have been used – Planning and Hybrid – which gives a range of demand under different future social and economic scenarios for London
- WLO services are forecast to be well used with up to 4,700 passengers per direction over the morning peak 3 hours
- In both directions, demand peaks towards Old Oak Common
- In scenarios with HS2 terminating at Old Oak Common, WLO carries more passengers who use the route to access HS2
- The branch to West Hampstead Thameslink is forecast to be considerably less busy than that to Hendon
- A comparison to other London Overground routes is presented on the next page

Demand for WLO services

The table below shows the forecast morning peak hour crowding levels in 2041 on the busiest parts of different Overground routes

The metric is passengers per square metre of standing space

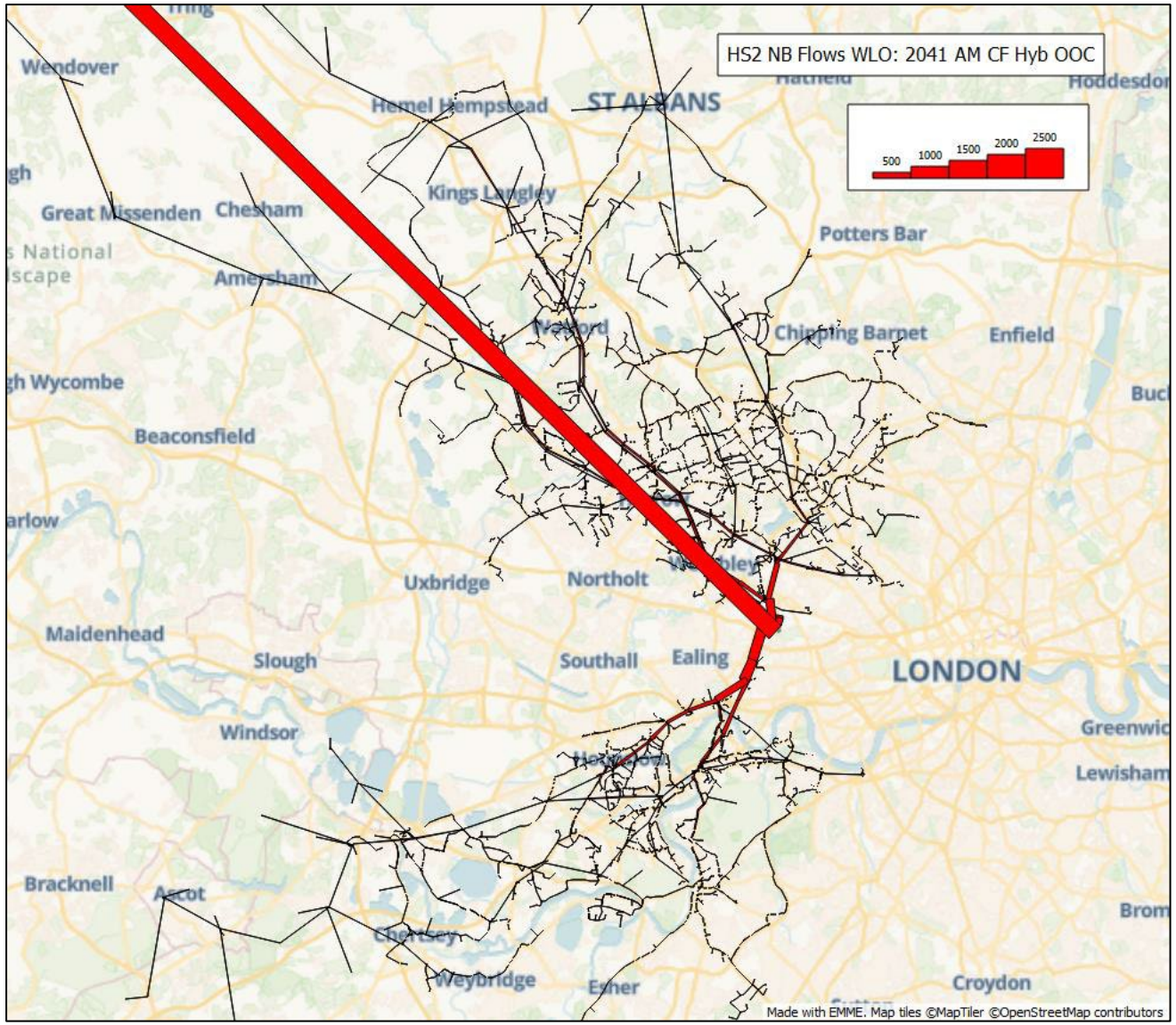
Overground route	Section	Crowding (passengers per square metre)
Windrush line	New Cross Gate to Surrey Quays	5.3
Suffragette line	Leyton Midland Road – Walthamstow Central	4.7
Mildmay line	Clapham Junction to Imperial Wharf	3.7
Weaver line	Clapton to Hackney Downs	3.6
Weaver line	Bruce Grove to Seven Sisters	2.7
WLO	**Acton Central to Old Oak Common Lane**	**2.6**
Mildmay line	Canonbury to Highbury & Islington	2.6
Weaver line	London Fields to Cambridge Heath	2.0
Suffragette line	Barking Riverside to Barking	1.7
Lioness line	Harlesden to Willesden Junction	1.7
WLO	**Harlesden to Old Oak Common Lane**	**1.6 (2.1 at 4 tph)**
Mildmay line	Willesden Junction to Acton Central	1.5
Mildmay line	Kensal Rise to Willesden Junction	0.9
Lioness line	Kilburn High Road to South Hampstead	0.3

- At its busiest, WLO is forecast to carry 108 passengers per carriage in the peak hour (northbound towards Old Oak Common)
- While other established sections of the London Overground network are forecast to be more crowded, the table demonstrates that WLO services would be very popular and well used
- Notably, WLO services are forecast to be more crowded than the entire Lioness line, the Mildmay line between West Hampstead and Richmond, the Weaver line towards Liverpool Street, and the newly opened Barking Riverside extension
- North of Old Oak Common the table assumes a 6 trains per hour WLO service – while fewer passengers would use a reduced 4 tph service, trains would be more crowded
- The WLO figures do not take account of any development unlocked by the scheme, so there is the potential for demand to be higher still

Forecasts for WLO and other London Overground lines use different model versions so figures are indicative only

WLO's benefits for HS2 connectivity and resilience

- The map shows the areas where HS2 passengers are forecast to use WLO to access the high speed line at Old Oak Common (with HS2 terminating in west London)
- With HS2 terminating at Old Oak Common, WLO would provide the best route to get to and from HS2 for people living and working in Hounslow, Brent, Barnet, Harrow and parts of Hillingdon
- Beyond this WLO would connect HS2 to large swathes of south west London and Surrey, north London and Hertfordshire
- It is also the best route for stations on the Midland Main Line through St Albans and Luton, West Coast Main Line through Watford and Hemel Hempstead, and Chiltern route through Amersham to Aylesbury
- The resilience of Old Oak Common due to its lack of rail connectivity other than the Elizabeth line is a major concern
- WLO could be important in helping ensure the success of HS2 in London
- WLO still provides the best route to access HS2 services from many of these areas with it running to Euston



Technical work completed during GRIP 2 design stage

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Overview of technical work completed

Transport modelling

Forecasting the number of passengers who will use WLO services and changes in demand for the rest of the public transport network

Economics and revenue assessment

Using the modelling outputs to quantify the revenue generated by the WLO scheme, its economic benefits, and its value for money

AECOM

Timetable assessment

Confirming that the level of WLO service proposed is feasible and assessing the impact on other passenger and freight services

Network Rail

Engineering design

Completing the design of the scheme to Network Rail's 'GRIP 2 / ES2' feasibility design stage

Cost estimating

Estimating the cost of constructing the scheme based on a detailed assessment of the infrastructure required and construction approach

Mott MacDonald

Traction power assessment

Determining the electricity requirement and infrastructure upgrades needed under different electrification and battery-electric train scenarios

Carbon assessment

Assessing the 'embodied carbon' involved in constructing the WLO scheme, to build an understanding of its Net Zero credentials

Land and property impacts

Assessment of land required outside the existing railway boundary, and the estimated cost of acquiring this land

TfL

Urban context analysis

Consideration of the constraints and opportunities for the wider public realm around stations and other WLO infrastructure interventions

Further details of the outputs of these work areas are available on request

WLO infrastructure

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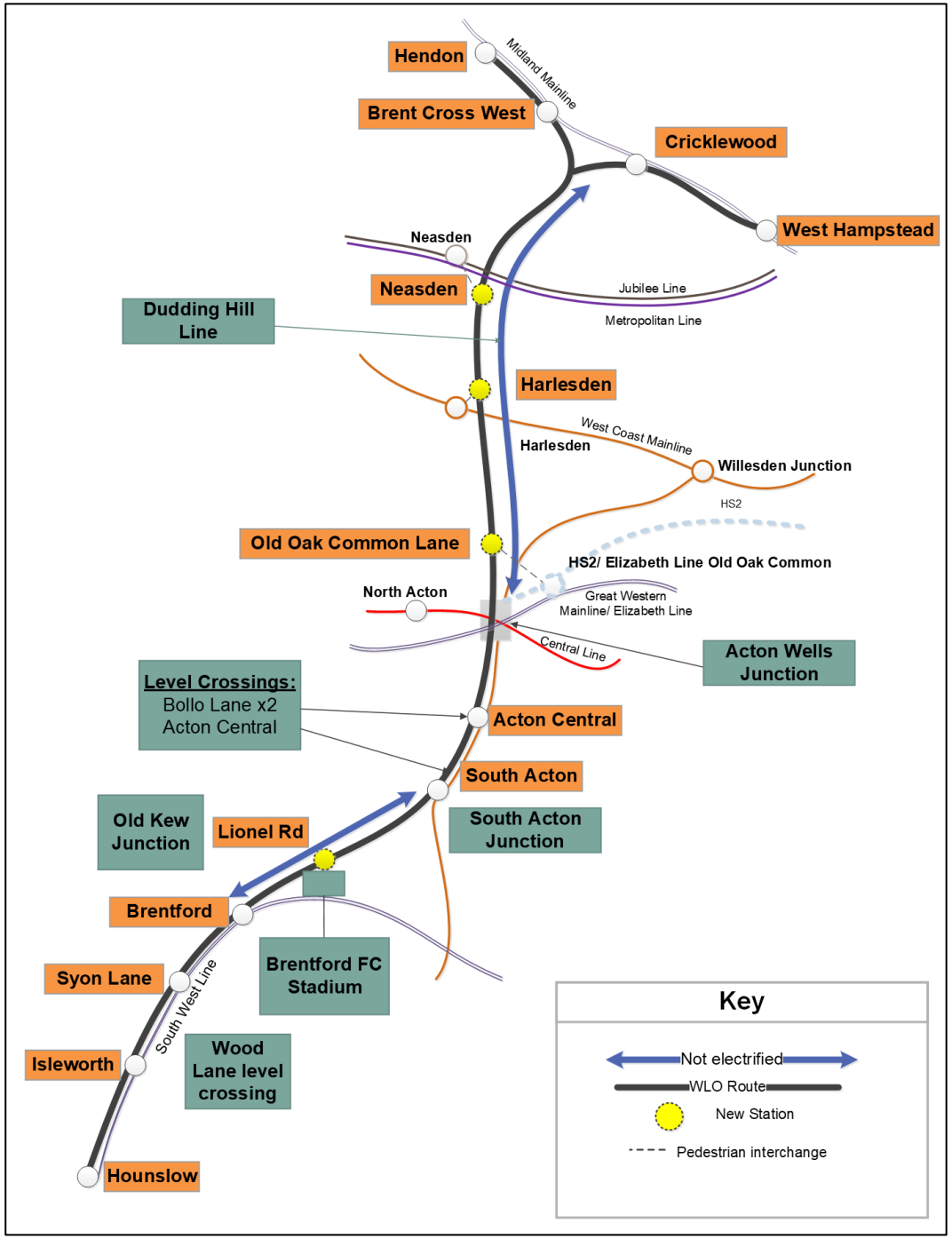
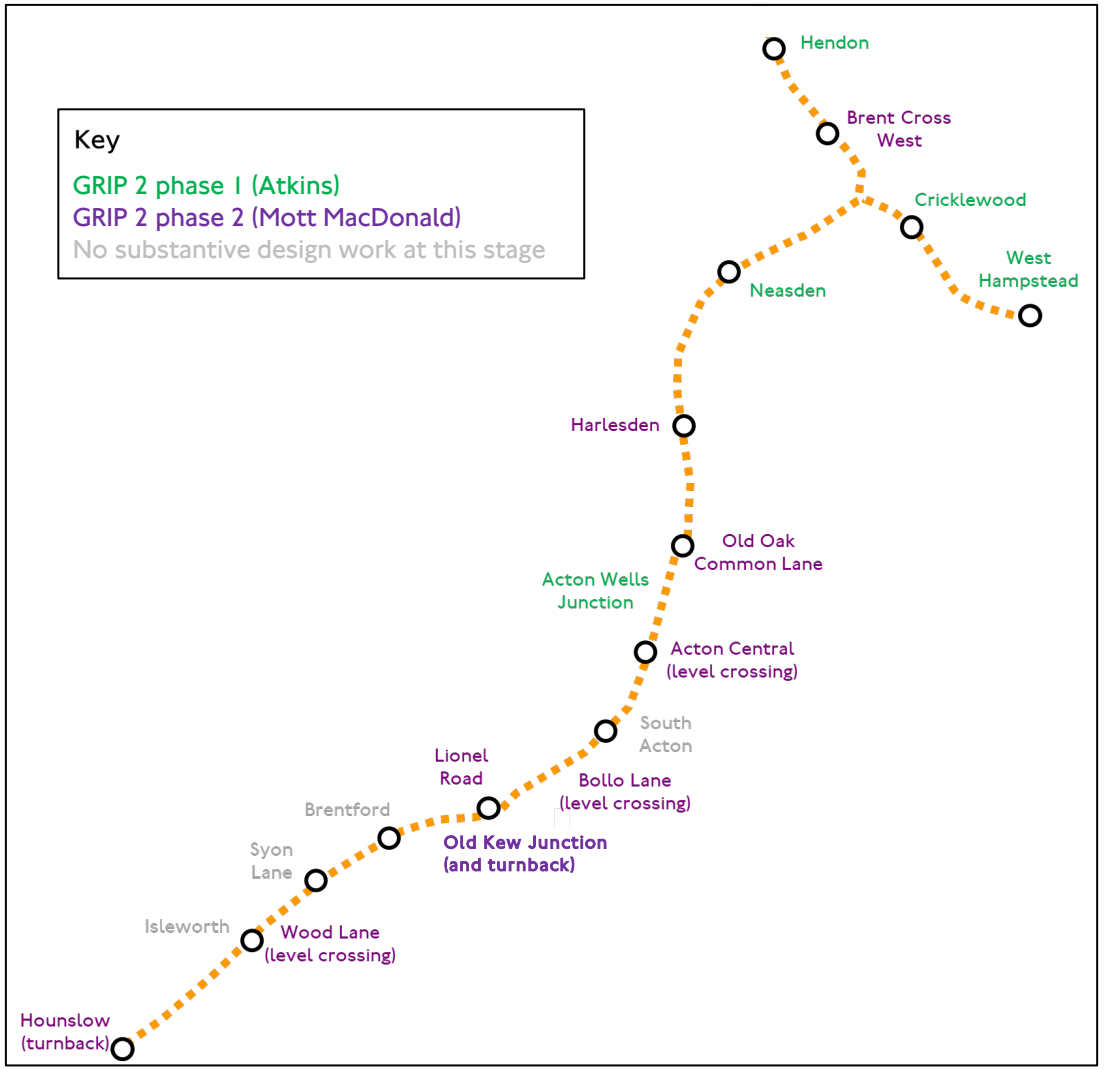
Scope of infrastructure works

- Key elements of scope
  - Four new stations Step free
  - New platforms at up to a further four stations
  - Step-free access at two existing stations
  - Major upgrade of Acton Wells Junction (four-tracking)
  - Doubling of Old Kew Junction
  - New / upgraded signalling Brent Cross/Cricklewood to South Acton
  - Turnback infrastructure at Hendon, West Hampstead Thameslink, Old Oak Common Lane, Lionel Road and Hounslow
  - Three level crossing closures
  - New trains with stabling at Willesden South West sidings
  - Power upgrades and electrification
  - Public realm and interchange improvements



Overview of feasibility design and assessment

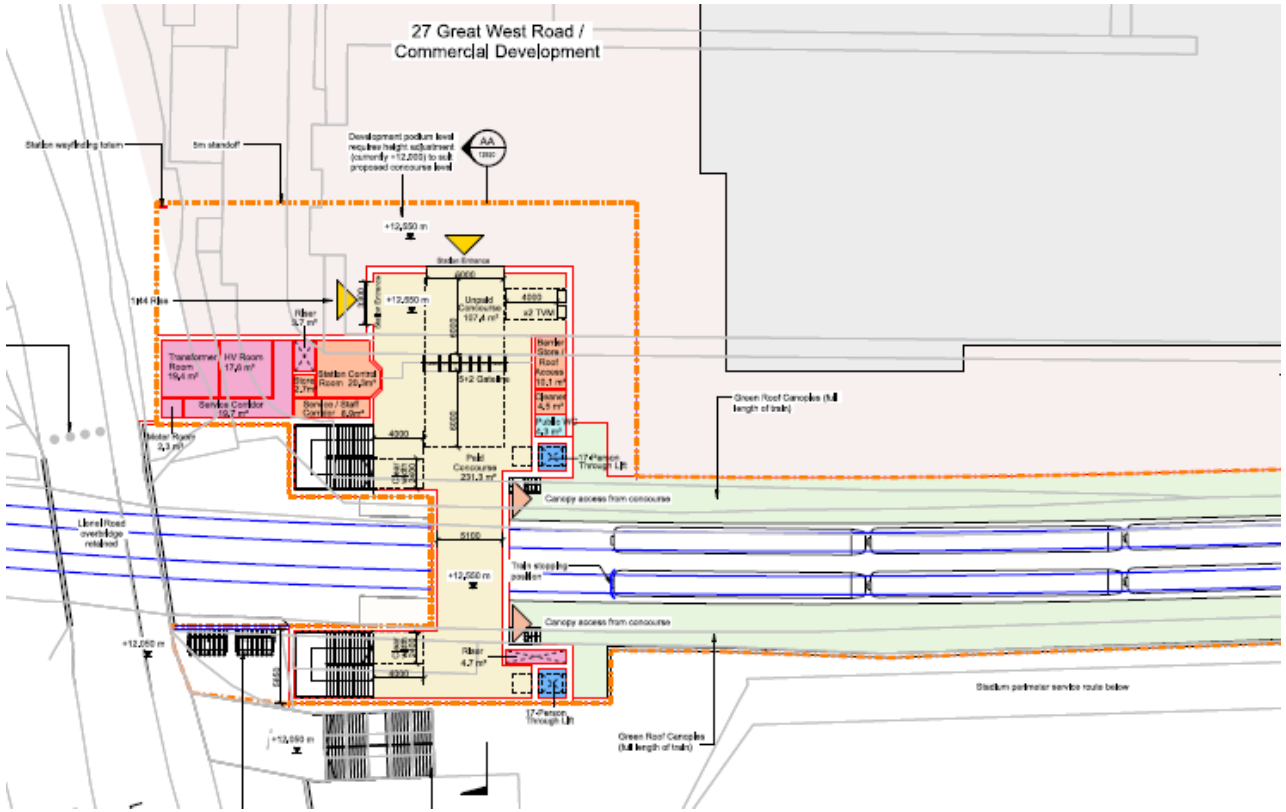
- Two phases of feasibility design work have now been completed:
  - The initial phase was undertaken by Atkins in 2021-22 and focused on the most challenging locations like Acton Wells Junction where there could have been showstoppers
  - The second phase has been carried out by Mott MacDonald in 2023-24, developing options for the remainder of the locations and bringing the two phases together into a route-wide design
- This work demonstrated that there were feasible solutions for all elements of the scheme with no showstoppers identified
- At least two shortlisted options have been identified for each station, junction, etc. – the design of these options will be developed further and a single option selected during the next design phase



New stations

- Four new stations would be delivered as part of the WLO scheme:
  - Neasden – two new side platforms on the Dudding Hill line with on-street interchange to the Jubilee line station
  - Harlesden – two new side platforms on the Dudding Hill line with on-street interchange to the Bakerloo / Lioness line station
  - Old Oak Common Lane – two new side platforms plus a north-facing bay platform, with entrance via east-west bridge to be delivered by OPDC providing interchange to Old Oak Common HS2/Elizabeth line station and North Acton station on the Central line
  - Lionel Road – two new side platforms on the Kew Branch (BOK5)
- At Neasden and Lionel Road land required to deliver the stations is being safeguarded as part of adjacent planned developments

Example – Lionel Road Station

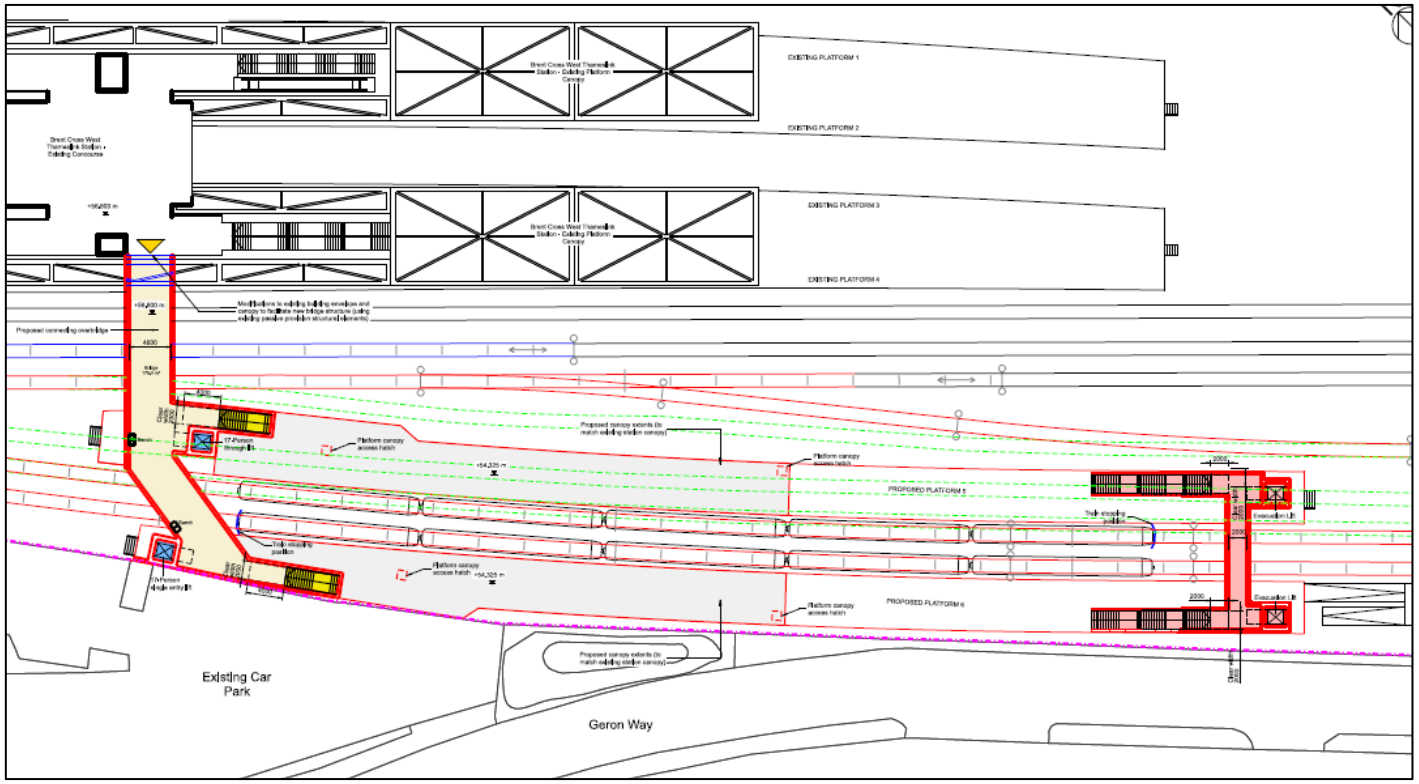


Note – plan shows one of several options at this location and is therefore an example only

New platforms at existing stations

- No direct interface between London Overground and either East Midlands Railway or Thameslink services
- New platforms would be provided at up to four stations on the Midland Main Line:
  - Hendon – two new side platforms on the Hendon lines and step-free access provided to all platforms
  - Brent Cross West – two new side platforms or an island platform on the Brent Curve
  - Cricklewood – two new side platforms on the Hendon lines
  - West Hampstead Thameslink – two new side platforms on the Run Round Loop and Down Hendon line

Example – Brent Cross West new platforms



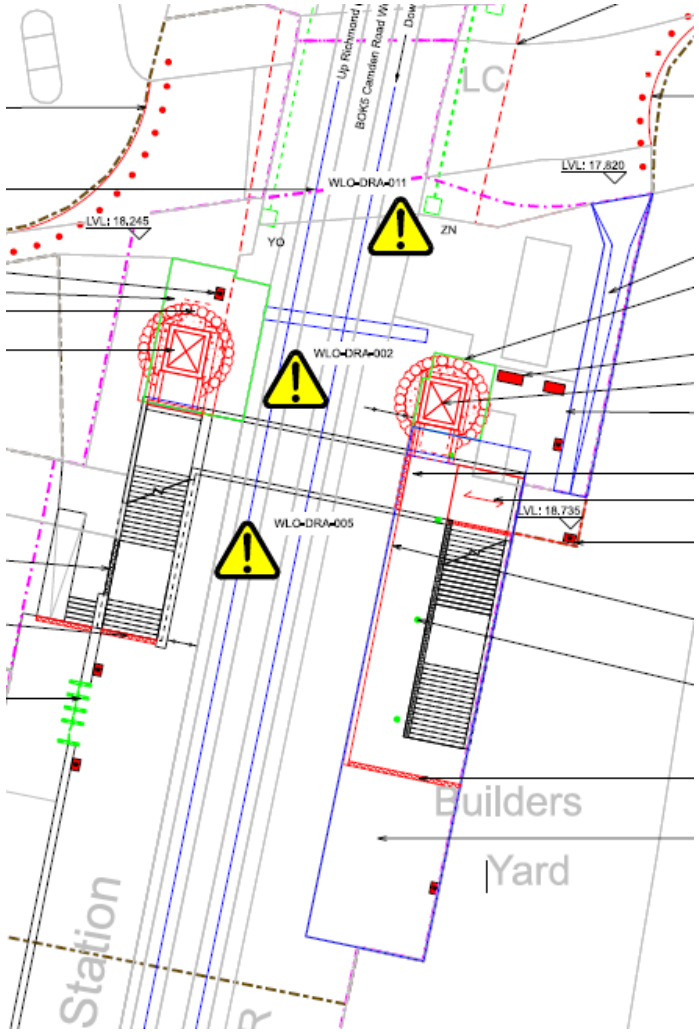
Note – plan shows one of several options at this location and is therefore an example only

Level crossings

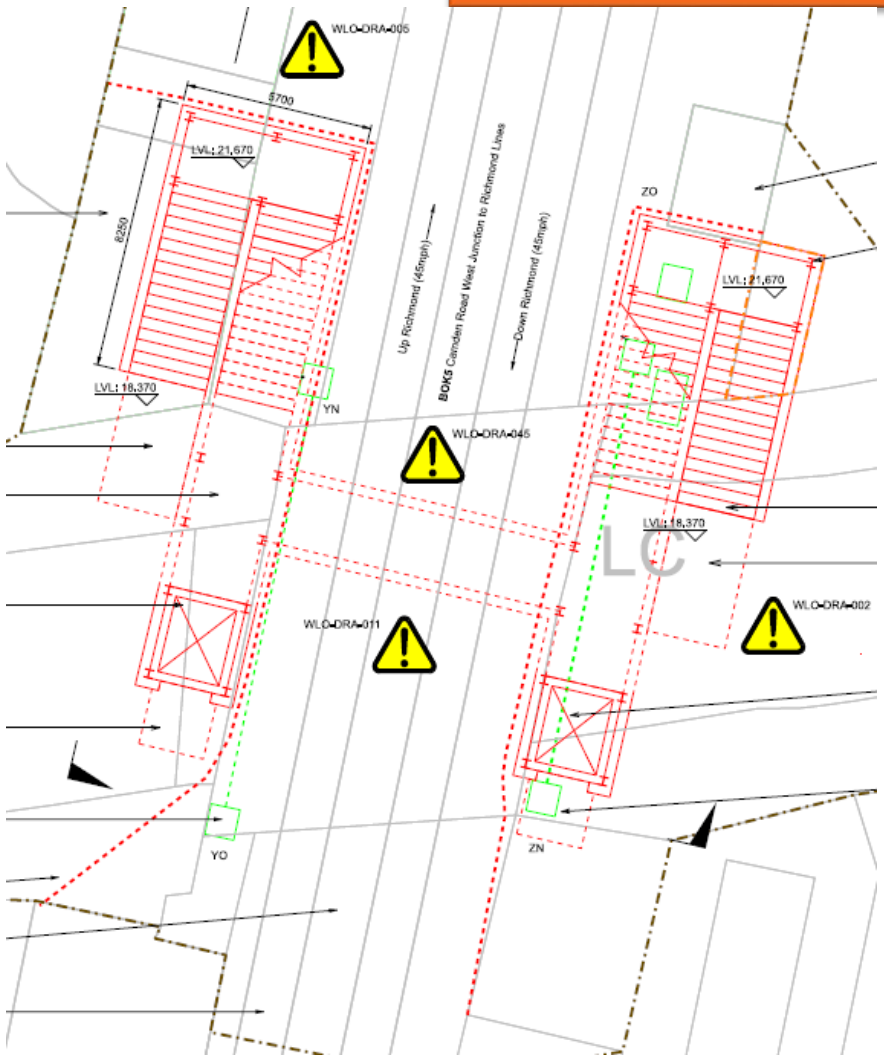
- Route passes through three existing level crossings at:
  - Churchfield Road, Ealing (at Acton Central station)
  - Bollo Lane, Ealing
  - Wood Lane, Hounslow
- Analysis has demonstrated that all three level crossings on the route would be closed to traffic for over 70% of the time with WLO services, with closure periods of up to 11 minutes
- This excessive barrier down time would be a safety risk so there is no practicable alternative to closing the level crossings to traffic
- Regardless of WLO, Network Rail policy is to close and upgrade level crossings for safety reasons
- Pedestrian and cycle bridge options have been developed for each location while traffic impacts have also been assessed
- Considerable engagement with local residents, businesses and other stakeholders will be needed during the next phase of work

Example – Churchfield Road – Acton Central Station

Level crossings – pedestrian solutions



Example – Churchfield Road – Acton Central



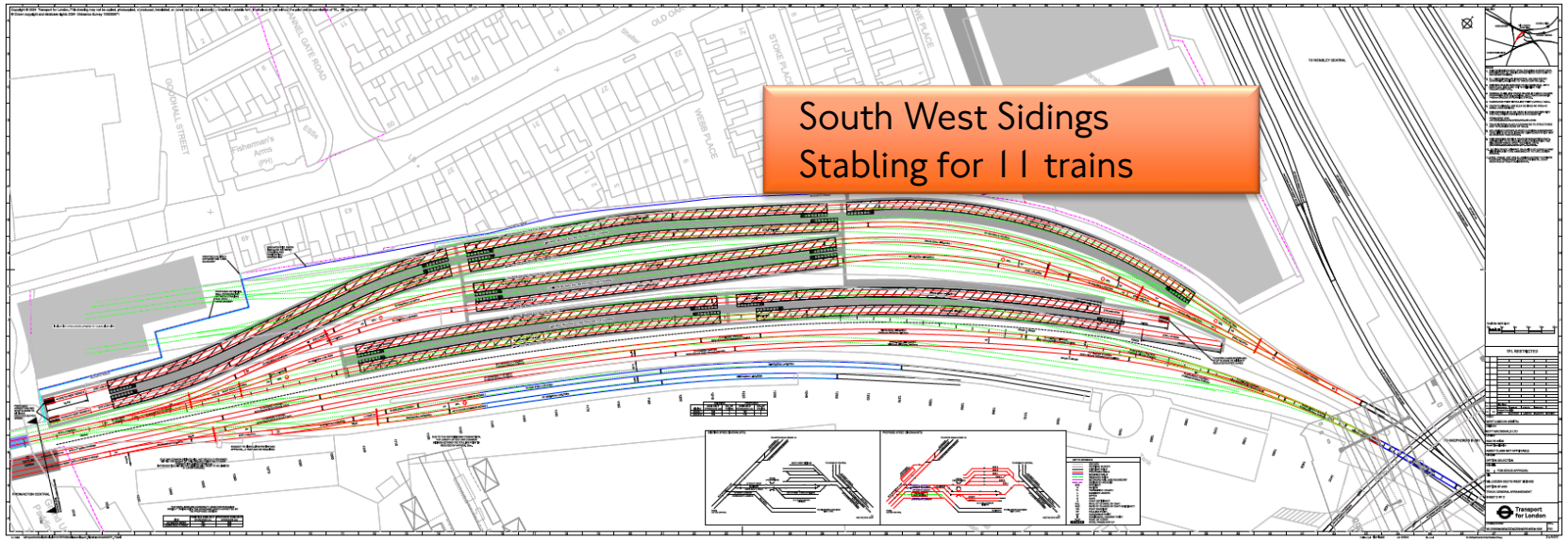
Signalling

- Currently the WLO assumes the residual resignalling and recontrol of the North London Line between Willesden Junction High Level and Richmond/Kew is completed. This involves;
  - Closure of Dudding Hill, Neasden, Acton Canal Wharf and Acton Wells signal boxes.
  - Control from Romford ROCC
  - New Signalling on the Dudding Hill Line
  - New Interlockings
- WLO requirements for signals at the planned new stations have been sited in the AiP Scheme Plan
- Should the resignalling, relock and recontrol not be completed by the start of WLO construction, this will need delivery in parallel increasing complexity and risk.

Example – Neasden signal Box

Stabling

- A site to accommodate the 11 new trains required to operate the service is needed
- A detailed review of all potential sites has been undertaken with Willesden South West Sidings the only viable option identified, with potential to also utilise additional available capacity at Wembley C sidings
- These are overgrown sidings in Network Rail ownership that have not been used for around 30 years, on a long lease to DB Cargo located between Willesden Jn and Old Oak Common.
- The sidings will need to be completely reconfigured including a new access bridge over the Grand Union Canal
- The Old Oak and Park Royal Development Corporation (OPDC) has development aspirations for the site, so we have explored adjustments to the design that would facilitate some development

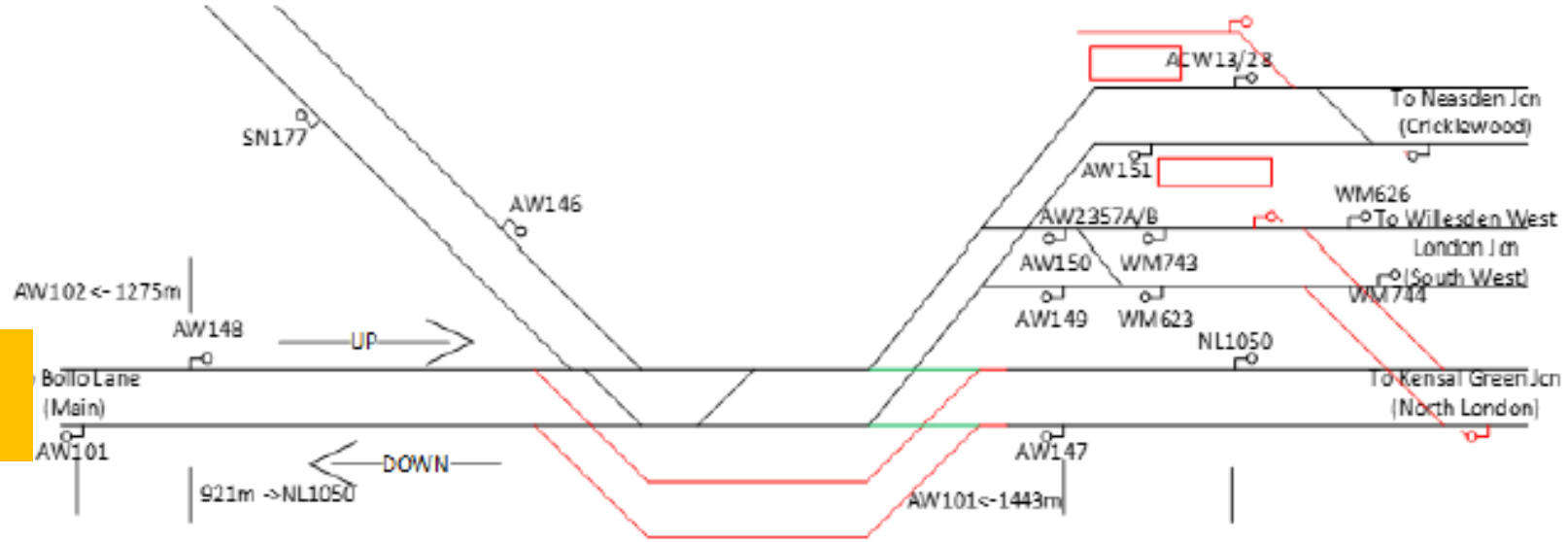


Stabling

Acton Wells Junction four-tracking

- This option would segregate some freight traffic from London Overground Richmond – Stratford services and some other freight services, providing extra capacity to accommodate 4 tph WLO services through the junction.
- Reinstatement of Old Oak Junction to the north east ensures all existing routes are still available.
- This junction upgrade is the most costly element of the WLO infrastructure proposals and there are significant constraints and interfaces with other projects that need to be addressed.

Acton Main Line GWML



NLL to Acton Central

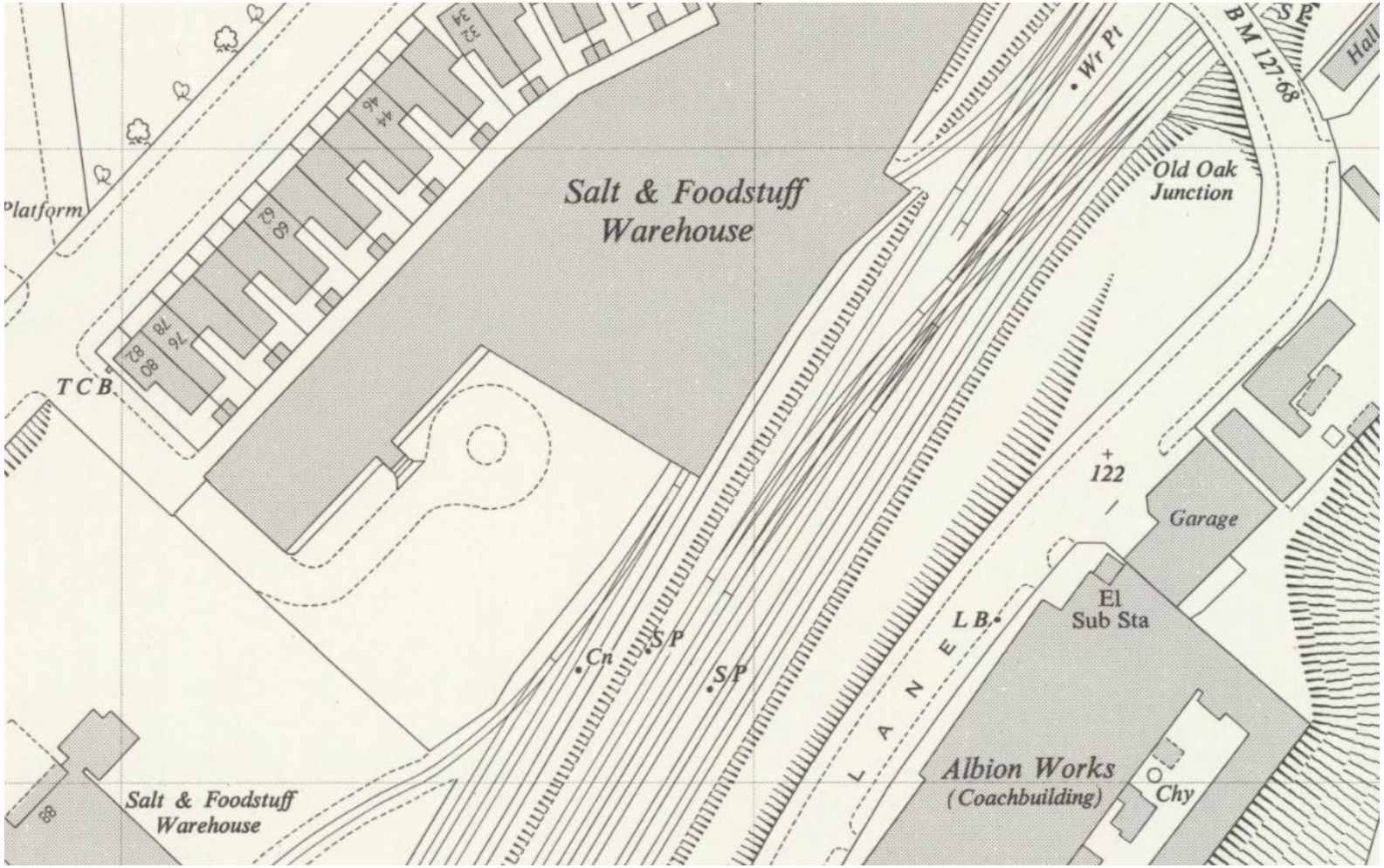
Dudding Hill line to Brent Cross

SWL to West London Junction

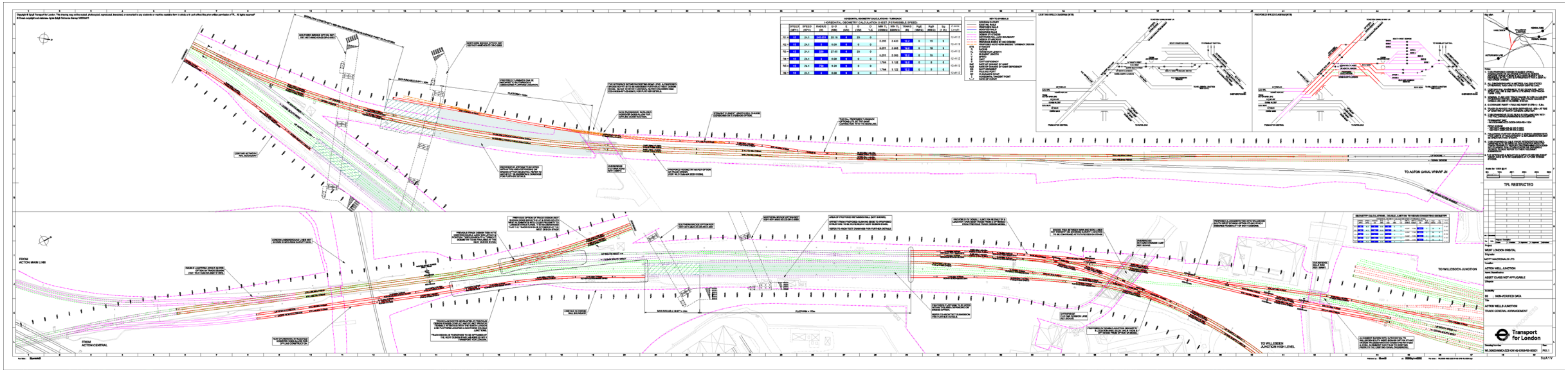
NLL to Willesden Jn

Acton Wells Junction four-tracking

Putting back what used to exist – Old Oak junction



Acton Wells Junction four-tracking



Other track interventions

- Further upgrades to junctions and additional track interventions are required to facilitate the required six trains per hour service.
- These include:
  - Doubling of Old Kew Junction
  - Providing a turnback beyond Lionel Road station, in the vicinity of Old Kew Junction, to help provide operational resilience
  - Providing a turnback beyond the southern terminus at Hounslow station
  - Additional crossover north of northern terminus at Hendon station, to allow flexibility for freight services
  - Other smaller scale track and signal enhancements to help mitigate impact on freight (see later slide)

Other track interventions - Hounslow

Gauging

- Gauging analysis undertaken for the route with and without 25Kv electrification
- Used all vehicles permitted and an aspirational set to reflect potential rolling stock
- Dudding Hill Line has the most points of intervention if 25Kv installed
- Only cleared to W7
- Bridges 9 and 10 (Craven Park) being renewed to permit W12 for the Radlett logistics development
- A footbridge and Bridge 4 will require raising.
- Track Lowering required under the A5 road overbridge

Example: Bridge 4 Gascoigne Park

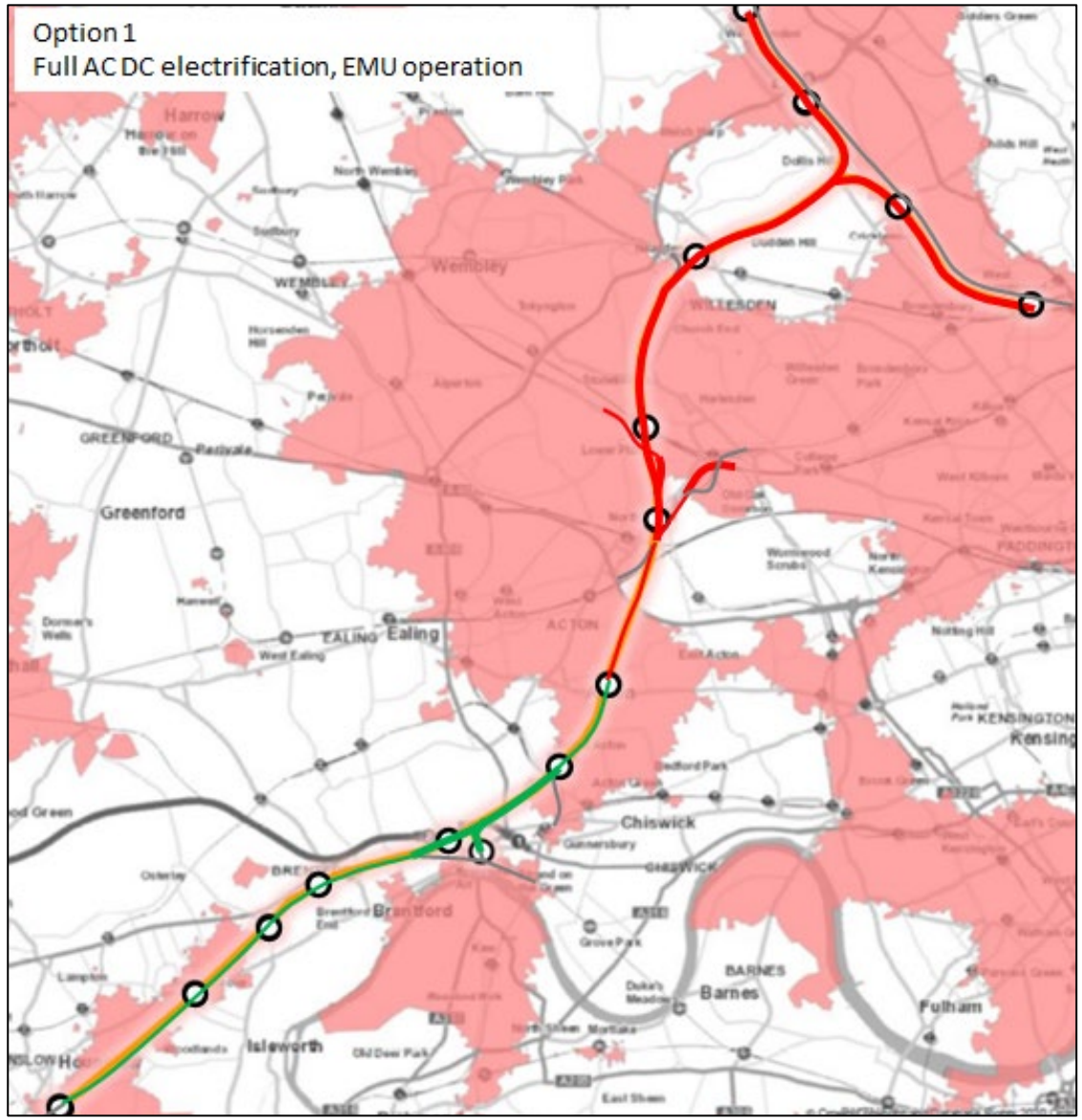
Interfaces and opportunities

Old Oak Common

Commercial developments - Neasden

- The WLO route is complex with several interfaces and opportunities.
- At Old Oak Common, the WLO station can be delivered independently of HS2 and the Elizabeth line station, but:
  - There are challenges with providing a high quality interchange
  - Complex interfaces with HS2 infrastructure including construction close to tunnels and high voltage cable diversions
- WLO would help ensure the success of HS2, particularly in its early stages, by providing connectivity to Old Oak Common for large swathes of west and northwest London, and parts of Surrey, Hertfordshire, Bedfordshire and Buckinghamshire
- Several major developments along the route provide opportunities if approved, e.g. adjacent to the WLO and LU stations at Neasden
- At the new Brent Cross West Thameslink station, Barnet Council funded safeguarding for WLO

Potential electrification



- WLO services would either run as fully electric throughout, or as battery-electric, charging on overhead electrified sections
- Either option requires electrification of the northern part of the route (Dudding Hill line and Hendon lines)
- This would have benefits for gauge clearance along the route as well as helping build the case for more freight to convert to electric traction
- Stabling at Willesden South West sidings triggers electrification of the South West lines north of Acton Wells Junction. And between Acton Canal Wharf and the WCML Low Level Goods to access Wembley C sidings.
- Infill electrification of the Poplar lines connecting to the GWML and at Acton Canal Wharf Junction will also be beneficial

Traction power assessment

Network Rail assessed two potential options:

Option 1 ('standard' rolling stock)
- AC electrification operation between Midland Main Line (MML) & Acton Central
- DC electrification operation between Acton Central & Hounslow

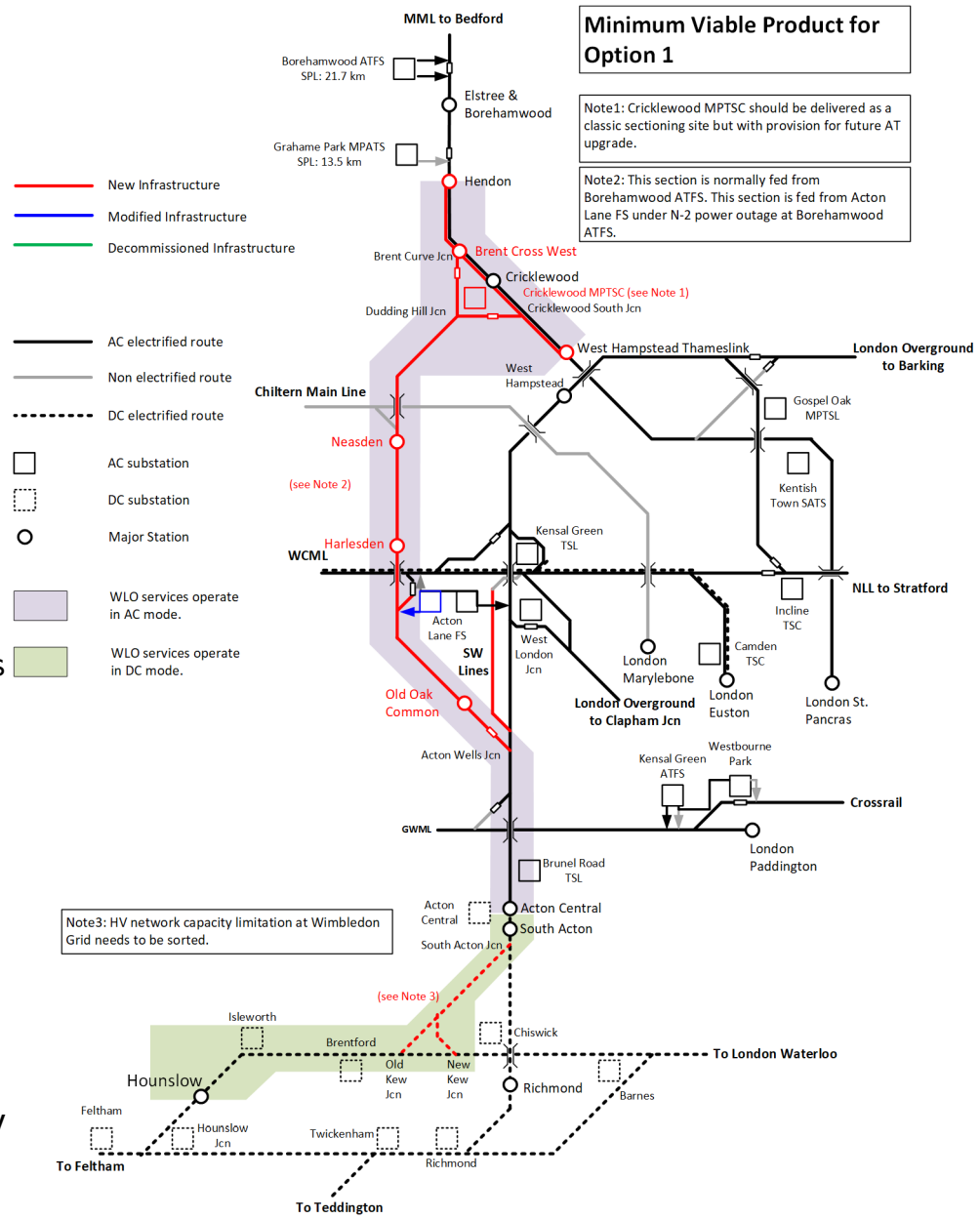
Option 2 (battery rolling stock)
- AC electrification (+ battery charging) between MML & Acton Central
- Battery self-propulsion operation between Acton Central & Hounslow

- Proposed infrastructure:

  Both options
  - New electrification between Hendon/West Hampstead Thameslink and Acton Wells Jcn
  - New neutral sections around Cricklewood area, Acton Central Wharf to Willesden Line and around Acton Wells Jcn
  - New sectioning site at Cricklewood - MPTSC
  - Reconfiguration of Acton Lane FS

  Option 1 only
  - DC Infill electrification between South Acton Jcn and Kew Jcn
  - HV work within Wimbledon Grid area

- Mott MacDonald used these findings of the report to assess feasibility and cost of proposed solutions and an additional end of route battery charging option



Rolling Stock

- As can be seen from the Electrification work it is too early to make a decision on the new fleet, but the following can be stated

- Full infill electrification
  - Probably additional dual voltage Aventra units CL710/2

- Partial infill and battery operation
  - New fleet – 11 trains
  - 25KV/Battery operation
  - Specification for battery range and resilience
    - 30 miles autonomy
    - 20% State of Charge minimum reserve
    - 250Kwh battery pack per traction package
  - Options for low floor stock e.g. Stadler CL755?

WLO operations

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Timetable assessment

- The latest phase of timetable assessment was completed by Network Rail in March 2024 with the key conclusions being:
  - Signalling upgrades are required between South Acton and Acton Wells Junction and on the Dudding Hill lines to achieve shorter headways (already in WLO scope)
  - A standard hour pattern is achievable in principle, subject to the viability of freight path changes over a wider geography:
    - 4 tph Hounslow – Hendon / West Hampstead Thameslink
    - 2 tph Old Oak Common Lane – Hendon
  - The proposed enhancement of Acton Wells Junction in the WLO scope is required
  - A centre turnback siding to the west of Hounslow is required (and the London Overground ops team advise two sidings will be required for resilience)
  - The impact on other London Overground services is limited and contained between Willesden Junction and Gunnersbury, while District line services are unaffected
  - Freight services have been retimed with paths for 8 tph freight per direction though Acton Wells Junction available
  - We intend to shortly commence engagement with the freight operators to discuss the WLO project, implications for freight services and any further mitigation that may be needed
- South Western services have been flexed by amending station dwell times but end-to-end journey times are unaffected

Freight Impacts

- Further timetable assessment reviewing impacts on freight specifically was undertaken by Network Rail and completed late last year
- In the assessment of the 189 existing freight services selected from Dec 23 WTT (0700-1900) in relation to the proposed WLO timetable:
  - No impact (34 services): no alterations during the timetable exercise
  - Pathing adjustments Only (12 Services): to align with the WLO and passenger timetable
  - Timetable modifications (137 Services), of which:
    - 103 require timing adjustments of 5 minutes or less
    - 6 require timing adjustments up to 20 minutes
    - 28 require additional infrastructure interventions
  - Incompatibility challenges (6 services): neither a feasible retiming nor a reasonable recommendation could be identified to align them with the proposed WLO timetable – see next slide
- The additional infrastructure interventions needed are:
  - Bi-directional running on the Down Kew Spur with associated crossovers
  - Bi-directional running through Hendon station on the freight lines with associated crossovers
  - Signalling enhancements to allow trains to access and egress Cricklewood aggregates terminal to/from the south
- Further work and engagement with the freight operators and NR freight teams is needed to explore the feasibility of the changes required as the scheme is developed

WLO funding and next steps

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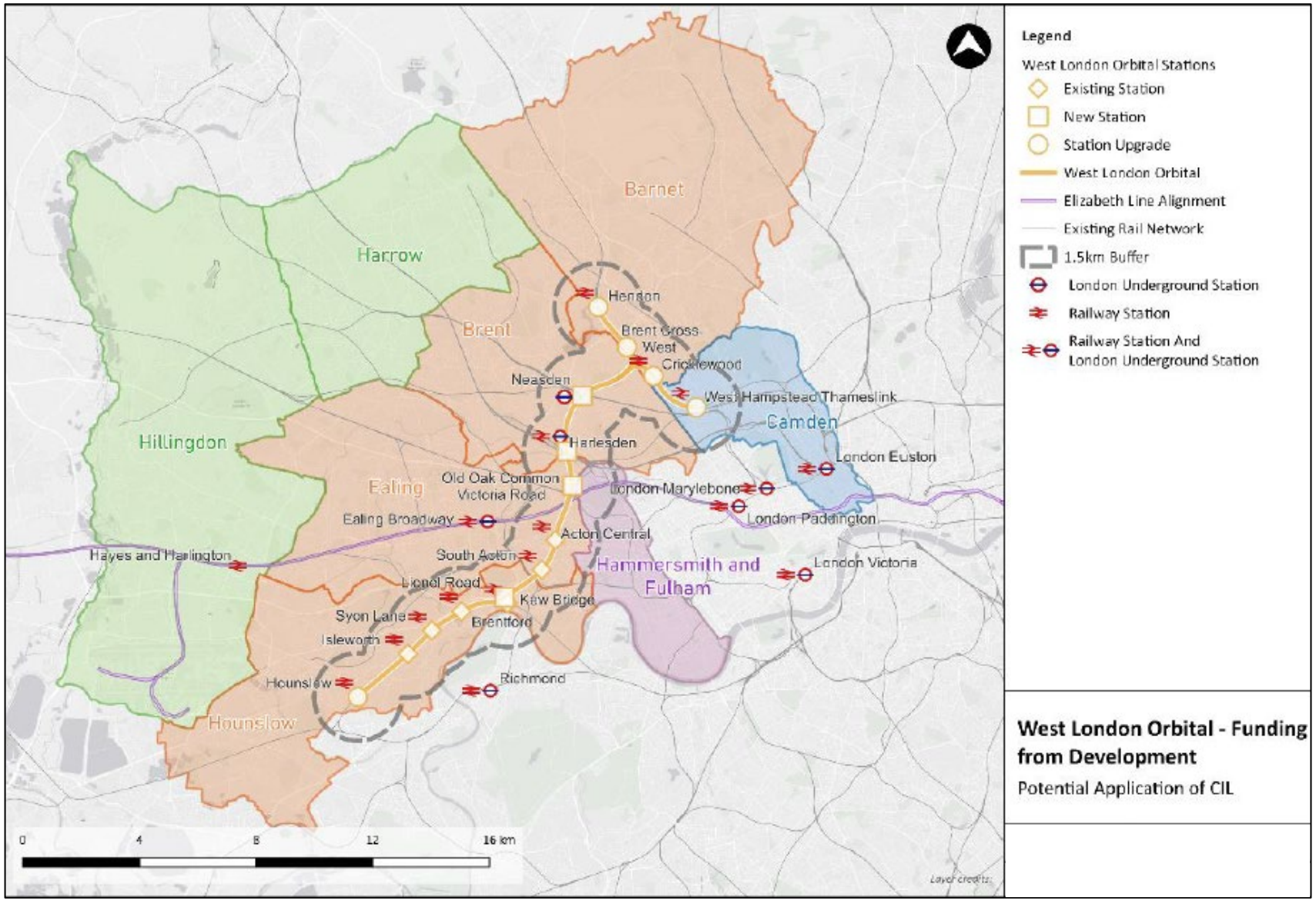
Funding options



- TfL is working with the boroughs on developing the funding package to deliver the scheme
- Funding will be needed from government and local sources as well as from TfL/GLA
- TfL has made the case to Government for a funding contribution towards developing the scheme further in its submission for the Spending Review
- Subject to funding we are aiming to submit a Transport & Works Act Order submission in 2028
- Assuming this is approved construction would commence in 2030 with services commencing in 2034

Position in the overall programme

- We have now completed the ES2 phase of design, with the next stage of work for which we are currently discussing funding being ES3
- Following this, a further stage of work will cover all the work necessary to prepare a Transport & Works Act Order application

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Design Development											
PACE 1 (ES2) / Feasibility											
PACE 1 (ES3) / Option Selection											
PACE 2 (ES4) / Concept Design											
PACE 2 (ES5) / Detailed Design											
Public consultation											
Consultation 1 – principle and optioneering											
Consultation 2 – scheme detail											
Transport and Works Act Order											
Preparation of application, including EIA											
Submission of TWAO application											
Public Inquiry											
Expected decision											
Delivery											
Construction											
Testing and commissioning											
Passenger services commence											

Scope of next phase of work

The next phase of work takes us to the stage at which a decision on whether to prepare a Transport & Works Act Order application to seek the necessary powers and consents can be taken

Workstream	Description
Engineering and environmental surveys	Surveys are required to ensure the next phase of engineering design work uses sound baseline information and to allow the efficient future delivery of the scheme, as well as initial environmental surveys
PACE 1 (ES3) engineering design and environmental assessment	Development of the scheme design to allow a preferred option for each location to be selected and land requirements to be confirmed
Train performance modelling and further timetable development	Performance modelling of WLO services and their impact on other services needs to be undertaken, with further timetable development work also potentially required
Demand forecasting and case-making	Revised London-wide growth forecasts are expected to be available later in 2024 and further demand modelling and sensitivity testing is needed, potentially with other analysis including dependent development, to bolster the case for the scheme as part of an updated business case to be shared with Government
Network Rail asset protection, operational readiness and sponsorship	Scope of work to focus on ensuring the impact on NR assets is known and acceptable, and work to develop a better understanding of all the operational interfaces and arrangements to ensure successful operation of WLO services
Appointment of third party verification body	Appointment of approved organisation to assess rail subsystems and their constituents against technical standards that apply under the Railways (Interoperability) Regulations 2011
Public consultation and stakeholder engagement	The first public consultation on the project needs to take place early in the next phase of work; this will seek views on the level of support for the principle of the scheme and the preferred route option that has been identified
Funding and financing support	External support is likely to be required to further develop the approach to funding and financing
Legal advice	It will be necessary to appoint external legal advisors at the start of the next phase of work to ensure the approach is consistent with the requirements of a future TWAO application, e.g. advice on the scope of the public consultation
TfL staff costs	TfL staff costs need to be included in the overall budget for the next stage of the project

PACE 1 (ES3) option selection overview

- The PACE 1 (ES3) design development work is by far the costliest area of work at the next stage
- It will enable a single option to be identified and endorsed, and will cover:
  - Development of design options from the previous stage to enable the selection of a single option for each location – this will include greater architectural and urban design input for development of station designs
  - Surveys to provide greater confidence in designs developed from desktop resources to date
  - More detailed constructability work to inform possession requirements and programme planning
  - Confirmation of worksite and other land requirements (both temporary for construction and permanent)
  - Baseline environmental surveys and assessment
  - Updated cost estimates, with additional detail enabling a reduction in the current 40% risk allowance
  - Closer working with Network Rail to assure designs and develop joint governance / ownership of the programme
- This level of design is required at this stage to:
  - Provide sufficient detail for meaningful public consultation on the specifics of the scheme
  - Inform land requirements to enable us to proceed with developing a TWAO in the subsequent stage

With Thanks to the Team

- Matthew Rheinberg –TFL City Planning
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- Drew Caddy – TFL Project Manager
- Nick Eddy – TfL City Planning
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- Felix Bartle – Overground PE Track & Survey
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- Connor Lempreire and Tom Ingrey – NR Freight and Strategy
- Southern Sponsor ship and Anglia ASPRO teams

And a few others I'm sure to have omitted!

West London Orbital

QUESTIONS?

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