

Network Rail

**King's Cross Station
Redevelopment**

Northern Access
Footbridge Strategy (B)

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Network Rail

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Footbridge Strategy (B)

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1 Introduction

Planning permission was granted to Network Rail for the King's Cross Station Redevelopment proposals in November 2007. The proposals are for a major redevelopment of the station, including the construction of a new concourse to the West of the existing station, and extensive renewals works.

There is an existing entrance to the station at the North of the Main Shed, on York Way. This entrance provides access to the signal box, and it was originally used by taxis when the cab rank occupied the road space under the Eastern Range buildings. The cab rank has since been relocated to Pancras Road, where it will remain in the redeveloped station, immediately outside the new concourse. This entrance to the station remains and it is used by pedestrians to get access into the station. The London Underground Station and Euston Road.

Prior to the main redevelopment works, new tracks will be laid in the old Cab Road, and a new platform, Platform Y, will be built. Planning Permission has already been granted for this work, and work on site has commenced. The new tracks will cut off access for pedestrians who currently use the York Way entrance. These pedestrians will have to access the station along York Way or Goods Way. There is also planned to be a footbridge running across the tracks from the existing York Way Access into the King's Cross Central development. From there is it a short walk to the new station concourse.

The Planning Permission granted by Camden Council includes a condition in the Section 106 Notice that Network Rail should prepare a "Footbridge Study". The first part of this was issued to Network Rail and considered all the technical options for a new access into the station, as well as an analysis of passenger movements. This report forms the Footbridge Strategy required to be submitted under Clause 4.18.3 of the Section 106 Agreement and considers whether any of the three options identified in the Footbridge Study are operationally practical, cost effective or reasonably able to be implemented.

The conclusion of this report is that none of the options for a new footbridge are considered suitable and it gives specific details why none of the options are considered to be operationally practical, cost effective or reasonably able to be implemented.



View from the bottom of the ramp up to York Way

Opposite: Computer rendered cut-away of new station

View of station at night. Access off York Way is visible at the bottom of the photograph

2 Context

2.1 King's Cross Station

King's Cross Station is a major transport hub in a dense, city-centre site. The station itself is the London terminus for the East Coast Main Line. It provides Intercity and suburban train services, and the station site has entrances to the London Underground, as well as connections to buses, taxis and Thameslink services. St Pancras International station is just across the road

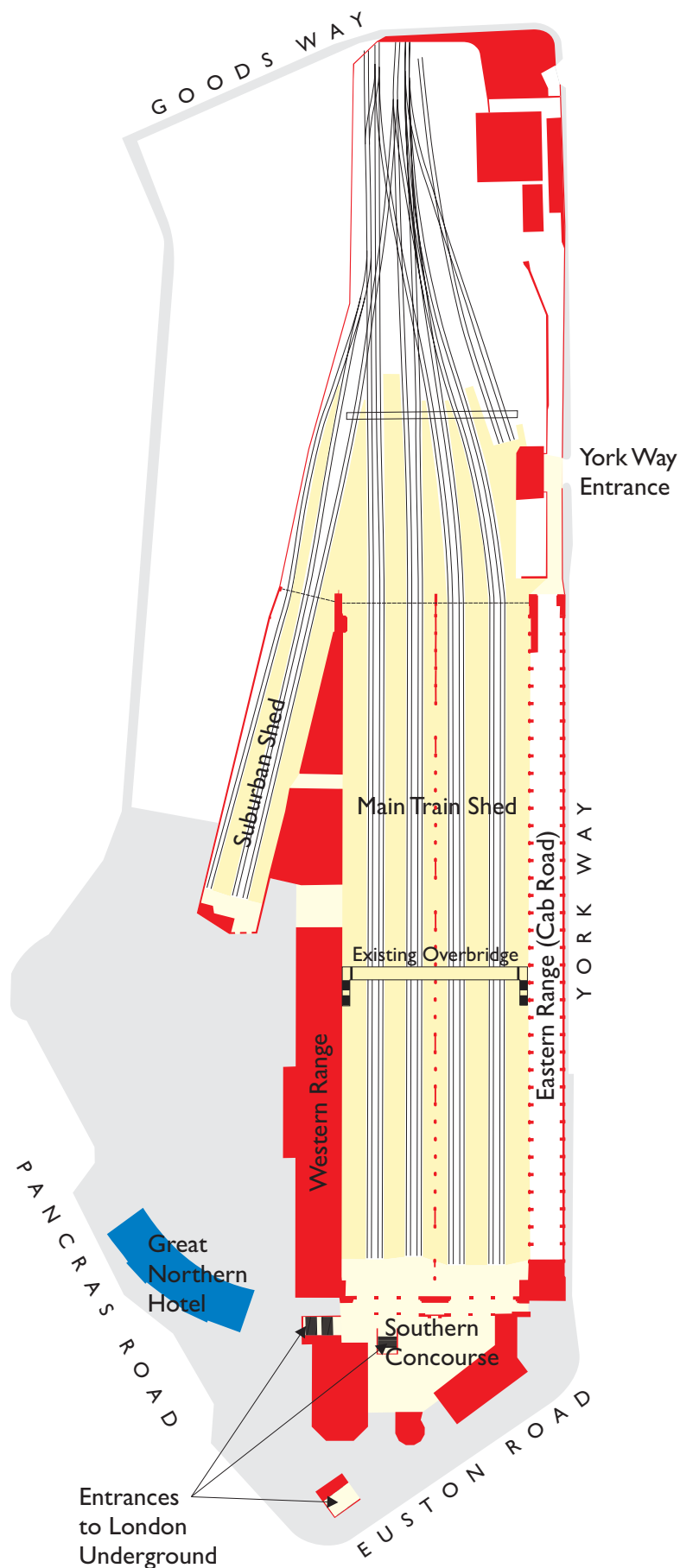
The future plans for the area around the station include developments to the North; the St Pancras complex and York Way developments.

Passenger use of all modes of transport at the site is forecast to increase significantly. The London Underground station is currently being redeveloped to increase the number of ticket halls from 1 to 3, including a new Northern Ticket Hall currently being built under the site of the new Main Station concourse. The new Tube Ticket Hall and Western Ticket Hall are already operational.

King's Cross Mainline station has 11 platforms – 1 to 8 in the Main Shed (numbered from east to west) which accommodate intercity trains, and 9 to 11 in the Suburban Shed which accommodate the shorter suburban services. All platforms have Overhead Line Equipment (OLE). A single storey extension to the south of the station houses retail, ticket offices and the current concourse although this is planned to be removed. The station is a busy commuter station and in the peak hours the concourse gets crowded as the commuter services do not run from dedicated platforms – platforms are announced shortly before trains depart

The platforms are at the same level as the roads to the south of the station. This provides for step-free access to the platforms; however access to the platforms is only from the south. There is one overbridge in the station linking platforms 1 and 8. This is little used, and there is no passenger information in the area around the overbridge. The bridge does not have lift access. This bridge will be replaced with a new overbridge between platforms 1 and 8 with escalators and lifts to the platforms. There is an existing tunnel under the platforms in the Main Shed, but this was not designed for passenger use – it was originally for parcel deliveries to and from the trains on platforms 1 to 8, and has more recently been used for On Board Services, supplying provisions to trains in the Main Shed.

The platforms in the Main Shed do not currently have gates to control access for passengers. There is public access to all platforms and there are a number of uncontrolled entrances into the station. Automatic ticket gates have recently been installed in the Suburban Shed



Existing Station

2.2 Train Operations

King's Cross Station is managed by Network Rail, and a number of Train Operating Companies (TOCs) run services from the station.

National Express East Coast run inter-city services on the East Coast Main Line to Peterborough, Doncaster, Leeds, York, Darlington, Newcastle, Edinburgh, Glasgow, Dundee, Aberdeen, Inverness, and Wakefield.

First Capital Connect services run to Cambridge and King's Lynn, with local services to North London, Hertfordshire, Bedfordshire, Peterborough and Cambridgeshire.

Hull Trains run direct inter-city services to Hull via the East Coast Main Line.

Offices and welfare facilities for the Network Rail station staff and TOCs will remain in the Western Range buildings on the west side of the main shed. Creating an access on York Way via a new ticket gateline will not benefit the Network Rail Staff who would have to get across the station from this entrance to the Western Range, passing through the gatelines.

2.3 York Way Access

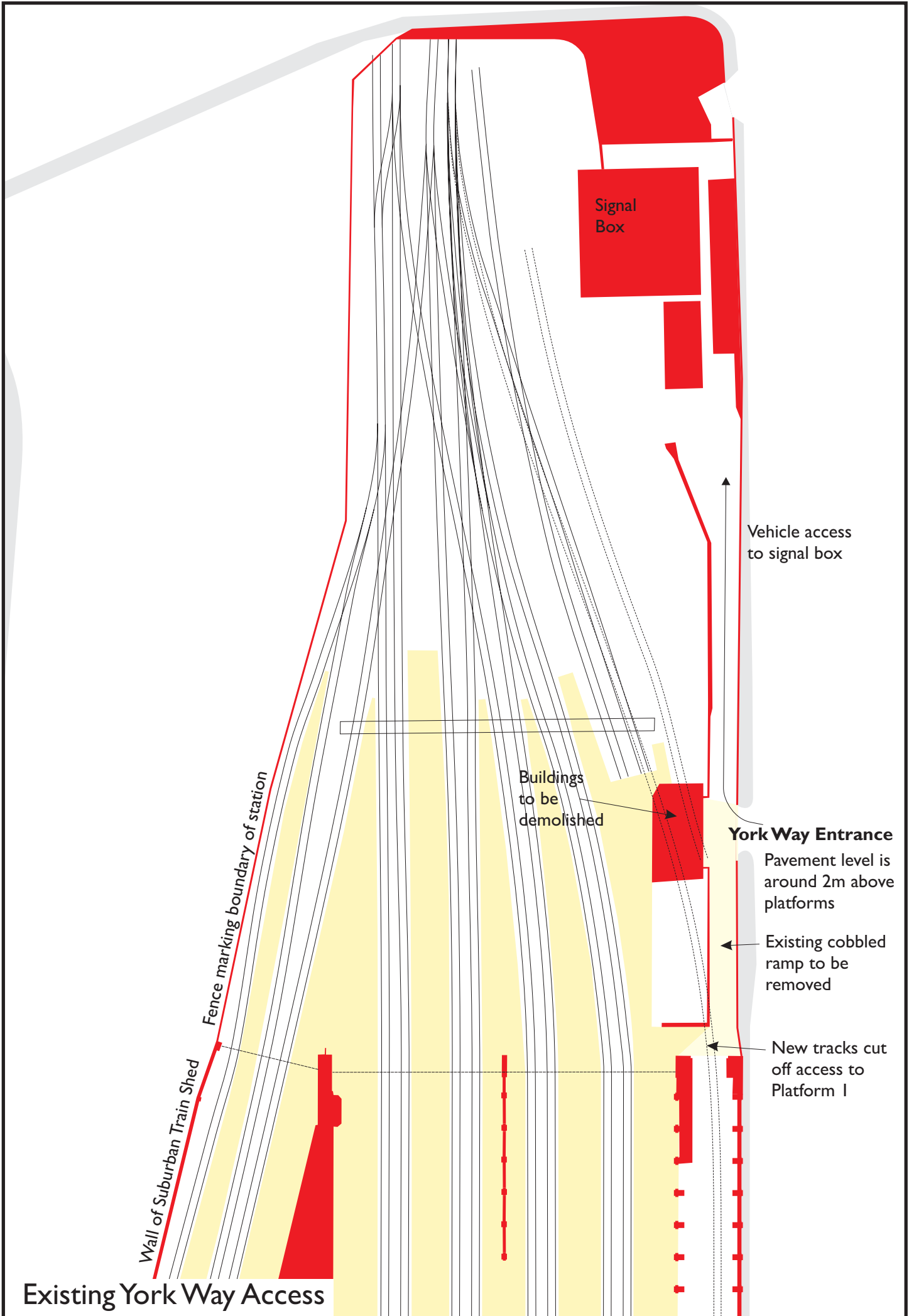
The existing access off York Way is higher than platform level. The ground around the station slopes up gently to the North, so that the pavement at the York Way access is some 2m above platform level. York Way continues to rise so that at Goods Way, the road crosses the tracks.

There was originally a brick viaduct across the tracks leading from the current York Way access. This carried Battle Bridge Road from the west towards the junctions with Wharfdale Road to the East. The viaduct was removed some 50 years ago though traces of the eastern abutment can be seen in the Bothy building that was subsequently built in that location. There are no visible traces of any foundations of the viaduct. The Bothy building is to be demolished as part of the Platform Y development.

A vehicle path runs north from the York Way access serving the Signal Box. This access is also in use for a worksite for the tunnelling contractors working on the London Underground station project. It would not be practical to build a pedestrian access at York Way that in any way restricts the existing access for vehicles to the Signal Box area. Any construction site for a Northern Footbridge would have to be kept clear of the Signal Box access.

There is an existing, cobbled ramp running south from the York Way access which was originally used by Taxis to get to the old cab rank under the Eastern Range Building. The ramp is still used by pedestrians; however it is due to be partly demolished to make way for the new Platform Y tracks. There is a proposal to extend the Thunderbird sidings (not yet confirmed) which would require the entire width of the ramp to be demolished to below track level.

Any new access towards Platform 1 from York Way would have to ramp up and cross over the new Platform Y tracks. The ramp would have to meet Network Rail requirements for maximum slope and landings. The ramp has to rise at least 800mm from pavement level so that the bridge has the minimum clearance possible over the tracks. If a flight of steps were provided to achieve this rise in place of a ramp, DDA considerations would require a lift alongside the steps to provide step-free access. A lift would not be reasonably able to be implemented as it would open directly onto the pavement and the associated enclosure and pit would encroach into the Platform Y area. It would not be practical to have columns in the Platform Y area to support the ramp so all supports for any structure over the tracks would have to be from the retaining wall to the East and columns on Platform 1.



Signal Box

Vehicle access to signal box

Buildings to be demolished

York Way Entrance

Pavement level is around 2m above platforms

Existing cobbled ramp to be removed

New tracks cut off access to Platform I

Wall of Suburban Train Shed
Fence marking boundary of station

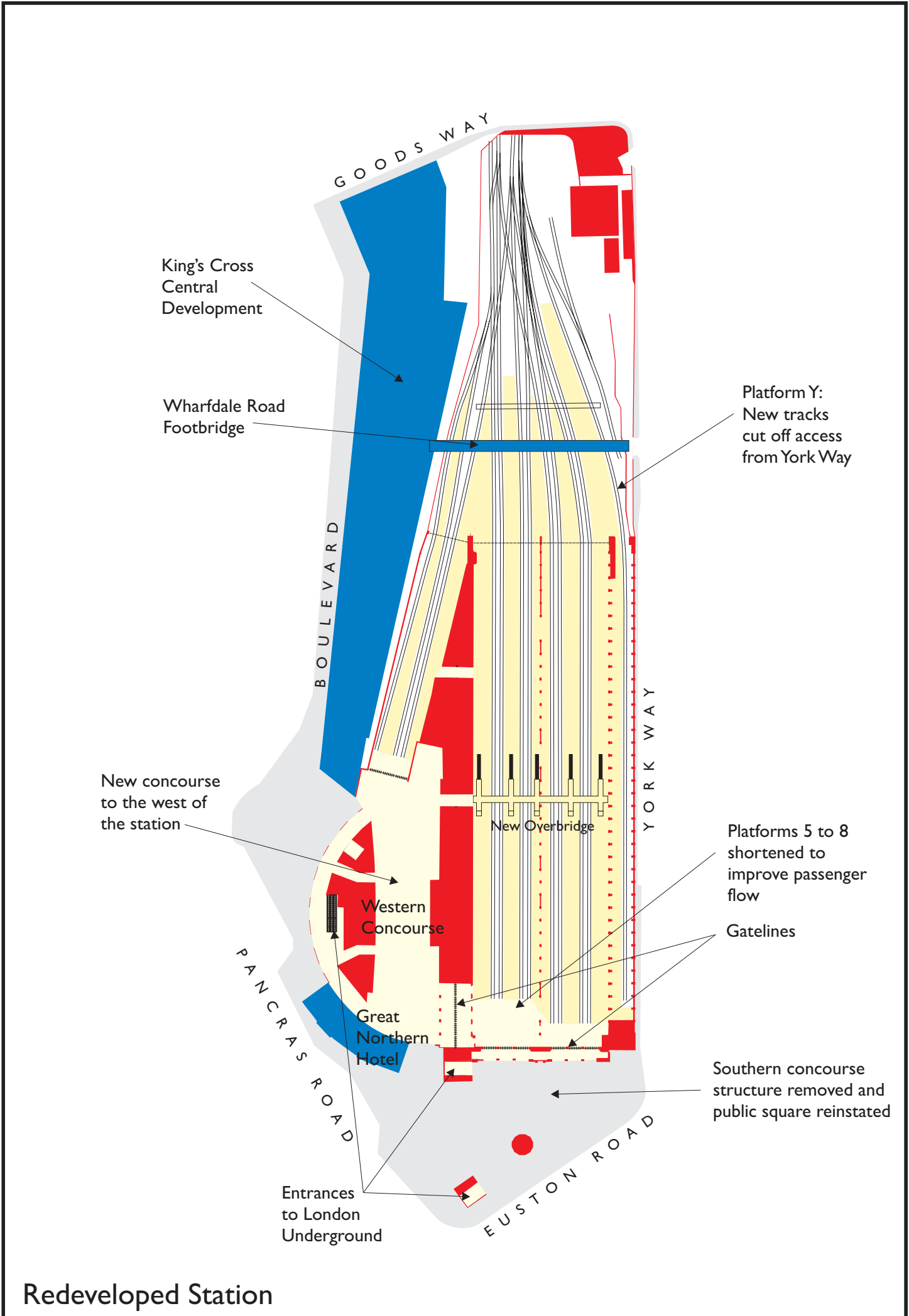
Existing York Way Access

2.4 Passenger Numbers and Movement

King's Cross Station caters for over 40m passengers a year and this is forecast to rise to 50m in a decade.

In both the morning and evening peak (7:00 to 10:00 and 16:00 to 19:00) almost 25,000 passengers arrive at and depart from the station. In these times, passenger counts indicate that around 1,000 people pass through the York Way entrance to the station – 2 ~ 3% of the total passenger numbers. As the Main Shed of the station is currently not gated, the pedestrians can use the York Way entrance as a short-cut through the station. The flow counts indicate that of the 1,000 pedestrians, around one third are heading for the Underground Station, one third are heading towards Euston Road and the remaining third remain within the station, including those who go on to catch trains.

The increase in overall passenger numbers using King's Cross Station will be reflected in the number of passengers who would make use of an entrance on York Way, were it available. It is also expected there will be increased numbers of potential passengers working at the new office developments near the York Way entrance. However, any new entrance would be gated, and alternative routes to the station (Goods Way and the possible new footbridge at Wharfdale Road) will also attract passengers from this area towards the Western Concourse.



King's Cross
Central
Development

Wharfdale Road
Footbridge

Platform Y:
New tracks
cut off access
from York Way

New concourse
to the west of
the station

New Overbridge

Platforms 5 to 8
shortened to
improve passenger
flow

Gatelines

Western
Concourse

Great
Northern
Hotel

Southern concourse
structure removed and
public square reinstated

Entrances
to London
Underground

Redeveloped Station

2.5 Redeveloped Station

The proposals for the redeveloped station involve

- Redevelopment of the Western and Eastern Range Buildings

- Remove Southern Shed and put retail and ticketing to the West, in a new concourse structure.

- Introduce gatelines to control passenger flow

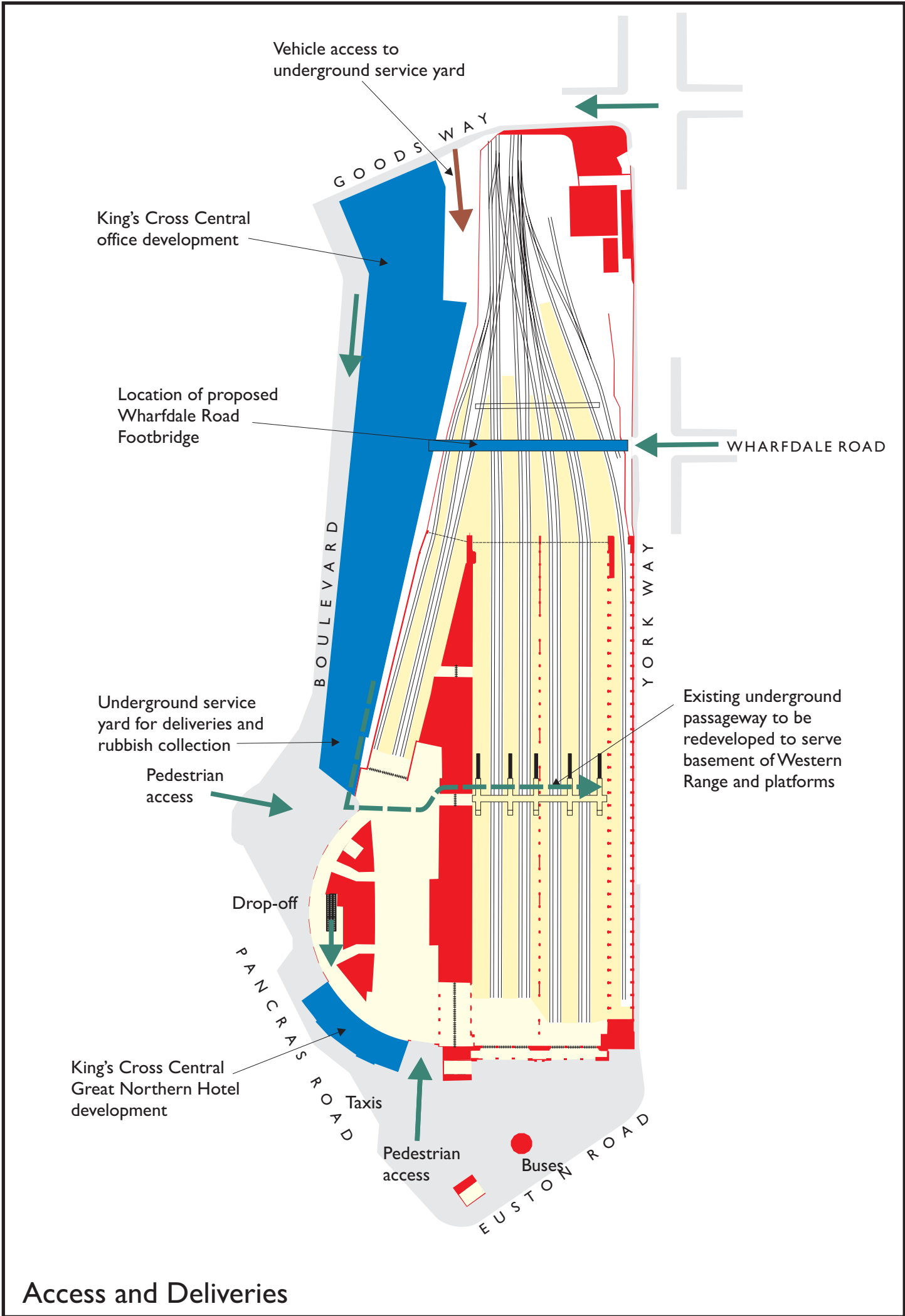
- Introduce one-way flow of passengers.

- Separate Suburban Shed and Main Shed access.

- Construction of a new platform under the Eastern Range buildings - Platform Y

The redeveloped station will provide a more controlled flow of passengers from the concourse, through ticket gates onto the trains. Passengers arriving by train will be able to leave the station directly to the South into the opened-up Southern Square. This aspect of the redevelopment is fundamental to creating a station that is able to handle the forecast increase in passenger numbers. The station operations and management have been designed around the models for passenger circulation.

It is forecast that the number of passengers using the entrance off York Way at the north end of the main shed would decrease once the ticket gates are installed as only passengers with valid tickets will be able to gain access. Nevertheless, any number of passengers, however small, making their way towards or away from an additional entrance at the north of the station will have a noticeable effect on passenger flows. It would not be practical nor would it be reasonably possible to implement an alternative station operation strategy to allow for this small number of passengers.



Access and Deliveries

3 Access and Movements

The redevelopment of King's Cross Station has been planned to encourage a one-way flow of passengers around the station. Passengers will arrive at the station at the new Western Concourse and leave the station by the Southern Square. Passengers and other users of the station will make their way towards the south-west corner of the site.

3.1 Pedestrians

Pedestrians arriving at the new station on foot will be making their way to the entrances to the new station concourse to the West and South of the station. Passengers from the North will approach either down Goods Way or possibly over the planned Wharfdale Road footbridge which may be built across the tracks, and down the new Boulevards in the King's Cross Central development. Pedestrians approaching from the East can approach the station down York Way and the Southern Square.

Pedestrians approaching from the South and West (including those arriving at St Pancras International) will use the same route to approach the station as is currently used, either via the entrance to the station off the Southern Square, or along Pancras Road.

3.2 Public Transport

The station is a major public transport interchange and has bus stands and taxi ranks along Pancras Road, and new entrances to the London Underground within the new concourse structure. The majority of passengers arriving at the station via public transport will arrive directly at the new concourse to the west of the station. The concourse will provide all the ticket sales, retail and other facilities for the passengers.

3.3 Private transport

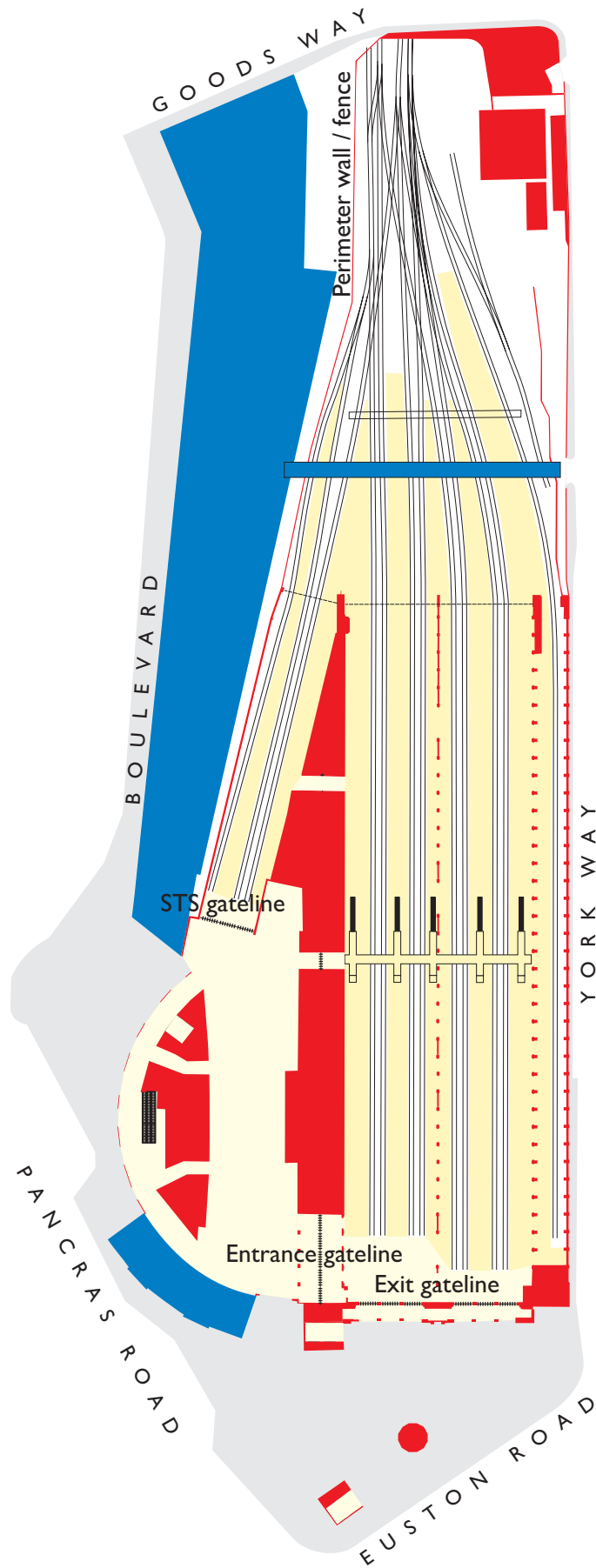
Private transport is not being encouraged at King's Cross Station. There is no car parking associated with the station as could be expected with a city-centre site. There is space for passenger drop off on Pancras Road, along with some short-term disabled parking. There are no drop-off points in the vicinity of the York Way access so there is no benefit to passengers arriving by car in having an access into the station at York Way.

3.4 Emergencies

Ambulances, the fire brigade and police will all gain access into the station via the entrances at the in the Western Concourse. The British Transport Police (BTP) has offices in the Western Range Buildings.

3.5 Deliveries

Deliveries and rubbish removal for the redeveloped station will all be handled in a new, underground Shared Service Yard at the south end of the King's Cross Central development, north of the Western Concourse. There is an existing underground corridor, originally built to link the platforms to the old parcels depot, which will be refurbished and brought back into use as a service route between the delivery dock and the concourse retail, Western Range and platforms.



Station Ticket Gates

4 Safety and Security in the Redeveloped Station

4.1 Reducing Risks and Passenger Security

Any new entrance/exit at the north on York Way could increase the risk of accidents as it will disrupt the planned passenger flow. Our assessment of platform conditions following train arrivals shows that passenger conditions are congested in the vicinity of the overbridge stairs. Poor levels of service are considered acceptable for brief periods over limited areas given that under the station routing strategy passengers exiting the platforms will all be moving south. If a northern entry/exit point is introduced on York Way our assessment has shown that opposing pedestrian movements along the platform will be introduced. Given the surge nature of movements following train arrivals, the introduction even of only a minority opposing flows will impose a safety risk in the area around the overbridge stairs. Fruin Level of Service F is calculated which represents very high levels of crowding which is not considered acceptable by Network Rail. It would not be possible to control the movement of passengers towards an exit at the north, as there is no gateline to control passengers moving from platform to platform.

The station is targeted by criminals and the gating of the station will help to reduce crime. Only passengers with valid tickets will be able to get onto the platforms and the trains. The gatelines will be staffed and monitored by CCTV. Any new gateline at York Way would require the same level of staffing and CCTV coverage as the other gatelines. This is not cost-effective as there would need to be a disproportionate level of staffing and monitoring given the passenger numbers that would use the York Way access. The York Way access is remote from the main station operations and this in itself would make staffing the access more onerous.

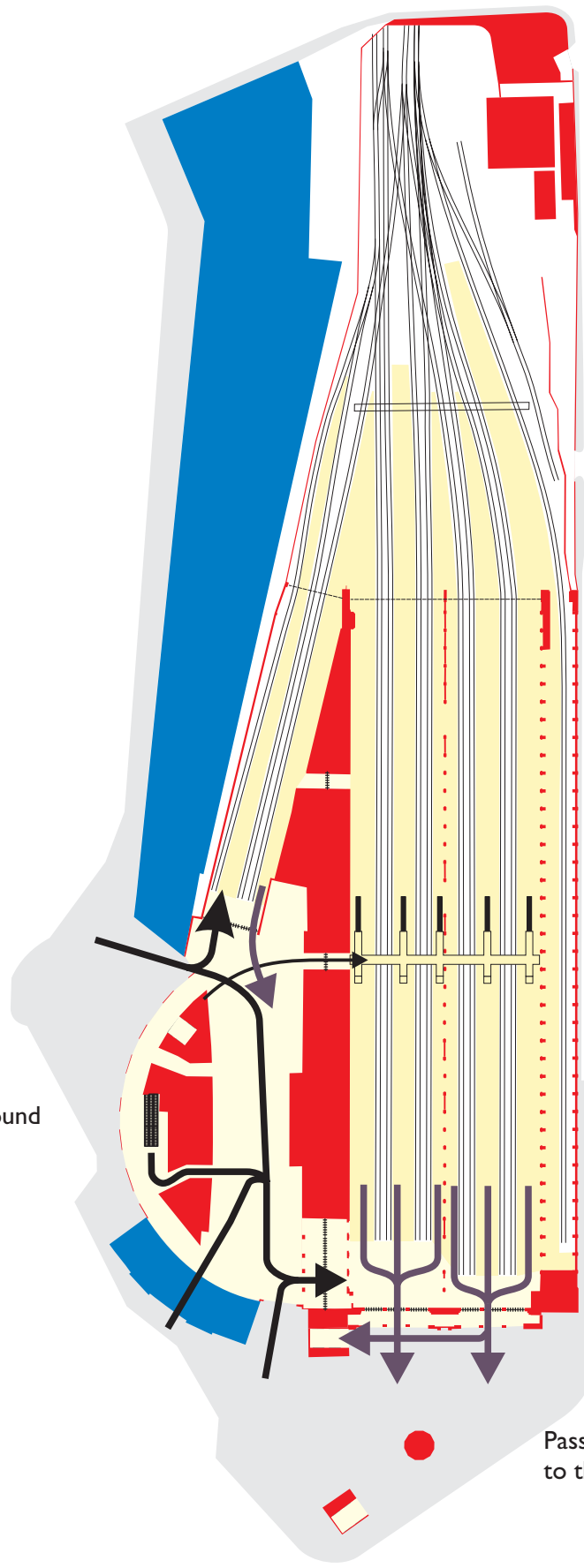
As a major transport hub, the station is also a potential target for more serious crimes and terrorist attacks. Controlling the flow of passengers into the station is considered to reduce these risks.

4.2 Station Management

The station management will be based in the Western Range Buildings. The welfare facilities for the station staff are in the Western Range Buildings. Any staff working at a mini-concourse at the York Way entrance must have their own welfare facilities provided locally. This is not economic as it will require new utilities connections as well as communications connections back to the main station systems.

If a new entrance to the station is provided off York Way, there should be facilities for passengers to buy tickets (ticket machines if not a ticket office). There would also be a need for passenger information screens so that passengers arriving at the entrance do not need to go to the main concourse to get information on trains.

Staffing requirements will increase with the additional ticket line and the maintenance requirements will increase. All these issues have significant capital and maintenance cost implications.



Passengers enter from the East:

- London Underground
- Suburban Shed
- Pancras Road
- Euston Road

New overbridge: escalators provide access only onto platforms from 1st floor of concourse

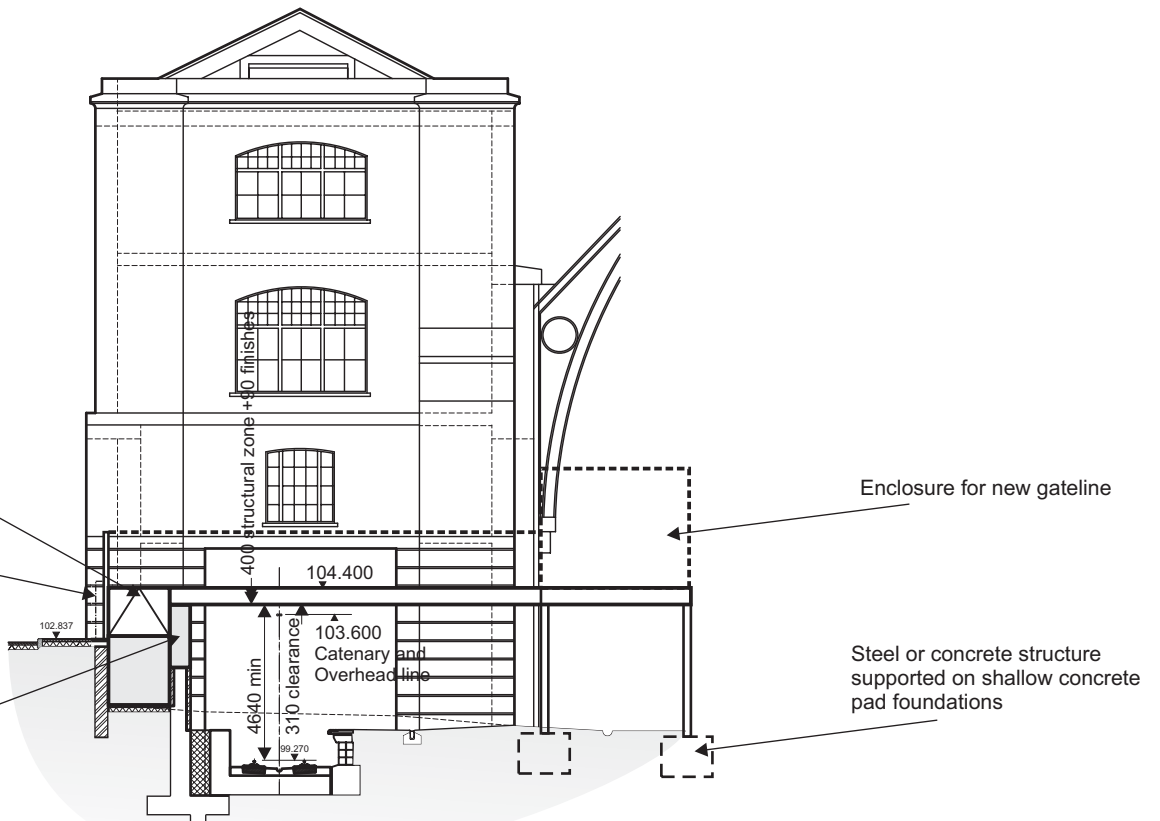
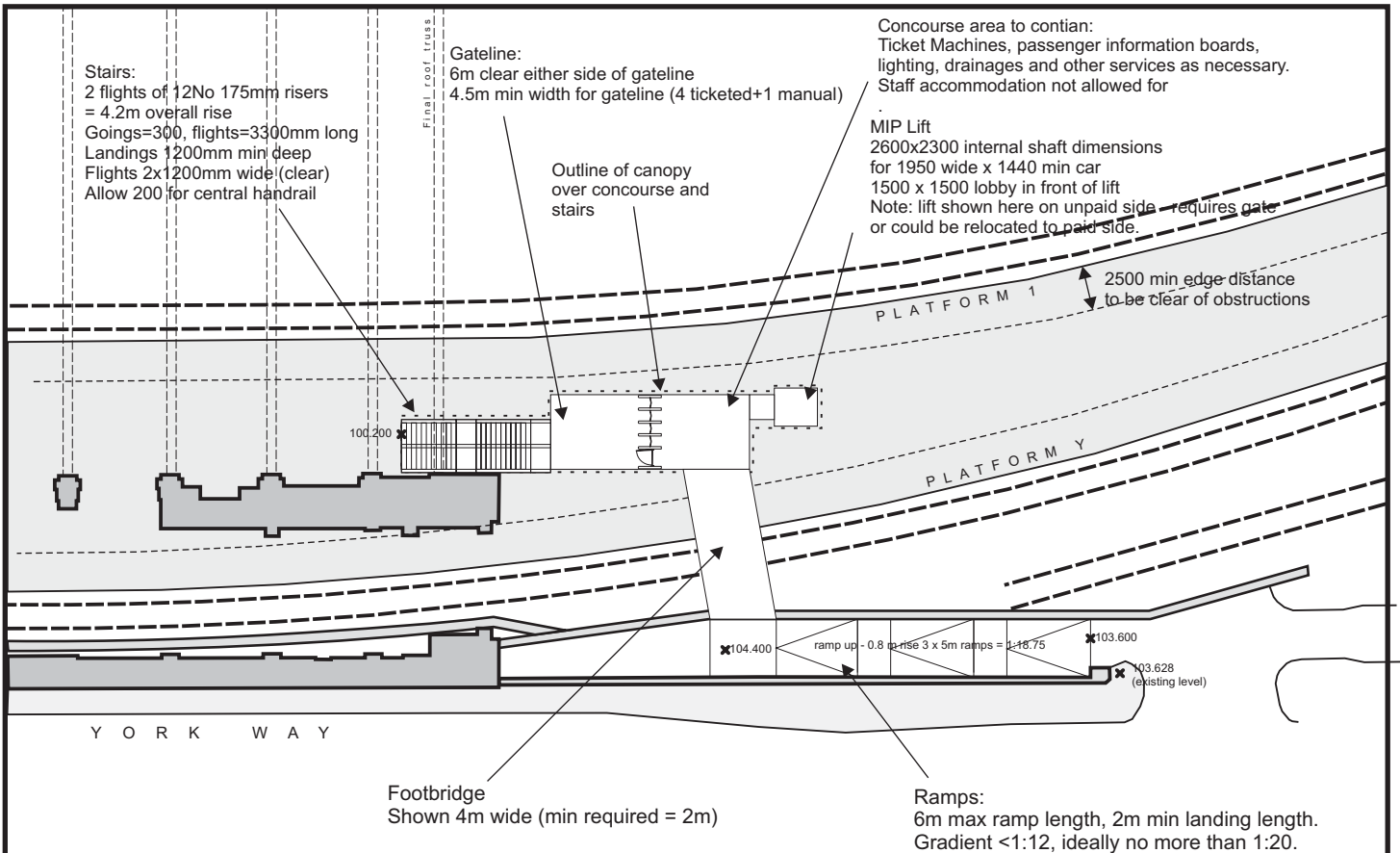
Passengers leave the station to the South

Passenger Movements

4.3 Passenger Movements

The design of the new station will allow the flow of passengers through the station to be controlled by the station management. The predicted passenger movements have been modelled in Pedflow analyses, which has been based on passenger counts on site and forecast increases in passenger numbers.

The computer model allows predictions to be made of the behaviour in crowds for different passenger densities and situations. The models can demonstrate how upsetting the normal passenger flow can bring the crowd to a standstill, and this can increase the risk of accidents



Ramp, overbridge and ticket hall

5 Assessment of Options

The Section 106 Notice requires that 3 particular options for a footbridge from York Way are considered in this report. The technical requirements for these options are considered in detail in previous reports (Arup report 122600-022_i4 *Northern Access Footbridge Study*).

This section describes the technical considerations for the construction of a connection between the platforms and the York Way access. Whilst the construction of a footbridge may be technically feasible, it is the operational considerations described in the rest of this report that make it:

- “impractical” Because of the disruptions to passenger flow, increased congestion and operational inefficiencies
- “not cost effective” No benefit to the operational costs of Network Rail or the TOCs, or savings to the travelling public
- “not reasonably able to be implemented” Causing disruption to the station operations and requiring alterations to the existing railway systems.

(Refer to the requirements of the Section 106 Notice, section.4.18.1 (ii).)

5.1 Construction of a link to Platform 1/Y

(Refer also to Arup report 122600-007 *Overview of the Northern Pedestrian Bridge*)

The proposal (summarised in the drawings opposite) is to provide a ramp up from York Way with a bridge crossing the Platform Y tracks to a small, elevated concourse above Platform 1. The structure has to comply with the Railway Safety Principles and Guidelines in respect of platform widths, ramp slopes and stair flight dimensions. It must also be DDA compliant and provide the minimum track clearance to Platform Y.

The schematic shows that the required levels and clearances can be achieved. However the lift cannot be located on the “paid” side of the gateline as it reduces the platform width too much. The lift controls will have to cater for this.

The small concourse area created will have to have a gateline as discussed elsewhere in this report. The area has to be big enough to allow run-offs either side of the gatelines as well as passenger information and ticketing facilities.

The concourse area is outside the Main Shed, and so is exposed to the elements. The concourse and steps will have to be covered and have a lockable gate.

The construction cost forecast for this scheme is £2,457,000 .The annual cost of maintenance and staffing is estimated to be £250,000.

The forecast includes design fees, and NR management costs. It is assumed that there are no finance charges or land/property acquisition costs as the options are all wholly within the station. The cost excludes VAT, the cost of alterations to the rail systems or other on costs. Allowances are made for ticket gates, ticket machines and passenger information displays.

5.2 Footbridge across to Platform 8

(Refer also to Arup report 122600-022 *Overview of the Northern Pedestrian Bridge*)

A number of locations were considered for a footbridge spanning across the tracks serving York Way, Platform 1 and Platform 8. The conclusion was that a bridge would be best located just north of the main shed roof, on the site of an earlier footbridge. This could be linked into the same concourse structure considered in the previous section of this report (with the stair flight relocated to the south).

The footbridge may be able to re-use the foundations for the earlier bridge, however it could not use the original access stairs as these could not be brought into compliance with current standards.

The footbridge would have to be covered as it is external. It will require lighting, CCTV and other station systems. The enclosure will reduce the levels of daylighting into the station

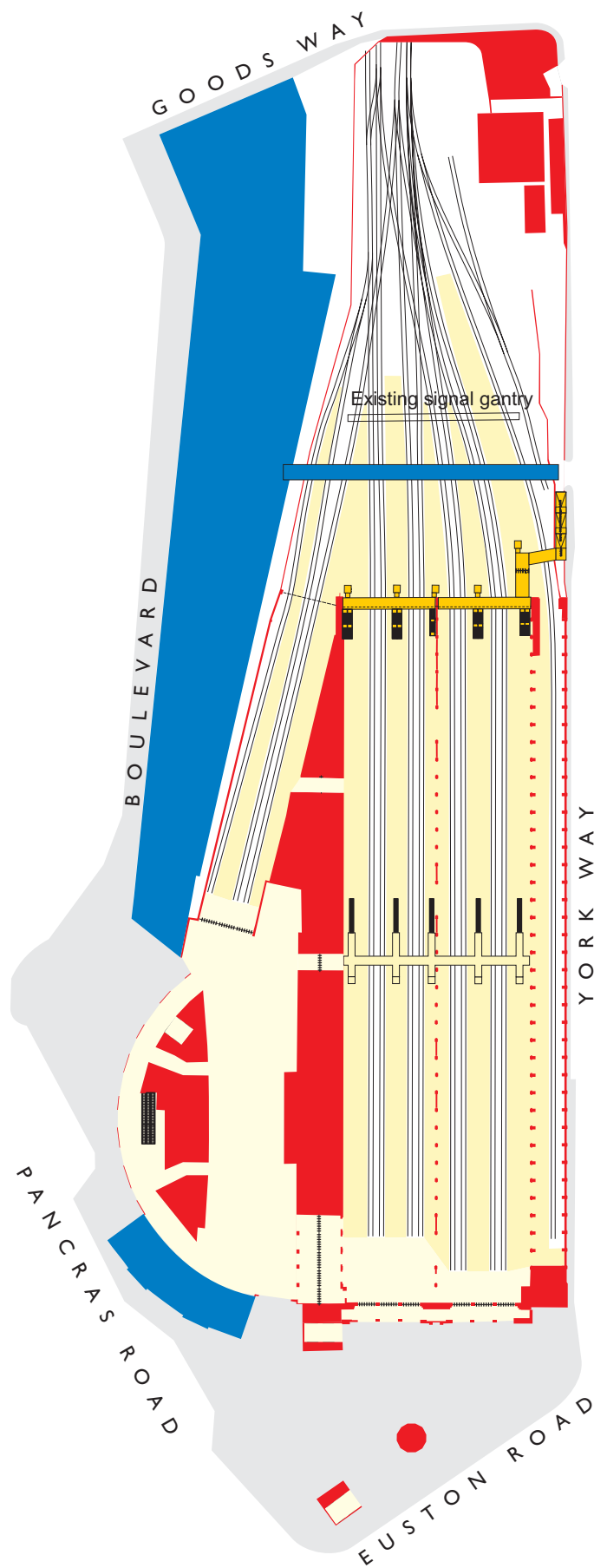
The construction cost forecast for this scheme is £7,896,000, on the same basis (assumptions and exclusions) as the forecast in the previous section. The annual cost of maintenance and staffing is estimated to be £250,000.

5.3 Bridge to serve intermediate platforms

(Refer also to Arup report 122600-022 *Overview of the Northern Pedestrian Bridge*)

This scheme is the same as the footbridge across the tracks, but with stairs and lifts to give access to all intermediate platforms. It is not possible to provide a stair with a compliant width down to platform 4/5 as the station spine wall is in the way. A narrow stair would have to be provided in this location. The 2m minimum platform width is just achieved on the other intermediate platforms, which will restrict passenger flows.

The construction cost forecast for this scheme is £10,864,000, on the same basis (assumptions and exclusions) as the forecast in the previous section. The annual cost of maintenance and staffing is estimated to be £250,000.



Construction over Platforms

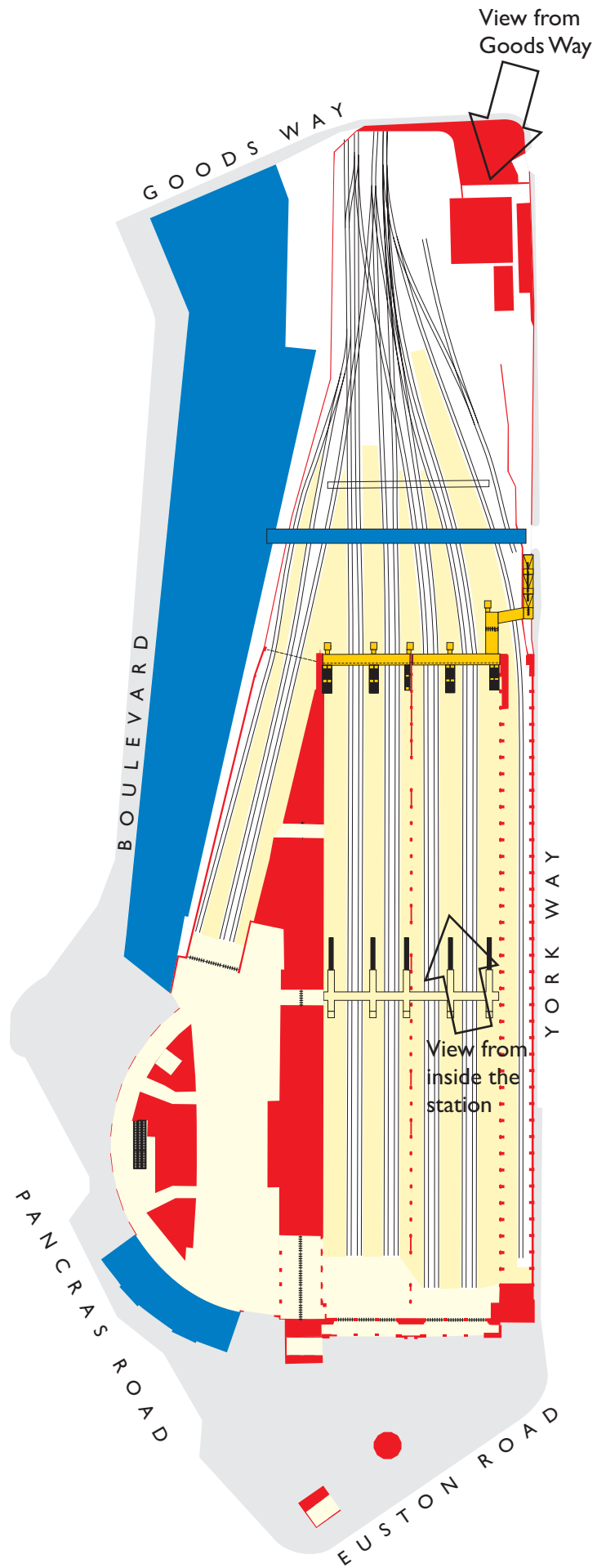
5.4 Over track considerations

Any structures built alongside or over the railway must be assessed for Overhead Line Equipment (OLE) clearances and signal sighting.

In the case of the overbridge with access to all platforms (section 5.3 above), the signal sighting will clearly be compromised from within the station. There are short trains that run from within the station and the signalling system would have to be adapted to cater for any obstructions caused by the new structure. The other options will also affect sight lines, though to a lesser degree. It is possible to make alterations to signalling systems, however the cost of any alterations are likely to be out of proportion to the cost of the new footbridge. It is not possible to make an accurate forecast of the costs without having a detailed assessment of the changes required to the system

The footbridge itself would provide the minimum clearance possible to the Overhead Lines Equipment. This is necessary to limit the overall rise in the stair flights to the platforms, which is close to the maximum allowed. The catenary cables supporting the overhead lines will have to be adapted to suit the footbridge, and there will have to be special provisions made for the maintenance of the footbridge given the proximity of the overhead lines.

The installation of the footbridge would require the lines to be closed down so that they can be adapted.



Heritage Considerations

5.5 Installation, Operation and Maintenance

The installation of a footbridge at the north end of the station with its associated staircases, lifts and concourse would not present insurmountable technical challenges – there is a footbridge to be installed across the tracks within the station as part of the King's Cross Enhancements works and so the installation methods are likely to be similar. However, the planning for the mid-platform bridge is already well advanced and it is unlikely that a new northern access bridge could be built at the same time. This would require an extra set of possessions to install a second footbridge and would need to be planned for after the completion of the Enhancements works.

The operation of a northern footbridge will require additional staffing. The signage of the station ought to be adapted to inform passengers of the alternative exit and maximise its use. This would increase the levels of disruption to the planned passenger flows.

The northern footbridge should be designed to minimise the need for maintenance as access will be difficult in that location.

5.6 Heritage Considerations

King's Cross Station has a Grade 1 listing from English Heritage. The view of the country end of the station from the north reveals much of the original, Victorian structure. Any new structure, such as a footbridge across the platforms, would need to be submitted to English Heritage for approval and so considerations would have to be made in the design of how the new structure can be integrated, visually, into the surrounding station.

The new bridge structure, with its canopy, would block light from the north end of the station requiring higher levels of artificial lighting inside that end of the shed. The views of the tracks from inside of the station will be blocked by the new structure.



View of the south end of the Main Shed showing the framework for the original access bridge from the Eastern to the Western Range Buildings. The framework was removed by the 1970s.



6 Conclusions

A small number of pedestrians have enjoyed the cab road access to Platform 1. Pedestrian counts at the station have measured that around 2 ~ 3 % of people using the station use the York Way access. Of these, less than half are passengers arriving or departing by train. This access will be closed.

There is no benefit to Network Rail or to the running of the station in providing an alternative access to the platforms from York Way in its immediate vicinity. Any such access would be costly to build, maintain and operate and visually intrusive. It is expected that it would be little used as it would be gated. This new entrance would interfere with the planned passenger flows in the redeveloped station. Pedestrian counts have been used to model the movement of passengers through the station using Pedroute computer analysis. The analysis has shown that the introduction of a northern access into the station will increase the likelihood of congestion reaching an unacceptable level. A particular pinch-point is predicted for Platform 1 when passengers are alighting from trains on platforms Y and 1 at the same time, and there are other passengers trying to make their way against the flow of disembarking passengers towards an exit at the northern end of platform 1.

King's Cross Station is a Grade I listed structure. Any additions to the station will have to be submitted to English Heritage for approval. It is expected that English Heritage would want to preserve the view of the country end of the Main Shed. Any footbridge structure at the northern end of the station will intrude into this view.

Any new access into the redeveloped station will have automatic ticket gates for revenue protection. An entrance at York Way with automatic ticket gates will require staff to be in attendance; staff welfare facilities; passenger information and facilities for the sale of tickets.

The engineering feasibility of a number of options for a northern footbridge has been considered. Three favoured options have been developed and the costs of construction and maintenance have been assessed. Some aspects of the design have yet to be resolved, notably signal sighting.

Alternative pedestrian routes will be available on the the improved Goods Way, the improved York Way and, possibly, on the new footbridge that may be built at Wharfdale Road.