



# CROSSRAIL INFORMATION PAPER

## A7 – SELECTION OF THE NORTH EASTERN TERMINUS

This paper explains the options considered for serving the Great Eastern Main Line corridor and how and why the decision was taken to operate Crossrail services from Shenfield.

It will be of particular relevance to those interested in the route development process.

This is not intended to replace or alter the text of the paper itself and it is important that you read the paper in order to have a full understanding of the subject. If you have any queries about this paper, please contact either your regular Petition Negotiator at CLRL or the Crossrail helpdesk, who will be able to direct your query to the relevant person at CLRL. The helpdesk can be reached at:

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## **1. Introduction**

1.1 During the development of Crossrail, a range of options were considered for serving the Great Eastern Main Line (GEML) corridor. This paper outlines these options and explains how the decision to operate services from Shenfield was reached.

1.2 It is based on work reported in the Environmental Statement<sup>1</sup>, background work that was undertaken during the option selection process and analysis undertaken in response to the petitions received in the House of Commons.

1.3 It should be noted that in the Bill scheme, Crossrail serves Shenfield by replacing the existing 'Metro' service operating over the 'Electric Lines'; Crossrail will not affect the 'Main' lines on which the fast services operate. The existing fast services from Shenfield to Liverpool Street are therefore assumed to be retained.

## **2. Why does Crossrail serve the Great Eastern corridor?**

2.1 The case for Crossrail to serve the GEML corridor is based upon meeting a range of strategic objectives:

- Tackling overcrowding in the corridor: Existing National Rail services into Liverpool Street already operate above capacity in the peak periods and this is forecast to significantly worsen by 2016. Overcrowding is also forecast to increase on sections of the Central line in east London. Crossrail will relieve pressure on platform capacity at Liverpool Street, allowing longer, more frequent trains to operate in the corridor.
- Improving journey times: At present passengers for central London from the Great Eastern corridor can only make direct journeys to Liverpool Street. Although this is convenient for passengers travelling to the eastern part of the City, it means that passengers travelling to other parts of the City, as well as the West End, must interchange onto London Underground or bus services at either Liverpool Street or Stratford to complete their journeys. This significantly increases journey times for passengers. Crossrail will allow a range of new direct journeys to be made from the GEML corridor to locations such as Moorgate, Farringdon, Tottenham Court Road, Bond Street and Paddington. These new direct journey opportunities will reduce journey times, as well the number of passengers interchanging on to the already overcrowded Central line at Stratford and Liverpool Street stations.
- Providing capacity for growth: The Mayor's London Plan forecasts significant employment and population growth in east London up to 2016. Crossrail is

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<sup>1</sup> The term 'Environmental Statement' refers to the Environmental Statement deposited with the Crossrail Bill in February 2005, the four Environmental Statements accompanying the Additional Provisions, the four Supplementary Environmental Statements submitted during the passage of the Bill, and their Non-Technical Summaries and errata, which together comprise the Crossrail Environmental Statement. The term 'the Main ES' refers specifically to the Environmental Statement produced (with its Non-Technical Summary) in February 2005. See <http://billdocuments.crossrail.co.uk/>.

identified as part of the planned transport investment to accommodate this level of growth and to support development opportunities around Stratford and at Ilford. In addition, use of the GEML corridor by Crossrail will reduce the number of peak period trains terminating at Liverpool Street, where limited platform capacity is a constraint on the overall capacity of the station. Crossrail will mean that additional services could be operated into the station from the Lea Valley line between Cambridge, Stansted and London. The London Plan identifies development opportunities in the Lea Valley between Tottenham Hale and the Upper Lea Valley, while outside London, the Government has committed to provide for major growth in the London-Stansted-Cambridge corridor. Government policy also supports the development of a second runway at Stansted Airport.

### **3. Constraints in planning Crossrail**

- 3.1 The GEML is a four-track railway which carries a range of rail services. The planning of the Crossrail service has had to take into account the diverse needs of these different services.
- 3.2 Two of the four tracks, known as the “Main lines” carry high-speed long distance services between Liverpool Street and Norwich, as well as commuter services from locations to the east of Shenfield, including Southend, Ipswich, Clacton, Colchester and Chelmsford. In the morning peak, around 20 trains per hour operate on these lines into Liverpool Street, with around half of these services stopping at Shenfield. These services normally run non-stop between Shenfield and Liverpool Street or call only at Stratford.
- 3.3 The other set of tracks, known as the “Electric lines”, are used to carry shorter distance “Metro” commuter services from Shenfield, Gidea Park and Ilford. In the morning peak period, around 16 trains per hour operate into Liverpool Street, made up of around seven trains from Shenfield, seven starting at Gidea Park and two starting at Ilford.
- 3.4 Outside the morning and evening peak periods, both the Main and Electric lines carry freight traffic to and from the East Coast ports including Harwich, Felixstowe and Tilbury. Freight flows are heaviest on the short section of the corridor between Stratford and Forest Gate in inner London.

### **4. Summary of options considered**

- 4.1 Cross London Rail Links (CLRL) identified a range of GEML route and service pattern options for Crossrail. These are:
  - Stratford option, with Crossrail terminating at Stratford from the west, with no connection provided to the GEML.
  - Great Eastern Main lines option, with Crossrail terminating to the east of Shenfield at a number of locations including Southend and Colchester.
  - Great Eastern Electric lines option, with Crossrail terminating at Shenfield. Alternative termination points at Romford and Gidea Park were also considered.

4.2 The following section explains the reasons for the decision to serve the Electric lines with a terminus at Shenfield.

## 5. Assessment of options

### Stratford

5.1 Since no GEML services terminate at Stratford, the proposed 12 trains per hour Crossrail service would comprise additional trains, with the existing GEML services continuing to run under their present pattern.

5.2 In order to accommodate these extra trains at Stratford, two platforms, track crossovers and two reversing sidings would have to be provided at the station. Because of the need to preserve the existing GEML train service through the station, none of the existing station platforms would be available to reverse the Crossrail service. There is insufficient spare land to provide the Crossrail station on the surface. This is due to the already congested nature of the site at Stratford, and the various development projects, for example, the Stratford City development to the north and south, the Transport for London upgrade (including plans to cater for the Olympics), and Docklands Light Railway's plans to take over the North London Line. As a result, the Crossrail platforms would need to be located underground, and at a level deep enough to avoid the existing Central line tunnels.

5.3 This underground station would need to be connected to the main Crossrail tunnels at Pudding Mill Lane by 2 kilometres of tunnel - this represents a construction project of considerable size and cost. In addition, the presence of the existing two-level station at Stratford, the River Lea and the very poor ground conditions in the area would make the new Crossrail station extremely expensive to construct at between £300 and £400 million. Construction of this facility would also be highly disruptive to existing rail services using Stratford station.

5.4 Terminating at Stratford would also realise significantly fewer benefits and be less attractive to passengers than Crossrail options that directly serve the GEML corridor. This Crossrail option would require passengers to interchange from the GEML services, thereby removing the direct journey opportunities provided by other options for the corridor. Additionally, the deep level nature of the interchange connection would be unattractive to passengers, particularly since the Central line already provides easy, cross platform interchange with GEML Metro services. As a result, the number of passengers using Crossrail would be very low with most opting to remain on the existing, overcrowded GEML and Central line services that operate through the station.

5.5 Under this option, no additional rail capacity would be provided on the GEML corridor east of Stratford and it would not release any platform capacity at Liverpool Street that could allow additional Lea Valley line services to operate. Given the poor performance of the option terminating at Stratford, no further work was undertaken and no technical reports prepared.

### **Great Eastern Main lines option**

- 5.6 A Crossrail option was examined that that involved operating over the GEML to a range of locations in Essex and Suffolk, including Southend Victoria, Colchester and Ipswich. Such a Crossrail service would have replaced a range of existing Great Eastern services that currently operate into Liverpool Street and would have operated non-stop between Shenfield and Stratford.
- 5.7 Analysis of this option raised a number of serious concerns, particularly concerning its operational reliability, that stem from the long distances that running to locations such as Southend and Ipswich would entail - Southend is nearly 70 kilometres from Liverpool Street while Ipswich is 110 kilometres away. The longer the route, the larger the risk of delays and hence the incompatibility with the need to provide a frequent and reliable service across central London.
- 5.8 Under this option, Crossrail services would be required to share tracks over substantial distances, with a range of other services, including high speed Intercity services from Norwich, freight and a range of commuter services into Liverpool Street. This need for substantial inter-running with other services would pose a further risk to the reliability of the Crossrail service by introducing a dependency upon the operation and train service regulation of non-Crossrail services.
- 5.9 Apart from these operational concerns, this option performed poorly against a number of the strategic objectives set by Crossrail for serving the GEML corridor. In particular, it would have failed to tackle existing overcrowding on the GEML Metro services or provide additional capacity to locations earmarked for growth in east London including Ilford.

### **Great Eastern Electric lines option**

- 5.10 Shenfield is the existing terminus of the GEML Metro service and an option was developed that would allow this entire group of services to be transferred onto Crossrail. However, the promoter has also considered the use of alternative terminating points at Romford and Gidea Park.

#### *Shenfield*

- 5.11 Terminating at Shenfield would allow all stations between Shenfield and Stratford to be served by Crossrail, thereby spreading its benefits of additional capacity and improved journey times over the entire length of the Electric lines corridor. Use of the electric lines from Shenfield would also ensure a high degree of operational segregation for Crossrail from other rail services in the corridor and assist in the operation of a reliable service by minimising the risk of “importing” delays from non-Crossrail services on to Crossrail.
- 5.12 In this option, Crossrail would replace the existing 8 car long trains currently used on the GEML Metro services in the peak periods with longer 10 car trains and therefore increase overall passenger capacity in the corridor. Terminating at Shenfield would also maximise the number of passengers in the corridor who gain from the faster journey times provided to parts of central London by

Crossrail. Passengers from Brentwood, for example, would save 8 and 6 minutes respectively on their journeys to Farringdon and Tottenham Court Road.

5.13 Although Shenfield is already equipped with two platforms for reversing trains, the proposed Crossrail service of 12 trains per hour from the station is greater than the present day service of around 7 trains per hour and would require the provision of an additional platform at the station as one of the existing platforms is also used by through train services to the Southend line. By providing this enhanced reversing facility at Shenfield, a significantly higher train service would be offered on the electric lines from Shenfield, Brentwood and Harold Wood, which would be particularly beneficial for the large number of London-bound passengers travelling from the latter two of these stations. Additionally, any passengers making local journeys down the electric lines from Shenfield would also benefit from the increased train frequency from that station.

5.14 Although the work to provide this platform is of a reasonable scale, it is considerably less than the work that would be required at locations such as Romford and Gidea Park to provide comparable reversing facilities.

*Alternative Electric line options – Romford and Gidea Park*

5.15 The Promoter has considered the possibility of terminating Crossrail at other locations on the Electric lines, particularly Romford and Gidea Park. However, these options would require the operation of a residual service on the electric lines to serve stations not served by Crossrail, as well as much more radical reconstruction of these stations to provide the necessary reversing capacity for the Crossrail service.

5.16 The difficulties of providing a residual service are not solely related to operational inconvenience. Instead there would be a severe impact on passengers through the need to reduce significantly train frequencies at stations served only by the residual service. These reductions would be unacceptable to passengers and limit the spread of the benefits of Crossrail along the whole of the Electric lines corridor.

5.17 For example, none of the existing GEML Metro services into Liverpool Street station currently terminate at Romford. Instead they terminate to the east of the station at either Gidea Park or Shenfield. As a result, terminating a 12 trains per hour Crossrail service at Romford would require additional trains to be added to the existing Metro services if existing train frequencies at stations between Shenfield and Romford were to be preserved.

5.18 Under the current GEML Metro timetable, 14 trains per hour operate in the peak hour into Liverpool Street from Romford. If an additional 12 trains per hour from Crossrail were added London-bound at Romford, a total of 26 trains per hour would need to operate between Romford and Stratford. This is at the capacity of the tracks but would generate service reliability issues for both

### **Crossrail and the Great Eastern Metro services**

- 5.19 A solution for accommodating the additional Crossrail trains on the line between Romford and Stratford would be to reduce the frequency of the GEML Metro service operating through Romford to a level where the existing frequency would not be exceeded. The Promoter estimates that the current 14 trains per hour service would need to be reduced to around 7 trains per hour to permit this to happen. This would require the withdrawal of all GEML Metro services that currently start at Gidea Park and therefore the loss of 7 trains per hour from this station in the peak period.
- 5.20 Terminating at Romford would also require extensive station and track reconstruction to allow the Crossrail service to terminate there. The existing Romford station has five platforms with four located on the main running lines and two additional terminating platforms would be needed to accommodate Crossrail.
- 5.21 To achieve this station and track layout, Romford station would have to be substantially rebuilt as there is little space for new platforms at the existing site, which is close to the town centre and surrounded by buildings. It is the promoter's view that substantial demolition could not be justified to provide a terminus that would have very limited benefits to passengers and whose construction would severely disrupt rail services in the corridor.
- 5.22 In order to terminate Crossrail at Gidea Park, the existing tracks would need to be reconfigured to allow Crossrail trains to terminate in the existing GEML Metro platforms and reverse in sidings beyond the station. However, by doing this, the ability of the line to also accommodate GEML Metro services from Shenfield would be severely compromised and a reduced service from Shenfield, Brentwood and Harold Wood would need to operate. The promoter does not consider this to be an attractive option to passengers, particularly for those from Brentwood and Harold Wood, who only have the option of using the GEML Metro service, as no GEML services stop there.