

- 3.10.5 The Barbican is a largely residential estate located within the City of London and includes a number of communal and public buildings including the Arts Centre, St. Giles Church and the Guildhall School of Music and Drama. The residential buildings are set on a raised pedestrian podium above ground-level car parking and the estate includes numerous squares, courtyards and gardens, including several lawns and a lake. The Barbican Estate is an important example of a comprehensively planned residential and cultural development of the post-war period. St. Giles Church is Grade I listed whilst the lake and many of the remaining buildings within the estate are Grade II listed. The Barbican is also listed as a Grade II* Garden of Special Historic Interest. It is a townscape of high quality and high sensitivity to change.

Impacts on Listed Buildings

- 3.10.6 Both the original crossover location and the amended location, as set out in Amendment 1, are underneath the Barbican Estate, which is a collection of buildings that have been listed as Grade II. The temporary construction adit runs underneath listed buildings in Finsbury Circus and Moorgate. The main ES identified buildings within the Barbican, Moorgate and Finsbury Circus where there is potential for settlement without mitigation, as set out in *Volume 2, Chapter 8, Section 8.8, paragraph 8.8.46 and Appendix B2* of the main ES. The amendment to the crossover location and construction method does not affect any additional buildings to those set out in the main ES. Shakespeare Tower, part of the Barbican, is no longer located within the potential zone of settlement.
- 3.10.7 The amendment to the crossover results in a reduced level of settlement at the following properties in comparison to the scheme set out in the main ES: Defoe House, John Trundle House, Lauderdale Tower, the Arts and Conference Centre, Lambert Jones Mews and the Podium (all within the Barbican complex) and 16–18 Finsbury Circus. All are listed Grade II. There remains a potential for significant settlement impacts (in the absence of mitigation measures) at the Arts and Conference Centre and the Podium. The remainder are not predicted to experience significant settlement impacts.
- 3.10.8 An increased risk of settlement is predicted for Gilbert House, the Guildhall School of Music and Drama, Brandon Mews, Willoughby House, Andrewes House and Lake (all within the Barbican complex), at Britannic House, London Wall Buildings and Salisbury House (all on Finsbury Circus) and at 76–92 Moorgate and 137–141 Moorgate. Britannic House is listed Grade II*; the others are listed Grade II.
- 3.10.9 *Appendix B1* of the main ES sets out the measures to be undertaken to protect listed buildings from the effects of settlement. These measures will be implemented as necessary.
- 3.10.10 At three properties (Gilbert House, Willoughby House and 76 – 92 Moorgate), the potential for settlement without mitigation would be of particular significance. For the Barbican structures, it is envisaged that compensation grouting will be used to mitigate settlement impacts (as set out above) as necessary, and consequently there will be no significant residual impacts on these buildings.

- 3.10.11 For 76–92 Moorgate it is envisaged that, if necessary, compensation grouting will be undertaken from the grout shaft in the Moorgate worksite (see *Volume 2, Chapter 8, Section 8.9, paragraph 8.9.20* of the main ES) and consequently there will be no significant residual impact on this building.
- 3.10.12 If sub-surface grout shafts are to be used as set out in mitigation Option Two, once construction and use of the grout shafts is completed, there will be no permanent impacts on the listed buildings, and the floors of the affected underground car parks will be reinstated.
- 3.10.13 Amendments 2 and 3 do not change the conclusions set out in the main ES with respect to listed buildings.

Mitigation and Temporary Residual Townscape Impacts

Amendment 1

- 3.10.14 The additional works within the Finsbury Circus worksite will not result in any additional temporary or permanent adverse impacts to those previously reported in the main ES. Due to the second shaft within Finsbury Circus, a 12 m false acacia and a 4 m winter cherry will be at risk from the works, and for assessment purposes are assumed to require removal. Although the works will result in an increase in duration of the works of two years, this is not considered to result in any change to the level of significance of impacts on the local townscape resources, conservation areas or settings of listed buildings.
- 3.10.15 The new worksite for the ventilation shaft at Moor Lane is relatively small and within part of the carriageway. The duration of works will be approximately 22 months. The Moor Lane worksite is adjacent to ground-level car parks, service ramps and entrances associated with the Barbican and the building complex opposite. The activities in this worksite are not predicted to result in any significant impacts on the local townscape resources, conservation areas or the setting of the listed Barbican and gardens.
- 3.10.16 The works at Moor House are within the building and comprise the completion of a partly constructed shaft to surface level. This will not result in any change to the level of significance of impacts on the local townscape resources, conservation areas or settings of listed buildings already reported in the main ES.
- 3.10.17 Because of the removal of works within Aldersgate Street, four young to medium age London plane trees considered in the original scheme to be at risk from the works, and therefore assumed to be removed, will now no longer be affected. The significant temporary impact on the setting of the Podium of the Grade II listed Barbican and the area designated as a Grade II* Park and Garden of Special Historic Interest by English Heritage will be removed.
- 3.10.18 Mitigation Options One and Two (compensation grouting from the access tunnels or surface grout shafts) will not result in any additional significant impacts on the setting of listed buildings or on townscape character.
- 3.10.19 An option to carry out works to the lake, if required, will not result in any significant adverse impacts as the drainage, lining, refilling and restocking works are likely to be no more than one to two months in duration.

Amendment 2

- 3.10.20 As a result of the revised access into Finsbury Circus, it will be possible to retain one of the mature London plane trees previously identified for removal. However, a young 6 m London plane tree on the periphery of the Circus will now need to be removed.
- 3.10.21 On the southern side of the gardens, a 21 m oak tree previously identified for removal will be retained under the amended proposals. A mature London plane tree considered to be at risk from the works in the original scheme, and therefore for assessment purposes assumed to be removed, is still considered to be at risk. Although this risk has been reduced by a realignment of the southern access point within existing limits, it is still assumed that it will be removed.

Amendment 3

- 3.10.22 The proposed amendment does not change the conclusions set out in the main ES with respect to townscape.

Mitigation and Permanent Residual Impact

- 3.10.23 There will be no change to the permanent impacts set out in the main ES.

Impacts on Visual Amenity*Baseline*

- 3.10.24 Visibility of the Farringdon crossover worksite, Aldersgate Street sewer diversion worksite and associated utility diversions are generally restricted by the buildings that front the streets where the works will take place. The zone of visual influence extends along sections of Aldersgate Street, Long Lane, Beech Street and Carthusian Street. A mixture of high, medium and low visual receptors are located in and around these streets.
- 3.10.25 Visibility of the Finsbury Circus worksite is generally restricted to within the gardens and the buildings surrounding the gardens. There will also be views from the short streets that access the inner circus.
- 3.10.26 Visibility of the Moor Lane worksite is generally restricted by the buildings that front the streets surrounding the site. The zone of visual influence extends along Moor Lane, the high-level pedestrian walkways that cross it and from the upper floors of the surrounding tall buildings.
- 3.10.27 Visibility of the Moor House works will generally be from the surrounding streets, including Fore Street Avenue and Moorfields.
- 3.10.28 Visibility of the Moorgate worksite and the extension at its southern end is generally restricted by the buildings that front the streets where the works will take place. The zone of visual influence extends along sections of Fore Street Avenue, Moor Place, London Wall, Moorgate, Moorfields and surrounding high-level walkways. There are mainly moderately sensitive visual receptors located in and around these streets.

- 3.10.29 Within the Barbican, the communal open space and associated lake to the east of Gilbert House is directly overlooked from the buildings that enclose the open space, such as Andrewes House, Willoughby House, Gilbert House, Brandon Mews, Speed House and the Guildhall School of Music and Drama. Open views of the lake are obtained by occupants of these buildings, by users of a paved seating area in front of the Guildhall School of Music and Drama, by users of the elevated pedestrian walkways, and by users of the lawn and children's playground to the north of the lake.
- 3.10.30 Occupants of the upper floors of more distant high-rise buildings may also have glimpsed views of the open space. The streets surrounding eastern edges of The Barbican tend to have a high degree of visual enclosure, provided by the high external walls of the Barbican and the tall office buildings on the opposite sides of the streets. These office buildings and streets generally provide a moderate level of visual amenity although the existing works compound in the southern part of Moor Lane detracts from this amenity.
- 3.10.31 The full baseline text for visual amenity in this route window is described within the main ES (*Volume 2, Chapter 8, Section 8.8, paragraphs 8.8.63 to 8.8.64, and Volume 2, Chapter 8.9 Section 8.9, paragraphs 8.9.51 to 8.9.54*).

Mitigation and Temporary Residual Impacts

Amendments 1 and 2

- 3.10.32 The removal of the Farringdon Crossover worksite, Aldersgate Street sewer diversion worksite and associated utility diversions will result in the removal of the temporary adverse significant impact on residents, workers and users of properties in Aldersgate Street, Charterhouse Street, the commercial premises on the ground floor of Lauderdale Tower in the Barbican and the pedestrian users of Beech Street, Long Lane, and Aldersgate Street. These are shown as eliminated impacts on Map C6/C7(iii) of the AP2 ES mapping volume (AP2a).
- 3.10.33 The additional works within the Finsbury Circus worksite will not result in any additional temporary adverse impacts on those visual receptors previously reported in the main ES.
- 3.10.34 The new worksite at Moor Lane will result in significant temporary adverse impacts for pedestrians using Moor Lane, pedestrians using the Britannic Highwalk adjacent to and across Moor Lane, and visitors to and workers at the southwestern corner of the City Point complex that faces Moor Lane. These are shown as significant impacts on Map C6/C7(iii) of the AP2 ES mapping volume (AP2a).
- 3.10.35 The works at Moor House will not result in any additional temporary adverse impacts on those visual receptors previously reported in the main ES.
- 3.10.36 Mitigation Options One and Two (compensation grouting from the access tunnels or surface grout shafts) would not result in any additional significant impacts on visual amenity as the worksites are located in underground car parks.
- 3.10.37 The works to the lake, if required, will not result in any significant adverse impacts on the amenity of views due to the short duration of the works.

Amendment 3

- 3.10.38 The revised location of the sewer through the Moorgate worksite will not result in any additional significant temporary adverse impact on those visual receptors previously identified in the main ES (*Volume 2, Chapter 8, Section 8.9, paragraphs 8.9.35 to 8.9.50*), although there will be a minor increase in the area and intensity of the works.
- 3.10.39 The Moorgate station sewer worksite on Fore Street Avenue will no longer be required for the sewer diversion although there will be a requirement for other utility diversions. These diversions were assessed in the SES2 and did not result in a significant impact on visual amenity. The removal of the Moorgate station sewer worksite will therefore mean that there will no longer be a temporary adverse significant impact on the workers at Telephone Exchange Building and workers and visitors at 3–6 Fore Street Avenue. This is shown on Map C6/C7(iii) of the AP2 ES mapping volume (AP2a).

Mitigation and Permanent Residual Impacts

- 3.10.40 The proposed amendments will not result in any change to the permanent impacts reported in the main ES.

Impacts on Archaeology*Baseline*

- 3.10.41 The baseline resources that might be affected by the revised scheme are substantially the same as those described in the main ES (*Volume 2, Chapter 8, Section 8.8, paragraph 8.8.79*). In addition, the access shaft location in Finsbury Circus gardens has the same baseline resources as works at that location for Liverpool Street station (*Volume 2, Chapter 8, Section 8.9, paragraph 8.9.61*), notably moderate potential for former layouts of the gardens, of moderate importance.
- 3.10.42 The full baseline text for archaeology for this route window is described within the main ES (*Volume 2, Chapter 8, Section 8.8, paragraphs 8.8.78 to 8.8.82 and Volume 2, Chapter 8, Section 8.9, paragraph 8.9.61*).

Mitigation and Residual Impacts

- 3.10.43 The revised scheme will no longer have an impact on potential archaeological remains from a shaft and associated sewer and other service diversions in Aldersgate Street, and in Fore Street Avenue.
- 3.10.44 Instead, the additional works in Finsbury Circus gardens will have an additional impact for a separate shaft in the northern part of the gardens. There will also be additional impacts resulting from the footprints of a ventilation shaft and a shaft for delivery of materials in the Moor Lane worksite.
- 3.10.45 It is unlikely that the compensation grouting will have any archaeological impact, unless ground reduction takes place in the limited areas of potential archaeological survival.
- 3.10.46 Mitigation measures for below-ground resources will remain as preservation by record, as in the main ES (*Volume 2, Chapter 8, Section 8.8, paragraph 8.8.82*). With this mitigation, no significant residual impacts will occur.

Impacts on Ecology

Baseline

- 3.10.47 The baseline conditions for ecology are as set out in the main ES (*Volume 2, Chapter 8, Section 8.8, paragraph 8.8.83 and Volume 2, Chapter 8, Section 8.9, paragraphs 8.9.64 to 8.9.65*).
- 3.10.48 In addition, there is a man-made lake which forms a central feature of private and public open spaces in the Barbican development. It is hard edged and surrounded by paved surfaces devoid of vegetation, though there are areas of ornamental planting in the vicinity. Aquatic vegetation is confined to three submerged planting troughs and consists of emergent ornamental species. Reportedly the lake contains fish.

Mitigation and Residual Impacts

- 3.10.49 In the original scheme, one tree at Finsbury Circus was identified as having bat roost potential, although surveys carried out in 2005 indicate no bat use. This tree will no longer be affected by the scheme.
- 3.10.50 With the implementation of a fish removal programme and reinstatement of the lake upon completion of the protective works, the possible temporary loss of this ornamental water feature will not constitute a significant impact.
- 3.10.51 No significant ecological impacts were reported in the main ES within Route Windows C6 or C7. The proposed amendments do not alter this conclusion.

Impacts on Water Resources

Baseline

- 3.10.52 The baseline text for water resources for this route window is described within the main ES (*Volume 2, Chapter 8, Section 8.8, paragraphs 8.8.85 to 8.8.87, and Volume 2, Chapter 8, Section 8.9 paragraphs 8.9.68 to 8.9.71*).

Mitigation and Residual Impacts

- 3.10.53 In addition to the main construction shaft in Finsbury Circus gardens, the revised works include an additional access shaft for construction of the crossover within the gardens. This increases the potential for affecting groundwater flows in the superficial deposits around the former River Walbrook. However, as described in the main ES (*Volume 2, Chapter 8, Section 8.9, paragraph 8.9.75*), the width of, and potential groundwater flows within, any such channel will be investigated further and monitored during construction. If necessary, drainage will be provided around the new structure to mitigate changes to groundwater levels. With this mitigation, no significant residual impacts will occur.
- 3.10.54 During construction of the Farringdon crossover, compensation grouting will be undertaken from the access tunnels and, if necessary, from sub-surface grout shafts (Mitigation Option Two). However all grouting will take place within the London Clay and as such no significant impacts on groundwater flow or quality will result.

- 3.10.55 With the implementation of good site practice measures to regulate surface water run-off, as set out in *Volume 6a Appendix B1* of the main ES, in conjunction with more detailed investigations of the existing drainage arrangements of the lake if necessary, no significant impacts on surface water will result from the construction and operation of the proposed Amendments.

Impacts on Traffic and Transport

Baseline

- 3.10.56 The full baseline text for traffic and transport for Route Windows C6 and C7 is described within the main ES (*Volume 2, Chapter 8, Section 8.8, paragraphs 8.8.93 to 8.8.96, and Volume 2, Chapter 8, Section 8.9, paragraphs 8.9.76 to 8.9.79*).
- 3.10.57 In addition, Wood Street, Fore Street, Moor Lane and Silk Street are lightly trafficked two-way roads to the north of the A1211 London Wall. A security control point is located at the southern end of Moor Lane close to its junction with Fore Street. A barrier at this point is used to close Moor Lane to through traffic between 2300 hours and 0700 hours Monday to Friday. Silk Street provides the main vehicular access to the Barbican Centre with access to the car parks at its western end before the road turns to the north and becomes White Cross Street.
- 3.10.58 In the section of Moor Lane where the worksite will be located there are four general parking bays, one disabled bay as well as an access to a private car park. The Barbican fire station to the northwest corner of Moor Lane junction with Silk Street, noted in the SES2, no longer operates as a fire station.

Mitigation and Temporary Residual Impacts – Amendments 1 and 2

- 3.10.59 By removing the need for the worksite and the utilities diversions in Aldersgate Street, the revised crossover proposals eliminate the associated significant impacts reported in the main ES and the SES2. The significant impacts reported in the main ES consisted of delays to traffic (including buses) on Aldersgate Street, Long Lane and Beech Street, delays to pedestrians in the same roads and the need to relocate the police security control point in Aldersgate Street. The SES2 reported that the utilities works at the junction of Aldersgate Street, Long Lane and Beech Street would result in a significant adverse impact of particular importance consisting of delay and disruption to traffic, including buses throughout the local road network. Furthermore, in the SES2 it was reported that the combined impacts caused by the utilities works around Farringdon (including Aldersgate Street), Moorgate and Liverpool Street would lead to a significant adverse impact of particular importance with effects felt over a wide area. Without the Aldersgate Street works the combined impacts will no longer be classified as being of particular importance but will remain significant.
- 3.10.60 The revised proposal for the crossover will utilise the Finsbury Circus worksite described in the main ES. A secondary worksite will also be required at Moor Lane, which will occupy approximately half the carriageway (including the footway) on the east side.

- 3.10.61 The likely construction programme will see the crossover works starting one year ahead of the main station works for Liverpool Street station at Finsbury Circus. Two other options have been considered as sensitivity tests. These envisage the construction works starting at the same time as the main construction works or two years before them. In all scenarios the construction period for the crossover will be approximately 3.5 years. The construction programme for the main station works will be as reported in the main ES.

Moor Lane Worksite

- 3.10.62 The Moor Lane worksite will affect two gates which provide access to a private car park. The northern gate will be blocked by the ventilation borehole for some two years. It is expected that provision can be made to allow vehicular access to the car park through the worksite using the remaining gate to the south. This will be discussed with affected owners and occupiers, and it is likely that with this arrangement there would be no significant impact.
- 3.10.63 Four pay-and-display bays and a disabled bay will be temporarily suspended. It is not expected that this will lead to significant impacts as general parking bays in this area are on the whole underutilised. If the City Corporation requires it, the disabled bay can be relocated by replacing a general parking bay in the unaffected section to the north.
- 3.10.64 Through traffic can be maintained past the works with single alternate line working. Temporary signals may not be necessary as traffic volume is low.
- 3.10.65 Initially the vehicles servicing the site will be associated with the construction of the two shafts. After this the vehicles will supply concrete for delivery to the tunnel. The peak volume will consist of some 33 lorry loads per day for approximately 6 weeks. At other times, an average of some 17 lorry loads per day is expected for approximately 22 weeks.
- 3.10.66 Sections of the lorry route used for accessing this worksite are shared with other Liverpool Street worksites. The lorry routes are discussed below.

Finsbury Circus Worksite

- 3.10.67 The changes to the worksite boundary described above in Amendment 2, will have no impacts on traffic and transport.
- 3.10.68 The additional construction activities for the crossover at this worksite will mean that the overall construction period and the number of lorries serving this site at peak times will increase. The peak duration will now last for about 32 weeks, during which some 100 lorries per day will enter the site. The lorry routes associated with this worksite are discussed below.

Compensation Grouting

- 3.10.69 The options to mitigate settlement are described in *Section 3.3*. The preferred option, Option One, with compensation grouting undertaken from the access shafts, would have no significant traffic impacts.

- 3.10.70 Option Two proposes additional sub-surface compensation grout shafts with up to four shafts located in the Barbican's basement car parks. Two shafts could be located in the public car park accessed from Silk Street, a third in the Barbican residential car parking with access from Moor Lane or Fore Street and a fourth in a car park to the west of Andrewes House accessed from Fore Street. It is not known how many of these shafts will be required but it is likely that more than 30 public parking spaces will be lost for the shafts and working areas. This would be a significant impact. The numbers of lorries accessing each shaft worksite will vary with the activity being undertaken. Typical numbers of lorries per day are as follows:
- sinking of the shafts — 6–8 lorries per day;
 - drilling for the grouting tubes — 1–2 lorries per day;
 - grouting — 4–6 lorries per day; and
 - decommissioning/backfilling of the shafts — 10–20 lorries per day.
- 3.10.71 As traffic levels on the access route are light, the lorry movements are not expected to cause a significant traffic impact.

Lorry Routes

- 3.10.72 The first part of the lorry route to the Moor Lane worksite would follow the same access route proposed for the Moorgate, Blomfield Street and Liverpool Street worksites described in the main ES. Lorries would then turn off London Wall at Wood Street and travel to the worksite via Fore Street and Moor Lane. Lorries would leave the site on the north side and turn right into Ropemaker Street, then turn left into Finsbury Pavement to join the same egress route proposed for the Moorgate worksite.
- 3.10.73 Lorries entering and leaving Finsbury Circus for the crossover works will use the routes described in the main ES for the main station works, and the estimated construction traffic flows on these routes have therefore increased.
- 3.10.74 The Moor Lane worksite is expected to generate a peak of some 33 lorry loads per day for approximately 6 weeks, with a lower peak of some 17 lorries per day for approximately 22 weeks. The combined construction works at Finsbury Circus will lead to a peak of around 100 lorries entering the site each day for some 32 weeks.
- 3.10.75 These flows will increase the number of parts of the lorry routes where the assessment criteria will be triggered. The roads affected are London Wall between Blomfield Street and Aldersgate Street and Circus Place between London Wall and Finsbury Circus. The assessment criteria are triggered on these roads because the number of Crossrail lorries during the peak period will exceed 30 per cent of the existing flow of lorries. The highest flows on these roads will be on London Wall between Blomfield Street and Circus Place where it is expected that there will be around an extra 100 lorries per day eastbound and 150 lorries per day westbound, of which around 100 will turn into Circus Place.
- 3.10.76 It may be desirable to provide temporary traffic signals at the London Wall/Circus Place junction to assist the right turn. These signals would be linked with the signals at the London Wall/Moorgate junction. Although the additional lorries will lead to

some additional delay for traffic (including buses) it is expected that, with this mitigating measure, the delays would not be significant as the lorries form a small proportion of the overall traffic volume.

- 3.10.77 The main ES suggested that some drivers may choose to use an informal diversion route for northbound traffic via Wood Street, Moor Lane and Ropemaker Street while the left turn from London Wall to Moorgate (north) is banned during construction works in Moorgate. In view of the proposed works at Moor Lane this alternative route would no longer be attractive and drivers are likely to use the signed diversion route via London Wall, Circus Place and Finsbury Circus. Subject to consultation with the City of London, the banned left turn from London Wall to Wood Street (north) would still be temporarily removed to allow access for construction traffic. This does not alter the significant impacts already reported in the main ES.
- 3.10.78 If the compensation grout shafts are required, construction traffic will use the same lorry route as for the Moor Lane worksite described above with the addition of Silk Street to access the basement car park shafts. Lorry numbers will be low and will not cause a significant impact.

Alternative Start Date Options

- 3.10.79 Although it is expected that the crossover works will start one year in advance of the main station works, the possibilities of them starting either two years before the main works or starting concurrently with the main works have been considered as sensitivity tests.
- 3.10.80 In both instances the impacts and durations of the traffic management measures in Moor Lane would be unchanged as compared with the likely option described above.
- 3.10.81 The peak volume of construction traffic for the crossover works at both worksites is no greater in the sensitivity tests. The cumulative impact with the main works will, however, differ because the period of overlap will change. These are not expected to increase peak lorry generation in comparison with starting the crossover works one year in advance of the main station works.
- 3.10.82 The main traffic risk associated with starting two years before the main works is that of increased and longer conflict with the utilities works during the enabling period. The utilities works are likely to give rise to significant impacts and may require diversions as described in detail in *Chapters 16 to 18* of the SES2. However, the lorries generated by the crossover works would make no significant difference to these impacts as the number of vehicles will be very small compared with the total flow of traffic.
- 3.10.83 The main effect will be that at times lorries serving the Finsbury Circus worksite will not be able to use the proposed lorry route when leaving the site because of one-way working in London Wall, which is necessary to accommodate utilities works in this street. An alternative route is via Finsbury Circus west arm, then Moorgate, South Place, Eldon Street and Blomfield Street. To facilitate the right turn onto Moorgate, the proposal in the main ES to remove the central reserve across the junction with Finsbury Circus would be brought forward.

- 3.10.84 Starting the crossover works at the same time as the main works would ensure that the utilities works had been completed before the start of works but would increase the time during which the crossover works and the main works were active simultaneously. However, whilst the peak period for construction traffic at the main worksite would increase to 49 weeks in this scenario, the actual number of lorries at any one time would not change significantly and no additional impacts are anticipated.

Mitigation and Temporary Residual Impacts – Amendment 3

- 3.10.85 As described above, the revised scheme will divert the sewer through the Moorgate worksite in Moorfields during the main construction programme. However, there will still be works on other utilities in Fore Street and Fore Street Avenue. These impacts were assessed in the SES2. The traffic and transport impacts on those roads as set out in the SES2, which were not significant, will not change. With careful phasing, including diversion of a water utility during stages 6a and 6b of Moorgate utilities diversion, it is not expected that the revised sewer diversion will lead to additional significant impacts on vehicular traffic.
- 3.10.86 It is expected that pedestrian accesses to the Moorgate station entrance at Moorfields and escalators leading up to Moorfields Highwalk will both be maintained during construction, although there will be short-term disruptions to the latter, which will restrict access. Such interference would be, as far as practicable, limited to weekends when pedestrian demand for the Highwalk is less. There is an alternative route to the Highwalk via an access ramp off Fore Street Avenue. No significant impacts are expected.
- 3.10.87 The sewer diversion in Moorfields extends southwards and out of Moorgate worksite. This part of Moorfields is wide, pedestrianised and leads to an open space northwest of the London Wall/Moorgate junction. It is likely that while works are undertaken in this section, pedestrian access, including access to all properties, can be maintained and hence no significant impacts will result.

Mitigation and Permanent Residual Impacts

- 3.10.88 No significant permanent impacts have been identified.

Summary

- 3.10.89 This revised scheme removes the need for the worksite and shaft at Aldersgate Street and, in doing so, removes the significant adverse impacts caused by relevant works reported in the main ES. Similarly, the significant adverse impacts of particular importance resulting from the utilities diversions that would have been necessary in Aldersgate Street and as reported in the SES2 will no longer apply.
- 3.10.90 As a result of the scheme revision there will be additional lorries in the vicinity of the Moor Lane and Finsbury Circus worksites. Some of these will be on roads where capacity has been reduced for the enabling works. Temporary traffic signals will be provided at the junction of London Wall and Circus Place. Although there will be additional delays to traffic (including buses) in the area, it is expected that, with this mitigation measure, these delays will not be significant.

- 3.10.91 It may be necessary to construct and operate compensation grout shafts in the eastern end of the Barbican. If the shafts located in the basement car parks are required the loss of parking spaces would be significant. No other significant impacts to traffic and transport, additional to those already reported with the main ES are predicted.

Impacts on Noise and Vibration

Baseline

- 3.10.92 The revised crossover will be situated close to the Guildhall School of Music, approximately 30 m from the Barbican Hall. There is residential development nearby to the east and south.
- 3.10.93 The full baseline text for noise and vibration for this route window is described within the main ES (*Volume 2, Chapter 8, Section 8.8, paragraphs 8.8.111 to 8.8.119, and Volume 2, Chapter 8, Section 8.9, paragraph 8.9.91*).

Mitigation and Residual Impacts – Amendment 1

Noise and Vibration from Above-ground Construction Activity

- 3.10.94 The proposed amendment does not change the impacts or proposed mitigation relating to noise and vibration from above-ground construction activity as set out in the main ES.

Vibration and Groundborne Noise from Underground Construction Activity

- 3.10.95 Adherence to the measures set out in *Appendix B1* of the main ES will ensure that no significant adverse groundborne noise and vibration impacts will occur due to the movement of equipment in the tunnel using the temporary construction railway. These measures include fastening the rail to sleepers using resilient rail pads, or providing adequate elasticity to the support of the track system between the rail foot and the sleeper or tunnel invert, where reasonably practicable.

Grout Shafts

- 3.10.96 Grout shaft works within the underground car parks will be screened from residential and other noise-sensitive properties by the structure of the car parks. In place of the normal site hoarding, openings in the car parks will be acoustically sealed so as to ensure that significant fugitive noise emissions do not occur, and thereby prevent significant noise impacts to properties above ground. With this screening, neither airborne noise from the shaft construction or the grouting operations will result in a significant noise impact, or require mitigation in the form of noise insulation or temporary rehousing.
- 3.10.97 There is a potential for structure-borne noise to occur in Andrewes House, Willoughby House and Gilbert House during the construction of the grout shafts, particularly during breaking out of the concrete slabs in the car parks prior to shaft sinking. This can be mitigated by using non-percussive methods for removing the slab, such as sawing or diamond drilling. Vibration isolation of grout pumps will mitigate potential structure-borne noise from the operation of this equipment.

Structural strengthening of the LU and Thameslink Railways

- 3.10.98 In order to prevent significant groundborne noise impacts on the residents and users of the Barbican complex from the operation of the Metropolitan, Circle, Hammersmith & City, and Thameslink railways they have been constructed on a floating slab. Provided that the integrity of the floating slab and its bearings is preserved, existing ground-borne noise from trains will not be significantly increased. Activities associated with structural strengthening of the tracks are not anticipated to result in a significant residual noise or vibration impact.

Vibration and Groundborne Noise from Operation

- 3.10.99 The additional groundborne noise caused by trains running through the switches and crossings in the crossover will require additional mitigation in the design of the track form, such as floating slab track, over and above the standard resilient rail support. With this mitigation in place no significant impact is predicted.

- 3.10.100 There will be no significant vibration impact.

Mitigation and Residual Impacts – Amendments 2 and 3

- 3.10.101 The proposed amendments do not change the conclusions set out in the main ES.

3.11 Summary**Additional Significant Impacts**

- 3.11.1 The revised scheme will generate the following significant adverse impacts:
- *Visual Amenity:* The new worksite at Moor Lane will result in significant temporary adverse impacts for pedestrians using Moor Lane, pedestrians using Britannic Highwalk adjacent to and across Moor Lane, and visitors to and workers at the southwestern corner of the City Point complex that faces Moor Lane;
 - *Traffic and Transport:* If compensation grout shafts are required, the loss of parking spaces in the Barbican basement car parks will be a significant impact.

Eliminated Significant Impacts

- 3.11.2 In addition, as a result of the change in the scheme, the following significant adverse impacts will be eliminated:
- *Townscape:* significant temporary adverse impact on the quality and setting of the podium of the Grade II listed Barbican and gardens complex and the area designated as a Grade II* Parks and Gardens of Special Historic Interest by English Heritage.
 - *Visual Amenity:* significant temporary adverse impact on residents, workers and users of properties overlooking the original Farringdon crossover worksite and Aldersgate Street sewer diversion worksite and the pedestrian users of streets with views of these worksites.
 - *Visual Amenity:* impacts on workers at the Telephone Exchange Building, and workers and visitors at 3–6 Fore Street Avenue.

- *Traffic and Transport*: significant temporary adverse impacts resulting from the worksite and shaft at Aldersgate Street.
- *Traffic and Transport*: significant impacts of particular importance resulting from the utilities diversions that would have been necessary in Aldersgate Street both in its own right and in combination with the works at Farringdon, Moorgate and Liverpool Street.