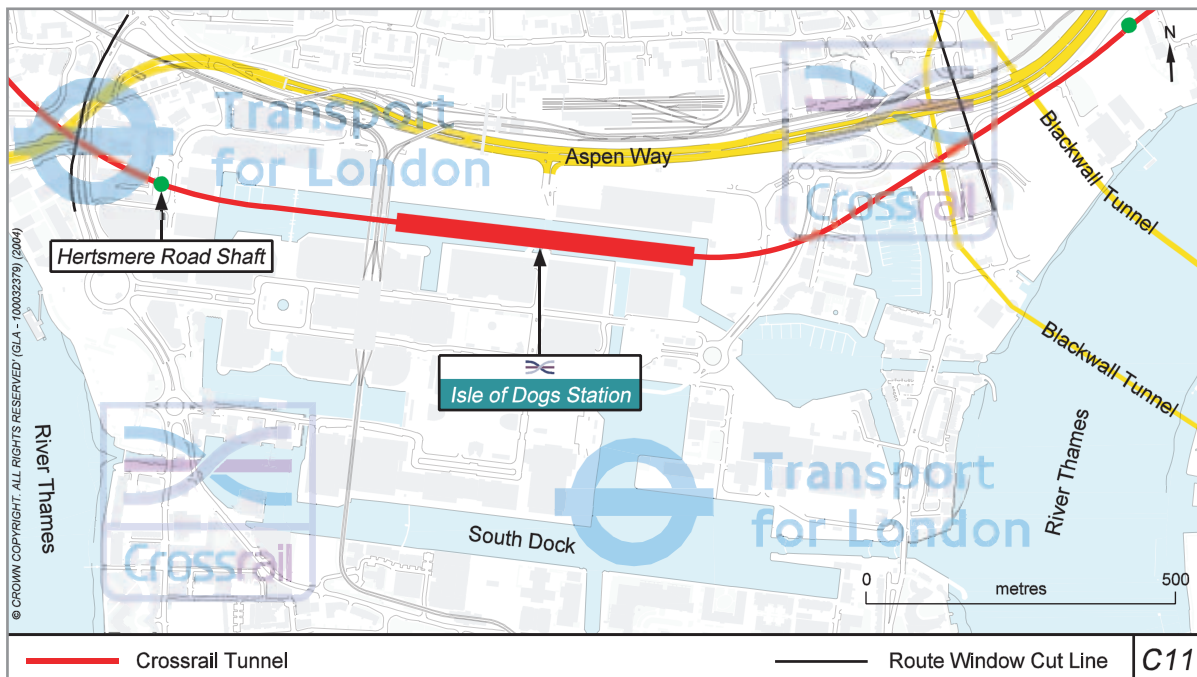


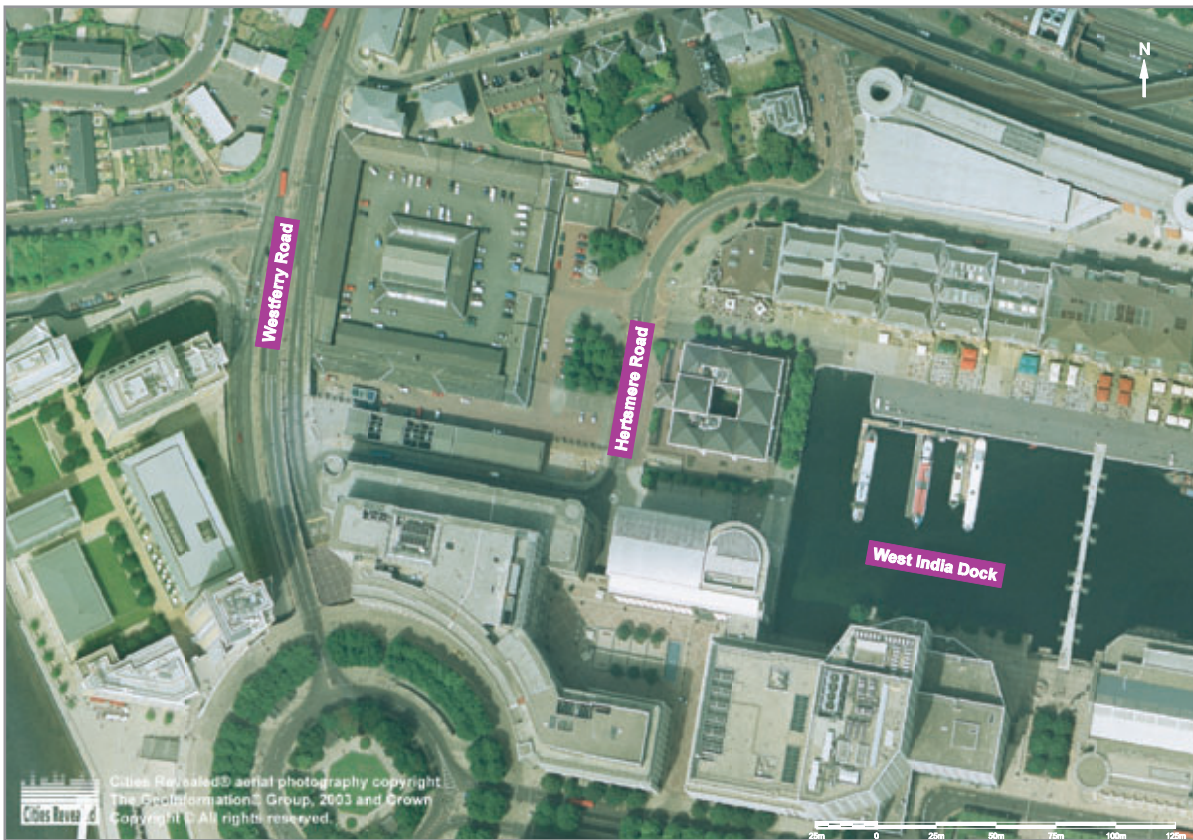
8.14 Route Window C11: Isle of Dogs Station



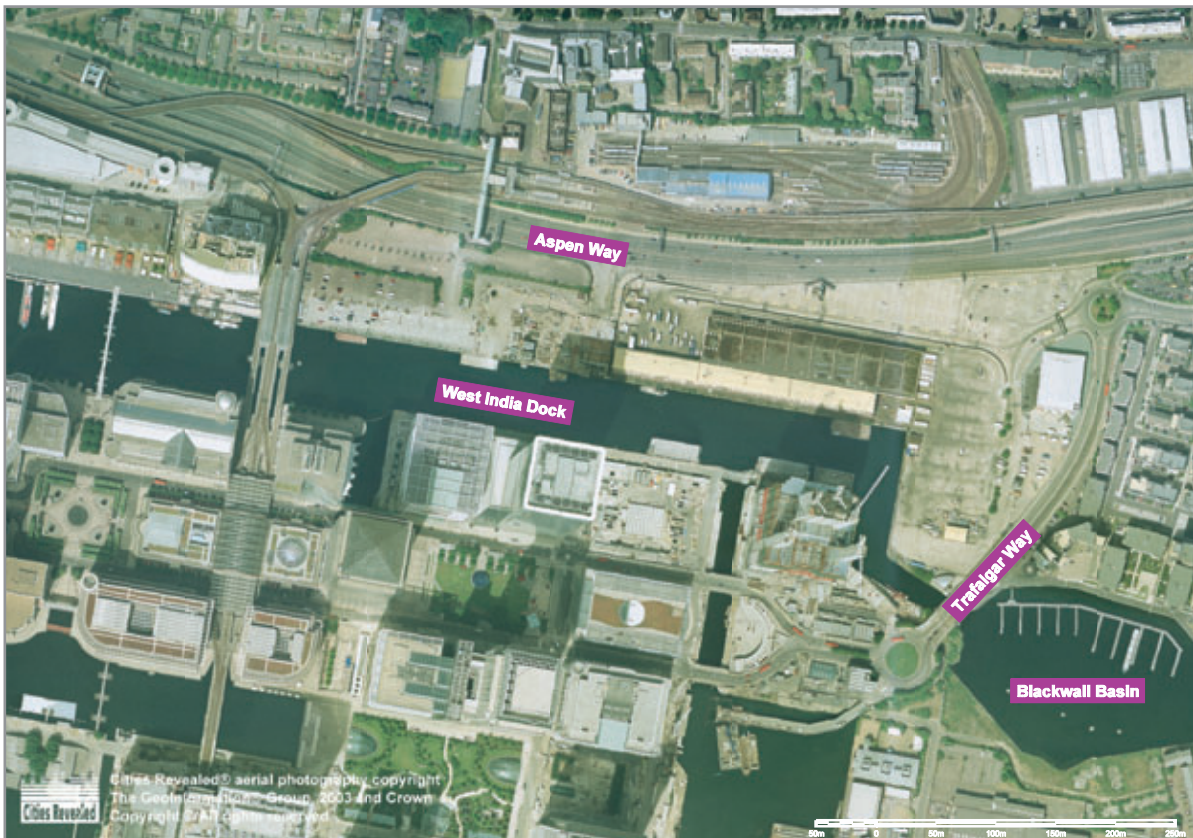
Location plan of Isle of Dogs station

Overview of Route Window C11

- 8.14.1 Crossrail's twin-bore tunnels will pass under the northern part of the Isle of Dogs between Westferry Road in the west and the Blackwall Tunnel in the east with the rails at a depth of about 30 m below street level. East of Westferry Road, the alignment runs under West India Docks, North Dock (roughly parallel with the Docklands Light Railway (DLR)) and Aspen Way. The main permanent features within this route window comprise the Hertsmere Road shaft and the Isle of Dogs station. The main temporary features will be the North Quay and Billingsgate worksites.
- 8.14.2 This route window lies within LB Tower Hamlets and is centred on Canary Wharf, a major commercial and retail development area and part of the Docklands. The predominant land uses are offices and retail, with some outdoor recreation and storage/warehousing, surrounded by, or adjacent to, West India Dock. The River Thames lies to the south of the alignment beyond the docks, with Billingsgate Market being located towards the east end of the North Dock.



Aerial view of Hertsmere Road shaft site



Aerial view of the Isle of Dogs station site

- 8.14.3 The permanent infrastructure will lie in a busy transport corridor comprising the DLR and Aspen Way, which is heavily trafficked. This results in high levels of railway and road traffic noise and poor air quality. The heritage of the western part of the route window is evident in the conservation areas and the listed buildings associated with the Docks. Historic and archaeological remains are likely to survive in the area. Dockland activities associated with the West India Docks are likely to have left a legacy of contamination.

Summary of Residual Impacts

- 8.14.4 The following significant adverse impacts will occur temporarily during construction.
- *Townscape*: Hertsmere Road shaft works giving rise to impacts on the setting of several listed buildings and structures, on townscape character and on the character, appearance and setting of the West India Dock Conservation Area.
 - *Townscape*: Isle of Dogs station and Hertsmere Road shaft works giving rise to impacts of particular importance on the setting of the Grade I listed Warehouse and on the visible section of the West India quay walls.
 - *Townscape*: Isle of Dogs station giving rise to impacts on townscape character and on the setting of the Grade II accumulator tower and the remaining section of the listed quay wall.
 - *Visual Amenity*: visual impacts from works at Hertsmere Road shaft and the lorry holding area on various groups of people.
 - *Visual Amenity*: visual impacts from the construction of the new station and from the conveyor on various groups of people.
 - *Ecology*: impact on fish access to their breeding area, although this can be mitigated.
 - *Traffic and Transport*: loss of private car parking at Cannon Workshops to the shaft worksite.
 - *Traffic and Transport*: diversions for pedestrians and cyclists as a result of the closure of Great Wharf bridge. This is also a significant community impact.
 - *Traffic and Transport*: loss of boat access to Blackwall Basin and Poplar Dock from The Thames and to moorings in the North Dock.
 - *Construction Noise*: construction noise impacts on two residential properties.
 - *Community*: closure of the dock will mean that St Peter's barge and some 110 other vessels in Poplar Basin and Blackwall Basin will no longer be able to moor within the docks. The closure of Great Wharf bridge is also a significant impact.
 - *Community*: closure of Great Wharf bridge.
- 8.14.5 The following permanent impacts will occur:
- *Townscape and Built Heritage*: adverse impact on the setting of the Grade II listed Cannon workshops as a result of the new shaft structure.
 - *Townscape and Built Heritage*: adverse impact of particular importance on the setting of the Grade I listed quay wall, and adverse impacts on local townscape character.
 - *Visual Amenity*: visual impacts for various groups of people around the North Dock.

- Traffic and Transport: benefits from improved journey times and increased accessibility to and from the Isle of Dogs and improved access for mobility impaired passengers.

The Permanent Works

Overview

8.14.6 The permanent works will consist of:

- Hertsmere Road shaft;
- Isle of Dogs station; and
- twin-bore tunnels.

Hertsmere Road Shaft

8.14.7 To comply with safety requirements, Crossrail will construct a shaft in this area. A 9 m diameter shaft will be constructed on a car park between the Cannon Workshops on Cannon Drive and Hertsmere Road. Emergency intervention facilities will be provided. At the surface, a 5 m high building will be constructed with a basement containing plant equipment. An area of hardstanding will also be provided adjacent to the building along with a 27 space car park.



View looking north along Hertsmere Road towards proposed shaft site

Isle of Dogs Station

- 8.14.8 A new station will be constructed beneath and within the West India North Dock. The station will extend from east of the DLR bridge to the east end of the dock. The station will be constructed within a 475 m long concrete box with a 245 m long island platform. This will be fitted out to 210 m with the potential for extension should the need to operate longer trains arise. A 165 m long scissor crossover at the western end of the box will enable trains to terminate at the station and return either to central London or to Abbey Wood.
- 8.14.9 Access to and from the station will be via a re-built Great Wharf bridge. A bank of escalators will be provided from the bridge down to a landing at the same level as the dockside where a further bank will connect with the ticket hall located within the station box beneath the water level. Further escalators will be provided to platform level.
- 8.14.10 Escape and ventilation structures will be constructed at each end of the station box. The station will have one ticket hall, with passive provision for a second.



Photomontage of proposed Isle of Dogs station looking east

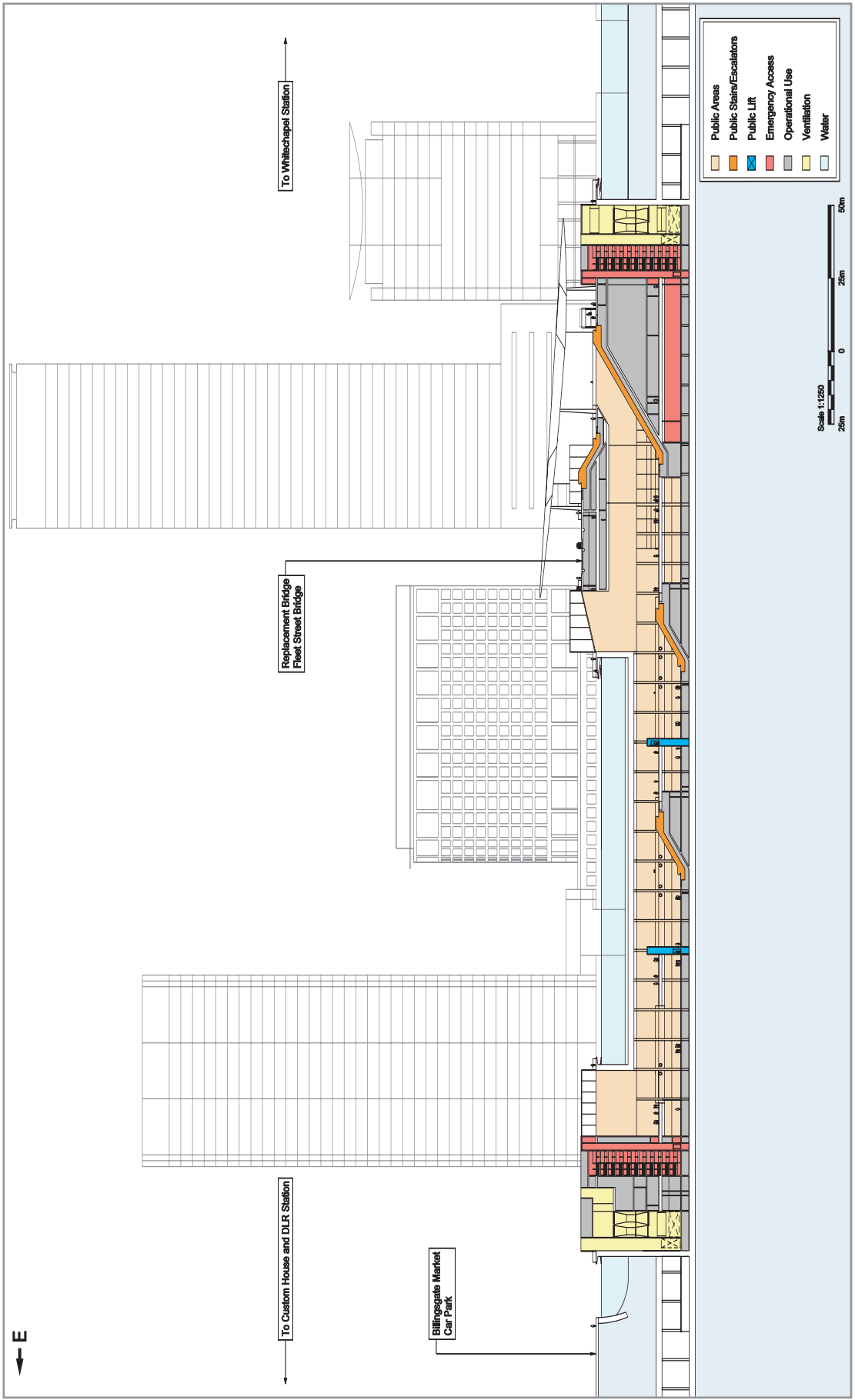


Figure 8.13 Isle of Dogs Crossrail station: long-section

Twin-bore Tunnels

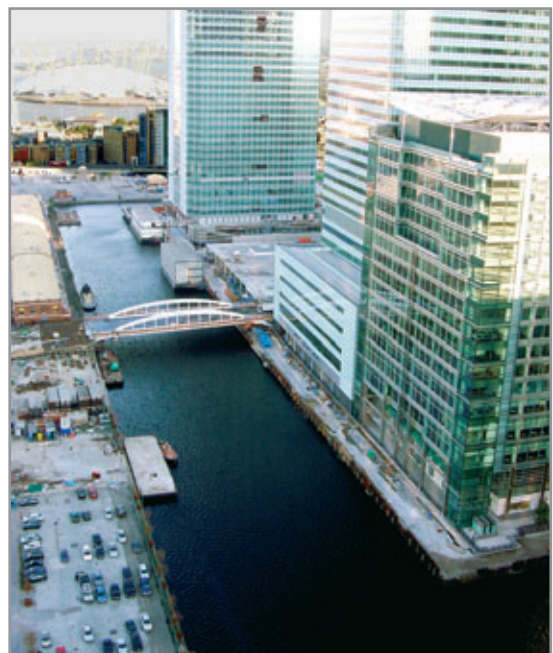
- 8.14.11 Two 6 m diameter tunnels will be constructed such that the rails will climb from a depth of approximately 30 m below street level at Hertsmere Road shaft to a depth of approximately 29 m below street level at the western end of Isle of Dogs station.

Construction*Duration of Works*

- 8.14.12 The construction including fit-out and commissioning of the Hertsmere Road shaft will take approximately four years.
- 8.14.13 The construction including fit-out and commissioning of the Isle of Dogs station will take approximately five years.

Enabling Works

- 8.14.14 Prior to the main construction period, enabling works will comprise general service diversions.
- 8.14.15 The demolition of Hertsmere House at 2 Hertsmere Road may be required as the foundations clash with the tunnel alignment.
- 8.14.16 The Great Wharf Lift bridge will be demolished to accommodate the main works for the construction of the Isle of Dogs station. Additionally, the North Quay car park and an area of parking at Billingsgate Market will be occupied for works during this advance phase.



Bird's-eye View of Great Wharf Lift Bridge and North Dock

Main Works

- 8.14.17 At the Hertsmere Road worksite, the main construction works will proceed as set out below.
- Site set-up will take approximately two months.
 - Dewatering of groundwater prior to excavation is assumed, for assessment purposes, to be necessary.
 - Excavation of a piled, concrete lined basement structure will be followed by construction of the shaft. Construction of the base slab of the basement will include the casting in of the first ring of the shaft. The construction of the shaft will be carried out by excavation and sinking of pre-cast concrete ring segments in phases, which will take place over about 13 months.
 - Excavation of passageways connecting the eastbound and westbound tunnels to the shaft will take place over about four months.

- Internal concrete structures will be fitted to the inside of the shaft, followed by installation of the concrete staircase and emergency services lift over a three month period. The TBMs will pass through the site while these works are being carried out.
- Construction of the above-ground structure will take place over four months, followed by fit-out over a further period of about five months.
- Reinstatement of the ground will take place on completion of these works over a two month period.

8.14.18 The Isle of Dogs station will be constructed in two sections consisting of a single storey crossover box at the western end and a two storey station box at the eastern end. The main construction works will proceed as set out below.

- Site set-up, removal of dock silts over the footprint of the cofferdam and sheet piling to the perimeter of the crossover box. A temporary cross cofferdam near the west end of the construction site will be constructed so that the western section can be pumped out and prepared for works from the dock floor. Further wells to dewater the deep aquifer will be installed. These works will take about one year and one month in total.
- The remainder of the station cofferdam will then be constructed, the enclosed area of dock pumped out and silt removed. The cross cofferdam can then be removed. The station box will be formed within the cofferdam using diaphragm walling. Prior to excavation, plunge columns including tension piles will be bored from the dock bed level. The box will be excavated in stages, constructing intermediate, base and roof slabs as this progresses.
- The tunnel drives westwards to Stepney Green are commenced from the crossover area at the western end of the Isle of Dogs station box. Assembly of the TBM will take three months at this location, with the subsequent drive to Stepney Green taking ten months. Additionally, the Isle of Dogs station box will be broken through at its eastern end by a TBM completing its drive from the east, having been launched from the Limmo Peninsula nine months previously. This TBM would then be disassembled within the Isle of Dogs station box.
- The box will be cleaned out and fitted with platforms and equipment. The ventilation equipment and stairwells will be constructed within the box at each end. Escalators and lifts will be installed. These works will take about one year and nine months to complete.
- The top of the western box will be backfilled to original dock base level. The dock will then be flooded and the cofferdam removed.

Construction Plant

8.14.19 The main construction plant to be used at the Hertsmere Road worksite will include cranes and machinery for piling and excavation. Other equipment will include a compressor, electrical generators and temporary ventilation fans.

8.14.20 The main construction plant to be used at the Isle of Dogs worksite will include cranes, floating piling rigs, diaphragm walling rigs, excavation machinery and grouting plant. Other equipment will include compressors and electrical generators and temporary ventilation fans.

Worksites and Access

- 8.14.21 The works for the Hertsmere Road shaft will occur between the car parking area on Cannon Drive and the adjacent paved hardstanding area. Materials going to and from the site will be transported by road. Lorries will enter the site from Cannon Drive (via Hertsmere Road) and exit onto Hertsmere Road. Generally about three lorries per day will access the Hertsmere Road worksite. Approximately 10 lorries per day will access the worksite during the peak construction period, over about five months.
- 8.14.22 The works for the Isle of Dogs station will occupy the whole of the West India Dock North area between the DLR bridge and the eastern end of the dock. Construction activities will take place from two areas:
- *North Quay worksite*: this will be situated at the west end of the construction area and will be used to construct tunnels, the western end of the station and the crossover; and
 - *Billingsgate worksite*: this will be situated to the east end of the dock and will be used for station construction.
- 8.14.23 Incoming materials will be delivered by road and will enter the site from Aspen Way via Upper Bank Street or Trafalgar Way. After temporary removal of the Great Wharf bridge Road and excavation of the cofferdam, the cofferdam itself will be used as a temporary site access road. Excavated material will be transported from the construction site via a conveyor system along Bellmouth Passage to a barge loading point in the South Dock. Excavated material will be transported away from the construction site along the River Thames by barge.
- 8.14.24 The navigation access point for Blackwall Basin and Poplar Dock through Bellmouth Passage will be closed off by the cofferdam works for the duration of construction.
- 8.14.25 Approximately 28 lorries per day will access the Isle of Dogs North Quay access worksite during the peak construction period, spanning about seven months. At other times, approximately 11 lorries per day will access the worksite during the construction works.
- 8.14.26 On average, approximately six lorries per day will access the Isle of Dogs eastern access worksite. Approximately 10 lorries per day will access the worksite during the peak construction period, spanning about two years and three months.

Impacts on Townscape and Built Heritage

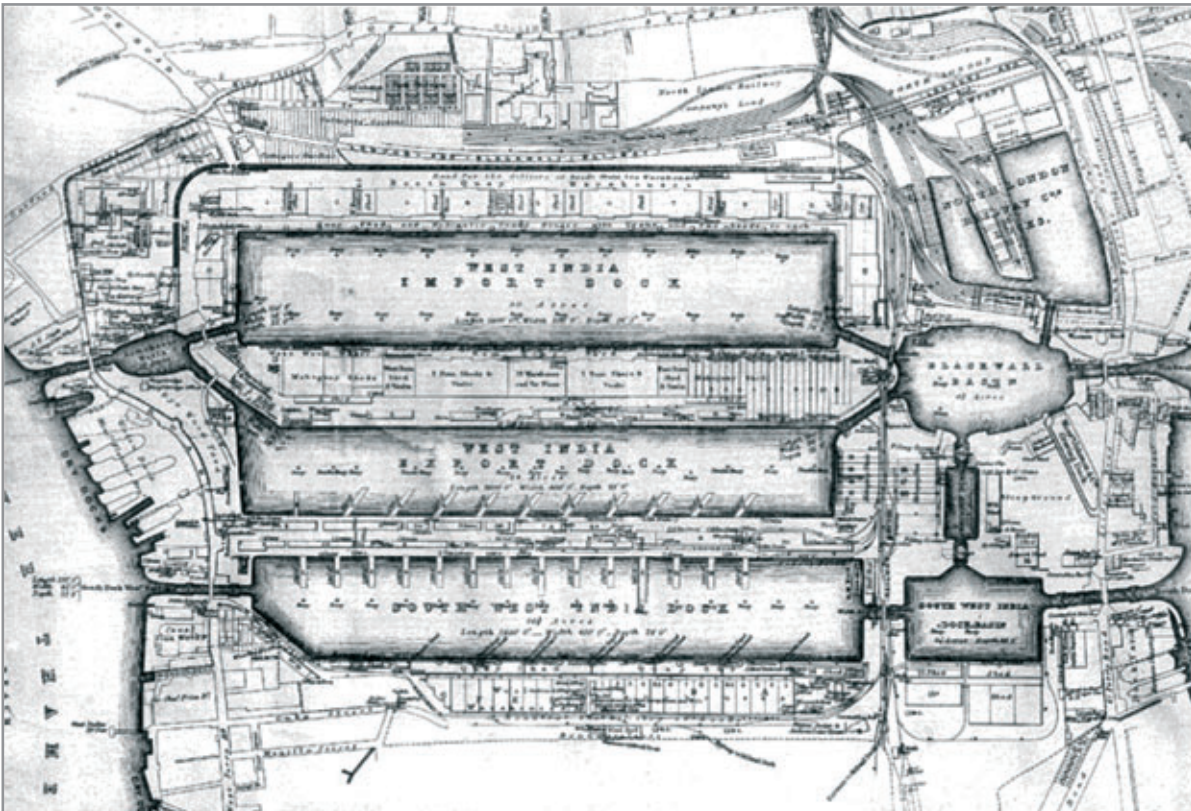
Baseline

- 8.14.27 An historic core of listed buildings is situated around Hertsmere Road and is designated as a conservation area (West India Docks). The construction site for the Hertsmere Road ventilation shaft will encroach slightly into this. Listed structures (all Grade II) include the Cannon Workshop units off the Westferry Road, built in the early 19th Century as a cannon foundry and the Circular Lodge. Overall, this is a high quality townscape of high sensitivity to change.

8.14.28 The townscape at Canary Wharf and on the Isle of Dogs as a whole has been transformed in recent years. Although the historic outline of the Georgian docks partly remains, together with some of the original warehouses and cranes, massive office development has created a wholly new and vast landscape. Residential apartments are becoming more evident in the area together with hotels. Docklands' landscape has become quite distinct, but overall of moderate quality. Its relative immaturity and ongoing development renders its sensitivity to further change quite low. The historic docks themselves remain fundamental to its character, however, and these are more sensitive to change.



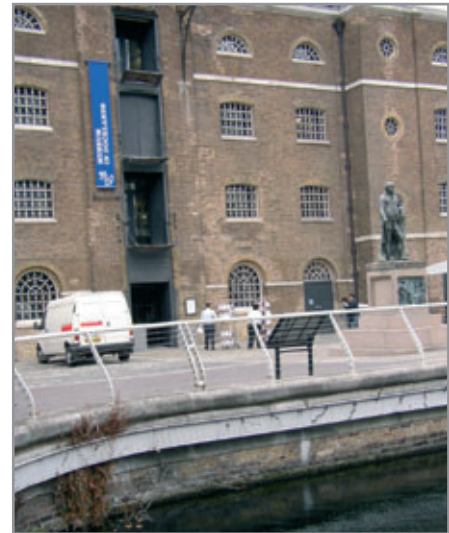
Cannon Workshop Units off Westferry Road



West India Docks circa 1881

8.14.29 Poplar to the north has also been subject to extensive development of residential estates, due in part to World War II bomb damage that devastated this part of London.

8.14.30 The significance of Docklands to the country's industrial history is reflected in the Grade I listing of the North Import Dock (North Dock) wall and the Blackwall Basin wall. The docks and their enclosing walls are amongst the most important dock structures in the country. The Georgian warehouses at West India Quay comprise the Grade I listed Warehouse No 1 (now the Museum in Docklands) and adjoining Warehouse No 2. They were built to house cargo for the newly formed West India Dock Company in 1802-3 and were the very first to be built for this purpose within London's first enclosed trading dock, opened in 1802. The basin of Poplar Dock, and the hydraulic accumulator tower east of the North Dock are also Grade II listed.



Listed Warehouse



Views of West India North Dock

Direct Impacts on Listed Buildings

- 8.14.31 The works in this route window involve no direct physical impacts on listed buildings.
- 8.14.32 There is a risk of settlement impacts at one Grade I listed structure and five Grade II listed buildings, all of which are located within the 10 mm settlement contour; these properties are listed in Appendix B2. Measures to protect the integrity and heritage value of these structures will be implemented as necessary in order to avoid significant adverse impacts; these measures are set out in Appendix B1.

Mitigation and Temporary Residual Townscape Impacts

- 8.14.33 Construction activity at the Hertsmere Road site, the presence of the lorry holding area, the demolition of Hertsmere House and the loss of young trees when considered cumulatively with the construction work for the station (described below) will result in significant adverse impacts on townscape character and on the character, appearance and setting of the West India Docks Conservation Area. There will also be adverse impacts on the setting of the Grade II listed Cannon Workshops, and the Grade II listed Circular Lodge, and adverse impacts of particular importance on the setting of the Grade I listed warehouse.



Listed circular lodge

- 8.14.34 The intensive construction work within the eastern portion of the North Dock for the station construction (which will need to be drained temporarily) will result in adverse impacts on townscape character. There will also be adverse impacts of particular importance on the setting of the Grade I listed Warehouse and the Grade I listed quay wall, parts of which are still visible at the west and east ends of the dock (these impacts are cumulative with works at Hertsmere Road). Construction of the station will give rise to an adverse significant impact on the setting of the Grade II listed accumulator tower that is located east of the dock, within the Billingsgate Market worksite. The excavated material conveyor on Bellmouth Passage will adversely affect the setting of the remaining section of the listed quay wall in this part of the dock.



Listed accumulator tower

Mitigation and Permanent Residual Townscape Impacts

8.14.35 The design of the new shaft structure on Hertsmere Road will accommodate the historic setting of the site, including the scale and materials of the Cannon Workshops.



Photomontage of proposed shaft structure on Hertsmere Road

- 8.14.36 The assessment has assumed that Hertsmere House is demolished for the works. Tunnelling work for Crossrail conflicts with the foundations of Hertsmere House leading to the need to acquire and demolish it. Hertsmere House is a ground plus three storey modern office building. Demolition will open up the townscape at the west end of West India Dock, but this would not result in a significant impact on townscape character. A planning application has been approved to build a new tower on the site, Columbus Tower. The design of the new tower has taken Crossrail tunnelling requirements into account and it is envisaged that the tower will be completed before Crossrail's opening. The impacts associated with the Columbus Tower have not been considered in this assessment.
- 8.14.37 Consequently, there will be no permanent impacts on townscape character or on the character, appearance and setting of West India Docks Conservation Area.
- 8.14.38 The new shaft will be located in an open space, immediately in front of the single storey Grade II listed Cannon Workshops. The current use of the space (a car park), does not enhance the setting of the listed building. However, the introduction of a building into this open space will interrupt some views and as such it will result in a significant adverse impact on this Grade II listed structure.



Photomontage of proposed Isle of Dogs station

8.14.39 The Isle of Dogs station has been designed to minimise its footprint within the dock (and so maximise the area of open water that is retained) while still achieving other design requirements, for example allowing natural light into the sub-surface station. The island within the dock and the roof canopy have been designed as light-weight structures that achieve some transparency when viewed across and along the dock.

8.14.40 The two new island structures will reduce the open water expanse of the dock. This has implications for the historic outline of the dock and undermines the dock's role in defining the characteristic Dockland landscape. The introduction of the station into West India Dock will result in a change to the dock shape. The docks and warehouses at West India Docks historically had a monumental scale and great coherence. The profile of the West India Dock has changed over the years, particularly along its southern edge where development has impinged into the area of the former water-body. However, remnants of dock still provide an essentially linear water-body, thereby providing a reasonably coherent link to its historical uses. The two island structures will intrude into the longitudinal views along the dock and will reduce the scale of the dock and coherence of its profile. Overall, a significantly adverse impact on townscape character will occur. In addition, this will represent an impact of particular importance on the setting of this Grade I listed structure.



The setting of the listed dock wall will be significantly affected

Impacts on Visual Amenity

Baseline

8.14.41 The relative proximity of the towering office blocks of Canary Wharf and development at West India Quay and along the North Colonnade will limit visibility of the station structure and shaft. Close views will be possible, however, for a large number of people, principally residents in Poplar and office workers at Canary Wharf.

Mitigation and Temporary Residual Impacts

8.14.42 Construction activities, including the Hertsmere Road lorry holding area, will give rise to significant impacts on the visual amenity of various groups of people within Docklands. Construction of the shaft at Hertsmere Road will result in temporary impacts on people working in surrounding buildings, including the Cannon Workshops themselves, the Circular Lodge and the two buildings to the immediate north of this structure, the Hertsmere House bank (or its replacement, Columbus Tower), and the lower floors of offices facing the site on Ontario Way. People walking along Hertsmere Road and Cannon Drive will also be significantly affected. Any demolition of Hertsmere House will also contribute to the significant visual impacts on the above receivers and will also result in additional significant impacts on the occupants of 1, West India Quay,

occupants of 1 and 10 Cabot Square, occupants of Eaton House on the western edge of Westferry Road, users of Warehouses 1 and 2, including residents of Port East Apartments.



View looking west along West India North Dock

- 8.14.43 Construction of the Isle of Dogs station, including the associated worksites in and around the North Dock and the temporary removal of water from the dock, will result in adverse impacts on the visual amenity of:
- pedestrians walking around the Dock (eg using Fisherman's Walk footpath);
 - residents of flats east of Trafalgar Way (eg on Boardwalk Place);
 - workers of Billingsgate Fish Market and occupants of the building to the east of the market;
 - passengers using the Docklands Light Railway at West India Quay station; and
 - occupants of offices on the south side of North Dock, directly facing the works (eg 8 Canada Square, 5 Canada Square, the North Colonnade and the South Colonnade) and occupants of offices at 1 West India Quay on the north side of the dock.
- 8.14.44 The presence of the conveyor between the Isle of Dogs worksite and South Dock will give rise to significant adverse impacts on the visual amenity of pedestrians using the footpaths around the South Dock, occupants of buildings at Churchill Place and to the

east and southeast of Bellmouth Passage and of occupants of the lower floors of the proposed office development facing the barge loading point on the northern edge of the South Dock.

Mitigation and Permanent Residual Impacts

- 8.14.45 The loss of open water due to the new island structures will result in significant adverse impacts on the visual amenity of various people around the North Dock. These comprise pedestrians walking around the dock, a small number of residents of flats east of Trafalgar Way, users of Billingsgate Fish Market and passengers using the DLR at West India Quay station.

Impacts on Archaeology

Baseline

- 8.14.46 There is high potential for prehistoric and later palaeo-environmental and topographic evidence to be present at the Hertsmere Road shaft site, including medieval and later land reclamation and water management. There is also high potential for 19th Century industrial archaeology features associated with West India Docks, including remains of a demolished 1803 guard tower. There is moderate potential for prehistoric timber trackways, and a low potential for prehistoric human remains.
- 8.14.47 There are similar expectations of the Isle of Dogs station site with respect to palaeo-environmental and topographic evidence, and 19th Century industrial archaeology associated with the worksite. There is also a moderate potential for prehistoric timber trackways.
- 8.14.48 At both sites, any prehistoric trackways or human remains would be of high importance. All other remains would be of moderate importance.

Mitigation and Residual Impacts

- 8.14.49 The basement around the Hertsmere Road shaft would completely remove potential archaeological deposits to a depth of about 6.5 m below ground level. The shaft would remove any remaining archaeological deposits below this. Works and structures within the construction compound, possible ground remediation, service diversions, and subsequent hard landscaping of the car park may damage remains of the demolished 1803 guardhouse and later industrial buildings. If this is the case and the remains are found to survive in good condition, protective measures would be implemented to achieve preservation in situ, either by reburial or by permanent display within the landscaped area.
- 8.14.50 The main construction works for the below ground station at the Isle of Dogs will have no impact on below-ground remains since these works will affect an area from which earlier archaeological deposits will have been removed by development of the North Dock. Some associated activities would, however, have an impact. Individual temporary structures and plant in the Billingsgate and North Quay construction compounds have the potential to partially remove or disturb remains of the 19th and early 20th Century industrial archaeology associated with the West India Docks, depending on the depth at which these survive. The excavated material conveyor is unlikely to affect below-ground archaeological remains. However, the route of the conveyor should be placed to avoid any dock infrastructure surviving above ground level.

- 8.14.51 Remains of the guardhouse, if well preserved, will be preserved in situ in order to mitigate a potentially significant impact. The preservation by record of other resources and, if found to be in poor condition, the guardhouse would be the most appropriate course of action. Metal detecting and other examination of silt removed by suction dredging for 19th and early 20th century artefacts relating to the history of the docks would form site-specific mitigation. With this mitigation, no significant impacts will occur.

Impacts on Ecology

Baseline

- 8.14.52 There is very little semi-natural vegetation on sites affected by Crossrail works. Hertsmere Road shaft is a car park and an area of cobble paving with young ornamental alder trees. The vegetation recorded in or near the work areas at North Quay worksite, Isle of Dogs station and Billingsgate worksite include scrub, grassland with wasteland plants, and ornamental trees and shrubberies.
- 8.14.53 The West India Docks were found to be eutrophic (nutrient rich) with nitrate and phosphate concentrations markedly uniform throughout the system. Nutrients do not limit the growth of algae, and blooms have been recorded in previous years. The benthic invertebrate community is poor.
- 8.14.54 Most of the fish populations in the West India Docks are present within the South Dock. However, it appears likely that the Poplar Dock is used by fish for breeding, since it contains the only areas of shallow water in the West India Dock system. There are migratory fish present within the dock system, although these are believed to be restricted to the South Dock.
- 8.14.55 The open water of the docks and basins, together with some of their surrounding land, fall within sites of borough importance. The Millwall and West India Docks SBI (Grade I) includes both the North Dock (adjacent to the North Quay worksite) and the South Dock. The Poplar Dock and Blackwall Basin SBI (Grade I) is located east of the Billingsgate worksite; this site has recently been largely cleared of vegetation. The docks are in part designated for their use by wintering birds.
- 8.14.56 Wintering and breeding bird surveys undertaken for CLRLL identified populations of local importance only. However two species, lesser black-backed gull and herring gull, probably have breeding populations of county significance. Surveys for Crossrail also record black redstart holding territory close to a work area but not actually in it.

Mitigation and Residual Impacts

- 8.14.57 Crossrail's permanent and temporary structures in North Dock will reduce wind-driven turbulent mixing of the water and reduce the likelihood of algae blooms. The isolation of Blackwall Basin and Poplar Dock will result in the disruption of fish access to Poplar Dock for breeding, an impact that would be significant if unmitigated. A water quality and aquatic ecology management plan will be developed in consultation with the Environment Agency and British Waterways. Measures proposed within the plan will include the provision of artificial reefs that will provide alternative fish breeding habitat. If implemented this will mitigate the significant impact on the fish populations.

- 8.14.58 Ecological impacts of low magnitude are anticipated with respect to wintering and breeding birds in the docks. With the implementation of this and other good site practice, as set out in Appendix B1, no other significant impacts on ecology will occur in this route window.

Impacts on Water Resources

Baseline

- 8.14.59 The geology in the route window is complex. The Hertsmere Road shaft will be constructed in Alluvium and Floodplain Gravel, which form the shallow aquifer, and the underlying upper Lambeth Group. The Lambeth Group, Thanet Sands and Chalk, which form the major deep aquifer, lie under these formations across the whole area. The Isle of Dogs station will be founded in Thanet Sands, which are generally overlain in succession by the Lambeth Group, London Clay, Floodplain Gravels, Alluvium and Made Ground. In some areas, the London Clay is absent, especially to the south where erosion by the River Thames has occurred. The Crossrail tunnels will be bored through the Thanet Sands but because of the dipping strata, will pass into the overlying Lambeth Group in the east.
- 8.14.60 The groundwater in the upper part of the Chalk aquifer is in hydraulic continuity with the lower parts of the Lambeth Group and Thanet Sands. The groundwater quality in both the shallow and deep aquifers has been influenced by saline intrusion from the River Thames.
- 8.14.61 Water levels within the deep aquifer have been affected by recent dewatering activities for construction in the Thanet Sands at Canary Wharf from 1999 to 2003. Data has shown that groundwater levels in the Chalk and Thanet Sands have been rising since the termination of the dewatering operations. To the north there has been a significant reduction in water levels in the Stratford area, due to the commencement of the dewatering for the development of the Channel Tunnel Rail Link (CTRL) and the Stratford Box station. These activities are likely to influence the groundwater level in this route window.
- 8.14.62 One groundwater abstraction is located within the route window, licensed to Britannia International Hotels Ltd (ID Number 86) for commercial/industrial use. However, the boundary of the 400 day TTZ is approximately 300 m from the route alignment.
- 8.14.63 The River Thames flows around the Isle of Dogs peninsula, and the entire area covered by the route window is within the River Thames tidal floodplain. Water quality in the River Thames has improved in recent years but contains high concentrations of suspended solids and nutrients, and is prone to algae growth. In terms of microbiological parameters the water in the Blackwall Basin and Poplar Dock is of a higher quality than water in both the Thames and in the West India Dock, which is closer to the inlet from the river.

Mitigation and Temporary Residual Impacts

- 8.14.64 Dewatering of the Chalk aquifer will be required for an estimated three years during the construction of the Isle of Dogs station and Hertsmere Road shaft. The dewatering of these two sites will be carried out simultaneously with that for the works set out in other nearby route windows. This will create an extensive cone of depression in the

water table, which will affect the water levels at 25 licensed abstractions across an area that extends outside both route windows. However, the application of the abstraction wells mitigation measures, set out in Appendix B1, will ensure that no significant residual impacts occur.

- 8.14.65 Impacts on groundwater quality may result from the use of grouting materials and soluble contaminants during construction that could migrate into the Chalk aquifer. Construction methods would prevent significant vertical flows passing from the shallow to the deep aquifer along the outside of the structures. Natural attenuation and dilution in the aquifer and abstractions from dewatering will significantly reduce any potential impact. A further impact of dewatering would be to increase the rate of infiltration from the Thames. However, the water quality impact is considered insignificant since this is an area where infiltration from the Thames has been occurring for a century or more and the aquifer has non-potable water quality as a result. The abstraction at Britannia Hotel is treated by reverse osmosis and is therefore only sensitive to large changes in groundwater salinity. This abstraction will therefore be included in the monitoring as set out in Appendix B1 to ensure that no significant residual impacts occur.
- 8.14.66 Partial closure of the West India North Dock will be required during construction of the Isle of Dogs station, which will reduce some of the flood storage available in this area while the Thames Barrier is left open. This impact, although not significant, can be avoided by a reduction of approximately 5 cm in the maintained water levels within the Dock system or a 0.5 cm reduction in trigger level at the barrier during the temporary period.
- 8.14.67 Part of the West India North Dock will need to be pumped out to enable construction of the Isle of Dogs station. This activity will need to be carefully managed because the bottom sediments in the dock will be highly contaminated. This will require some dredging and will result in a temporary deterioration in water quality. However, the application of mitigation measures set out in Appendix B1 will ensure that no significant adverse impacts occur from these activities.
- 8.14.68 The presence of the cofferdam to enable construction of the Isle of Dogs station will restrict the flow of water throughout the North Dock, Blackwall Basin and Poplar Dock. This will cause a reduction in water quality and flow through part of the dock system and will require mitigation measures to ensure that flows and aeration of the water in the docks are maintained. These mitigation measures will be set out in a Water Quality and Aquatic Ecology Management Plan that will be prepared in accordance with the measures set out in Appendix B1. The application of these mitigation measures will ensure that no significant adverse impacts occur.
- 8.14.69 The water from the deep groundwater dewatering will be discharged to the River Thames or the docks and described in the Water Quality and Aquatic Ecology Management Plan. Application of mitigation measures set out in Appendix B1 will ensure that no significant adverse impacts occur.

Mitigation and Permanent Residual Impacts

- 8.14.70 The station box will obstruct groundwater flows through sand channels in and above the Lambeth Clays, as well as partially blocking flow in the Upnor Formation and upper layer of Thanet Sands. These impacts are not considered to be significant as flows will redistribute elsewhere.
- 8.14.71 The contamination contained within the bottom sediments found in West India North Dock, will be removed during dredging. This will lead to an overall improvement in the water quality within this dock. No significant adverse impacts will occur.
- 8.14.72 The permanent works within West India North Dock would lead to approximately 0.05 cm higher water levels in the Thames than presently exist during those floods for which the Thames Barrier is left open. This will not generate a significant impact on water levels or barrier operation.
- 8.14.73 The Hertsmere Road shaft and Isle of Dogs Station are sited on the defended floodplain but could become partially inundated under some flood defence breach or Thames Barrier failure scenarios. This will be mitigated by suitable design of the potential water entry points.

Traffic and Transport Impacts*Baseline*

- 8.14.74 Worksites are located to the south of the A1203 Limehouse Link and the A1261 Aspen Way, which are part of the TfL Road Network.
- 8.14.75 The proposed station will be located immediately north of Canary Wharf, which is well served by public transport with Docklands Light Railway, Jubilee line and local bus services. There are existing bus stops and taxi facilities in North Colonnade.

Mitigation and Temporary Residual Impacts

- 8.14.76 The Hertsmere Road shaft worksite will be located in an area of a private car park at the junction of Hertsmere Road and Cannon Drive, immediately to the north of Westferry Circus; there will be a loss of some 27 car parking spaces. The loss of private car parking will be a significant temporary impact. Access will be from the A1261 Aspen Way via Westferry Road and Westferry Circus (lower), Hertsmere Road and Cannon Drive. A lorry holding area for the worksite will be located on Cannon Drive immediately adjacent to the worksite.
- 8.14.77 For the construction of the Isle of Dogs station, worksites will be established at North Quay and at Billingsgate Market. The North Quay worksite will occupy a vacant site currently used for car parking. It will be accessed from the A1261 Aspen Way via Upper Bank Street. The Billingsgate worksite will occupy part of the fish market's lorry park and will be accessed from the A1261 Aspen Way via Prestons Road roundabout and Trafalgar Way. Excavated material will be transferred from the site via a conveyor along Bellmouth Passage to South Dock and onward by barge.

- 8.14.78 The works will require the closure and temporary removal of the Great Wharf bridge across the West India North Dock. This closure will result in diversions for pedestrians and cyclists, which will cause a significant temporary impact.
- 8.14.79 Following discussions with the market authorities at Billingsgate, changes have been made to the worksite area so that the impact on market lorry parking can be minimised. No significant temporary impact is anticipated.



Proposed Billingsgate Market worksite

- 8.14.80 The construction of a cofferdam in North Dock will prevent access by boat to Blackwall Basin, Poplar Dock and moorings at the western end of North Dock. This will be a significant temporary impact.

Mitigation and Permanent Residual Impacts

- 8.14.81 Passengers from around the area of the Isle of Dogs station are forecast to experience significant journey time savings to the West End and the City. It is estimated that an additional 600,000 people will be within a 60 minute catchment. The provision of lift access to platforms will be a significant benefit for mobility impaired passengers.
- 8.14.82 With the continuing development expected at Canary Wharf, passenger numbers at the Isle of Dogs Crossrail station are forecast to increase rapidly. Forecasts indicate that there will be a substantial number of passengers using the new station. The forecast passenger numbers will be accommodated by the design of the new station and additional measures proposed for passenger dispersal and interchange. Station capacity modelling (PEDROUTE) demonstrates that the new station will accommodate

the predicted passenger demand. Following completion of the station works, boat access will be regained at the North Dock. No significant adverse residual traffic and transport impacts are expected.

Noise and Vibration Impacts

Baseline

- 8.14.83 Baseline noise levels are relatively high, and are dominated by road traffic. Table 8.38 shows the baseline noise levels that have been recorded at representative noise-sensitive receptors within this route window.

Table 8.38 Baseline Noise Measurements at Representative Noise-sensitive Receptors

Reference	Receptor	Baseline Noise Level	
		Daytime ($L_{Aeq, 12 \text{ hour}}$)	Night-time ($L_{Aeq, 8 \text{ hour}}$)
TH26	Barclays Bank, Hertsmere House	63	57
TH26	331 Boardwalk Place, off Trafalgar Way	74	70

Mitigation and Temporary Residual Impacts

- 8.14.84 *Noise from Above-ground Construction Activity:* The relevant mitigation measures set out in Appendix B1 will be employed to reduce construction noise impacts, including the provision of a 2.4 m high hoarding around the worksites. In addition, concrete pumps, concrete lorries and compressors will be housed in enclosures when in operation.
- 8.14.85 Despite these measures, two residential properties in the Port East Apartments will be affected by significant construction noise impacts during the day over an aggregated period of four months. Neither of these properties will be likely to qualify for noise insulation or temporary rehousing.
- 8.14.86 Planning permission has been granted for 40 'direct access' bedroom units and 20 one bedroom 'resettlement' hostel flats at Riverside House, off Garford Street. Crossrail construction works associated with the Hertsmere Road worksite have the potential to result in significant impacts to this development. At present, due to uncertainties about the detailed layout of this development, it is not practicable to quantify the magnitude or duration of any impact that might arise should this development come forward.
- 8.14.87 *Vibration from Above-ground Construction Activity:* The application of mitigation measures set out in Appendix B1 will ensure that potential impacts from vibration during construction associated with both the Hertsmere Road shaft and the Isle of Dogs station are not significant. There will be no vibration impacts on other receptors in this route window from above-ground construction activity.
- 8.14.88 *Vibration and Groundborne Noise from Underground Construction Activity:* Adherence to the measures set out in Appendix B1 will ensure that no significant adverse impacts will occur due to the movement of equipment and excavated material trains in the

tunnel. These measures include fastening the rail to sleepers using resilient rail pads, or adequate elasticity to the support of the track system between the rail foot and the sleeper, or tunnel invert where reasonably practicable.

8.14.89 Groundborne noise and vibration from the passage of the tunnel boring machines may be perceptible. However, this will be a transient effect lasting only a few days and will not be significant.

8.14.90 *Noise from Construction Road Traffic:* Changes in roadside noise levels resulting from Crossrail construction traffic, at less than 1 dB(A), will not be sufficient to give rise to a significant impact.

Mitigation and Permanent Residual Impacts

8.14.91 *Noise from Ventilation Shafts:* Silencers and other mitigation measures will be incorporated into the design of the ventilation shafts. This will ensure that noise levels generated by the operation of the ventilation shafts will be below the level at which an impact is deemed to occur. No significant residual noise impacts will, therefore, occur.

8.14.92 *Groundborne Noise and Vibration from the Operational Railway:* The mitigation measures that have been incorporated into the design will ensure that there are no significant residual impacts from operational vibration or groundborne noise.

8.14.93 *Noise from Operational Road Traffic:* Changes in roadside noise levels arising from traffic flows once Crossrail is operational will be less than 1 dB(A). This will not be sufficient to give rise to a significant impact.

Impacts on Air Quality

Baseline

8.14.94 This route window is within an AQMA that extends across the whole borough. The AQMA has been designated because the Air Quality Objectives for NO₂ and PM₁₀ are not likely to be achieved. Although the AQMA extends across the whole route window, the principal source of these two pollutants is road traffic, with maximum concentrations occurring near to busy roads.

Mitigation and Temporary Residual Impacts

8.14.95 Dust will be generated by construction activity, including the movement of materials. At North Quay and Billingsgate worksites, there is a high potential for dust nuisance, whereas at Hertsmere Road worksite there is a medium potential for dust nuisance. With the application of measures set out in Appendix B1, no significant impacts due to dust will occur.

8.14.96 The construction traffic generated by Crossrail will not be sufficient to cause significant impacts from air pollution for a number of reasons, as summarised below.

8.14.97 In 2007, when construction is due to start, the ambient background NO₂ concentration in the route window will breach the National Air Quality Objective of 40 µg/m³ on half of the roads. Increases in NO₂ roadside concentrations from Crossrail's construction traffic are forecast to be less than 1 µg/m³. This increase also only arises during the

construction period and is not permanent. As a result the construction of Crossrail is not likely to prejudice the strategy adopted by the local authority to meet the National Air Quality Objective in its Local Air Quality Action Plan.

- 8.14.98 In 2007, ambient background PM₁₀ concentrations within the route window will be less than 70% of the Air Quality Objective Value of 40 µg/m³ in 2007. A provisional Air Quality Objective Value of 23 µg/m³ is proposed for 2010. The ambient background concentration for PM₁₀ within the route window is forecast to be 21 µg/m³ in 2010. Increases in PM₁₀ roadside concentrations from Crossrail's construction traffic is forecast to be less than 1 µg/m³. This increase also only arises during the construction period and is not permanent. As a result the construction of Crossrail is not likely to result in a breach of either the 2007 objective or the provisional 2010 objective.

Mitigation and Permanent Residual Impacts

- 8.14.99 In 2016, ambient background NO₂ concentrations in this route window are expected to exceed the National Air Quality Objective Value of 40 µg/m³ on one of the roads. Increases in NO₂ roadside concentrations as a result of changes in operational traffic brought about by Crossrail will be less than 2 µg/m³. This increase is not likely to prejudice the strategy adopted by the local authority to meet the National Air Quality Objective in its Local Air Quality Action Plan.
- 8.14.100 In 2016, ambient background PM₁₀ concentrations within the route window are expected to be less than 70% of the National Air Quality Objective Value of 40 µg/m³. The forecast ambient PM₁₀ background concentration, at 20 µg/m³, will be less than the 2010 provisional Air Quality Objective Value of 23 µg/m³ within this route window. Increase in PM₁₀ roadside concentrations as a result of changes in operational traffic brought about by Crossrail will be less than 0.5 µg/m³. As a result, no significant impacts will occur.
- 8.14.101 The only permanent source of air pollution directly from Crossrail is the ventilation shaft and the potential for PM₁₀ arising from train operations and passenger movements being emitted at this point. Monitoring at a ventilation shaft on the Jubilee line recorded no significant emissions of PM₁₀. Crossrail tunnels will be cleaned on a regular basis, Crossrail trains will use regenerative braking reducing the potential for generation of particulates, and station platforms will be partitioned from the main tunnels. On this basis, it is considered that no significant impacts from emissions of PM₁₀ through Crossrail ventilation shafts will occur.

Impacts from Contaminated Land

Baseline

- 8.14.102 There will be significant ground-breaking required for the construction of Isle of Dogs station; the area around West India Dock North that will be affected by this work has been identified as having a potential risk of being significantly contaminated owing to its industrial use for about 150 years. The relevant sites are described in Table 8.39.

Table 8.39 Sites Identified as Having a Significant Contamination Potential

Site Name	Past and Current Uses	Potential Contaminants	Potential Receptors
West India Dock North – high risk	Dockland activities including ship maintenance until c.1980	Inorganic substances Organic substances Contaminated groundwater	Construction workers and site visitors Confined Chalk aquifer Dock waters
4 warehouses surrounding West India Dock North – medium risk	Warehouse activities until c.1980	Organic substances Inorganic substances Contaminated groundwater	Construction workers and site visitors Confined Chalk aquifer Dock waters
General docklands area – medium risk	WWII bomb damage	Unexploded ordnance Incendiary devices	Construction workers and site visitors

Mitigation and Residual Impacts

- 8.14.103 With the application of measures set out in Appendix B1 relating to the assessment, handling, treatment and ongoing management of contaminated soil and groundwater, no significant impacts will occur during the construction phase or in the long term.
- 8.14.104 Where a potential for unexploded ordnance has been identified, measures to deal with this are described in the health and safety section of Appendix B1.

Community Impacts

Baseline

- 8.14.105 The northern area of the Isle of Dogs comprises the North Dock surrounded by the high-rise Canary Wharf offices and retail complex and Billingsgate Market. Given the strong commercial nature of the area, there are limited community resources. These include sheltered accommodation, a church and a community centre. Blackwall Basin and Poplar Basin lie to the east of the North Dock. They provide moorings for both residential and leisure boats.

Mitigation and Temporary Residual Impacts

- 8.14.106 The closure of the West India North Dock, will block access to the Blackwall Basin and Poplar Dock. It is likely that, with no other means of access, 20 vessels moored in Blackwall Basin and 90 vessels moored in Poplar Dock may have to find alternative moorings. Given the shortage of alternative moorings in Central London this will result in a significant temporary impact.

8.14.107 The closure of West India North Dock will also effectively 'lock in' St Peter's barge, which accommodates St Helen's Church. It is likely that this barge will have to find an alternative mooring during the construction works. The potential temporary loss of the use of the barge by the church would be a significant impact.

8.14.108 The construction works will also require the closure of Great Wharf bridge resulting in a considerable diversion for pedestrians. A significant adverse impact will therefore occur.

Socio-Economic Impacts

Baseline

8.14.109 The route window includes Canary Wharf, a high density development of office and retail. In a one-kilometre radius of the station, there are 24,000 jobs and 1.6 million m² of commercial floorspace with the potential for similar sized future developments.



Canary Wharf developments

8.14.110 Billingsgate Market also lies within the route window. This is the largest inland fish market in the UK. The market has 54 tenants and an average of 25,000 tonnes of fish is sold through it each year for a turnover in the region of £200 million.

Mitigation and Residual Impacts

8.14.111 The temporary loss of 27 parking spaces from the Cannon Workshops car park, although disruptive, will not have a significant impact on the business.

- 8.14.112 Tunnelling work for Crossrail conflicts with the foundations of Hertsmere House leading to the need to acquire and demolish it. This building, with office space of 6,913 m², has the capacity to accommodate 350 to 450 jobs. However, a planning application has been approved to build Columbus Tower. This will provide 93,423 m² of space for hotel, office, retail, leisure and catering use. It is envisaged that the tower will be completed before Crossrail's opening and will more than offset the employment impacts associated with the demolition of Hertsmere House.
- 8.14.113 The cofferdam along the North Dock's southern side means that barges on West India Quay may have to move before the dock is closed for the construction phase. Barges that remain will need to use the residual area of the dock and will not be able to leave the dock for overhaul and maintenance. There are eight boats on West India North Dock, the uses of which include an architects studio, an art gallery, a photo gallery, a private venue and bar. It is likely that all of these boats will have to find alternative moorings. However, this will not be a significant socio-economic impact.
- 8.14.114 Billingsgate Market will be impacted upon insofar as part of its car park will be needed as a worksite. This will lead to the displacement of a fish processing unit but it is anticipated that this can be rehoused within the main building on the site. Consultation with the market confirms that the overall viability of the market will not be affected and therefore there is no significant temporary impact.

Design Options

Hertsmere Road Shaft

- 8.14.115 A number of options were considered for the location of the shaft. The options considered were:
- Option 1 – shaft located within the Hertsmere House Bank building;
 - Option 2 – shaft located between Quayside and West India Dock North (adjacent to the Hertsmere House Bank building); and
 - Option 3 – shaft located within the Cannon Workshop car park.
- 8.14.116 Option 1 was rejected because it is dependent upon the proposed Columbus Tower development. The shaft would have been integrated within Columbus Tower and access would have been dependent upon agreement with the developers. The option also meant that the shaft and associated plant rooms would have been coupled within the proposed development, resulting in additional costs associated with integrating the structures.
- 8.14.117 Option 2 was rejected because it would have been located at the quayside, to the western end of West India Dock North. The dock wall is Grade I listed. Locating the shaft at this site would require works at both ends of the listed structure. The works would have had an adverse impact on the amenity of the quay (with local bars and restaurants). The works would also have been technically complex, requiring the construction of a cofferdam within the dock, making this the most expensive of the three options.

8.14.118 Option 3 was selected for the following reasons:

- the shaft will be located at a suitable site, which is within a car park;
- there is no reliance on third party development at this site;
- the site provides a workable site area with good access and does not require construction of lengthy adits; and
- it is the least costly of the options.

Isle of Dogs Station

8.14.119 Options were considered for the design of the station, the main ones relate to the location and configuration of the station box and the entrances to the station.

8.14.120 The following options were considered for the location and configuration of the station box:

- Option 1 – a combined station and crossover box to the east of the DLR; and
- Option 2 - a station box in North Dock to the east of the DLR and a separate crossover box to the west of the DLR.

8.14.121 The separate crossover box for Option 2 was required initially to meet an earlier project requirement for 285 m long platforms, which meant that the crossover could not be accommodated within a cofferdam to the east of the DLR. However, following a revised project requirement for 210 m long platforms (with the potential to extend to 245 m in the future), Option 1 was selected. Option 1 will result in less disruption, simpler construction methods and lower costs than Option 2.

8.14.122 The following options were considered for station entrances:

- Option 1 – separate station entrance buildings with surface link bridges;
- Option 2 – entrances integrated within adjacent buildings and shopping arcades; and
- Option 3 – stand alone entrances on North Quay.

8.14.123 Option 2 was proposed by the Canary Wharf Group. This option was not pursued due to the complexity of constructing the links through the cofferdam and into adjacent buildings. The dependence upon exits to private buildings would also have presented a safety risk for the emergency evacuation of the station. Additional exits would have been required direct to the surface to address this risk. The costs of this option were judged to be prohibitive. Ventilation structures and routes were not adequately addressed within this option. Option 1 was selected on this basis.

8.14.124 Option 3 was considered early on in the project development process. To the east of the Canary Wharf North Quay development (as in option 2 above), the North Quay is occupied by Billingsgate Market. Any access to the station from this site would, therefore, require alteration and some demolition of either the listed or current market buildings with impacts on the business. From a construction perspective, the difficulties in constructing access structures from the main box under the dock and through the

dock wall to North Quay would be extensive. A similar form of structure would be required at each end of the station as both ventilation and access for emergency services is provided at both ends of the station.

8.14.125 The operation of the station would also be inferior as the route for passengers to access the station would be indirect. Access for emergency services would be similarly compromised at both ends of the station. Option 1 was selected on this basis.