06
Portal & Building Design

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This chapter considers the permanent structures associated with the Silvertown Tunnel.

6.1 Scheme Requirements

There are three component parts:

- Portal Structure
- Control Buildings
- Ventilation Tower

6.1.1 One set of Tunnel Service Buildings would be designated the primary buildings, incorporating the control buildings which operate the Tunnel, as well as the portal specific infrastructure in relation to fire fighting and ventilation. For the purposes of the illustrative design the northern portal buildings have been designated as the primary.

6.1.2 Projected traffic levels indicate that the tunnel would need to be mechanically ventilated in order to manage air quality within the tunnel and aroud the portals. This would require a ventilation building and tower at both portals.

6.1.3 The design and positions of the portal and buildings would be determined by both technical and contextual factors.

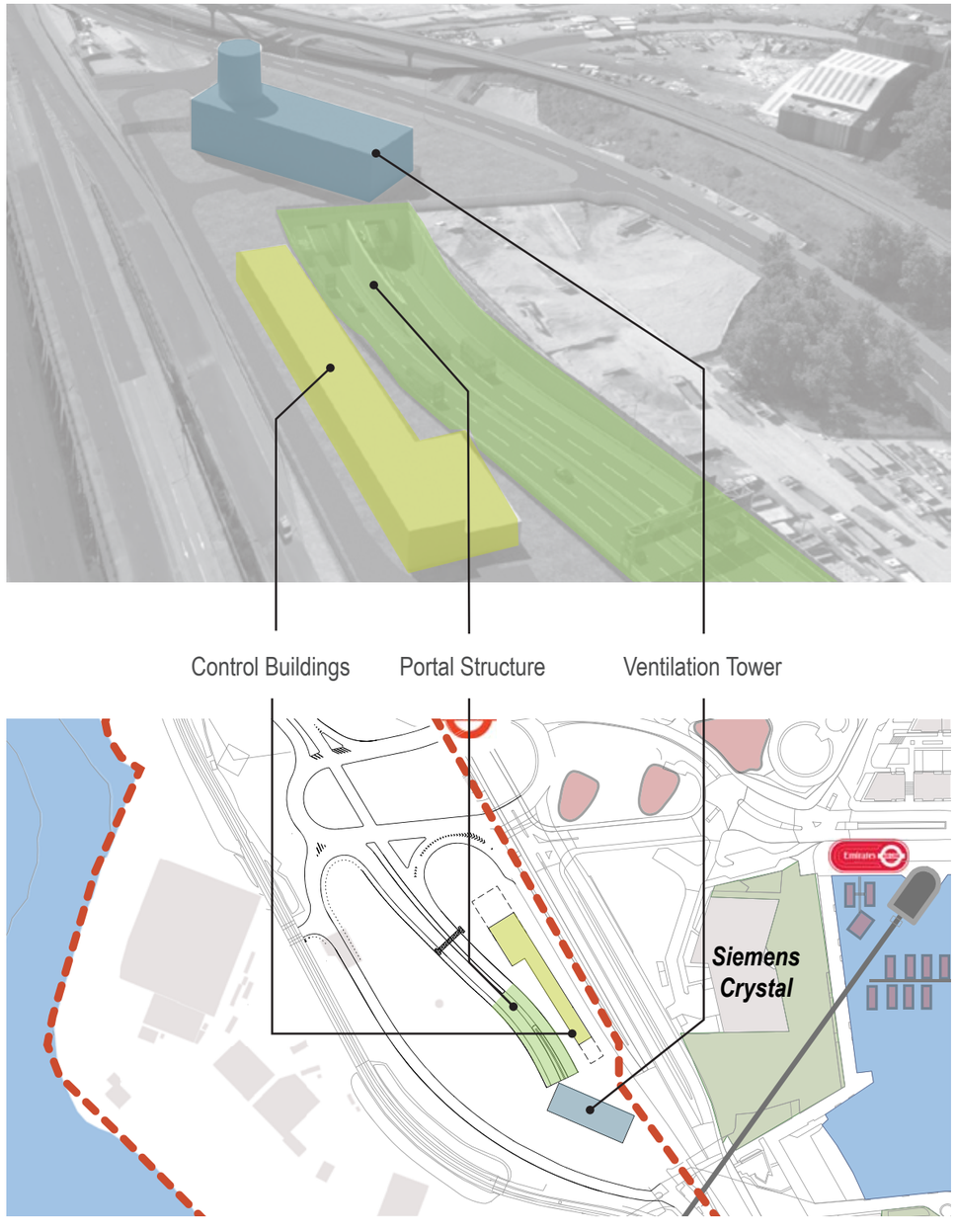
6.1.4 Separate bores are proposed for the north and south bound carriageways. The alignment is governed by the need to get below the River Thames, while avoiding existing foundations and utility infrastructure.

Silvertown Portal

6.1.5 The northern portal at Silvertown is a simple tunnel portal which needs to accommodate two traffic lanes in each direction, along with the necessary ventilation infrastructure. The compound would also include space for water tanks to supply the tunnel fire fighting systems.

6.1.6 Anti-recirculation walls between the tunnel bores would limit the degree to which exhaust fumes exiting one bore would be drawn back into the adjacent bore. This would reduce the size of the fans at the tunnel portals and hence the size of the ventilation buildings. The location of the ventilation and control buildings has also been chosen to optimise future development sites and minimise the visual impact on existing and future uses such as residential.

Figure 6.1 Permanent Structures - Silvertown Portal

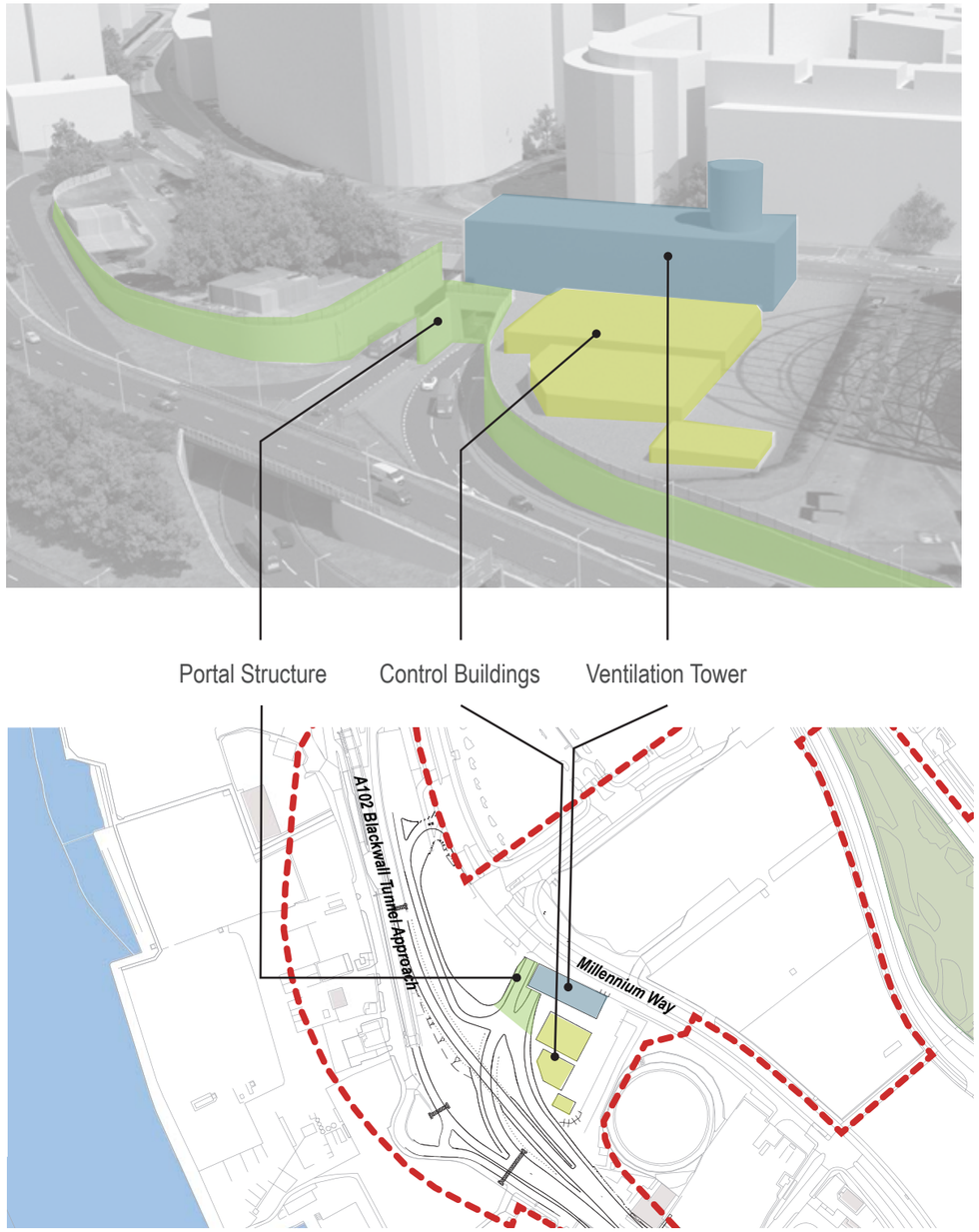


Greenwich Portal

6.1.7 The southern portal is a split design, so the two bores of the tunnel are non-aligned, as a result of the tunnel geometry. This arrangement would reduce the required length of anti-recirculation wall compared to the Silvertown Portal.

6.1.8 There would also be reduced facilities at the Greenwich Portal site as the main control buildings are located on the north side. Therefore the total footprint of buildings would be reduced in comparison. The compound would also include space for water tanks to supply the tunnel fire fighting systems and the buildings associated with the tunnel ventilation system, which include large fan chambers. It is the requirement of these fans together with the vent stack that set the minimum dimensions for the tunnel ventilation building.

Figure 6.2 Permanent Structures - Greenwich Portal



6.2 Illustrative Scheme

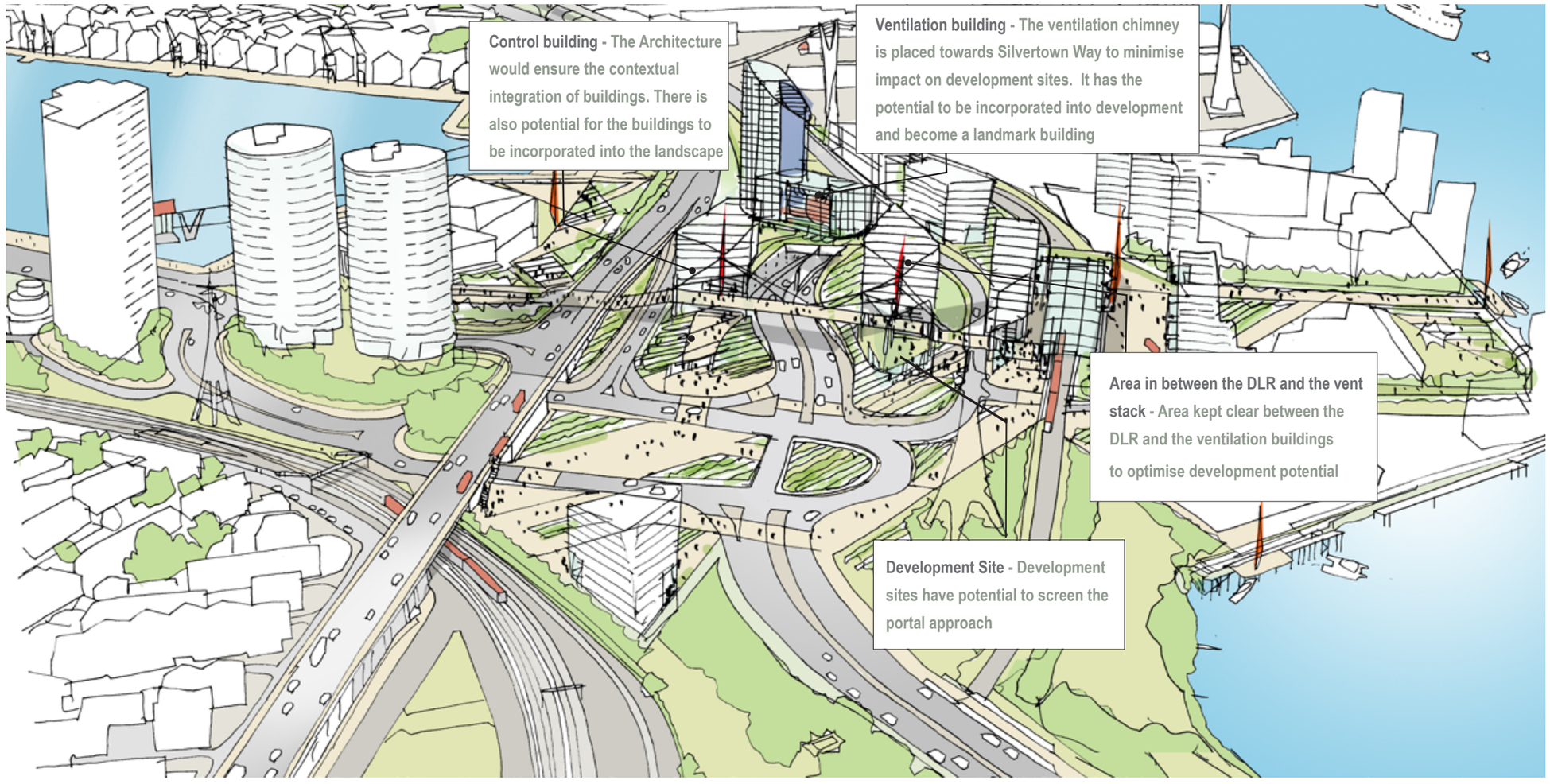
Silvertown Portal

6.2.1 The illustrative design for the northern portal comprises three elements: the portal; the ventilation building; and the ancillary service building.

6.2.2 The portal and retaining walls would run continuously one into the other and would be aesthetically finished with a layered composition of acoustic surface treatments. To enhance the night time appearance of the portals a lighting strip could be added to delineate the level of the tunnel soffit. This treatment would also help to draw the viewer's attention to the tunnel entrance. For environmental mitigation an acoustic screen may be needed. If required they would be added symmetrically so that both retaining walls match visually.

6.2.3 The northern Tunnel Service Buildings would be located above ground. The buildings would be designed so that the visual appearance breaks down their scale and massing at the same time as creating a landmark structures of high design quality. The buildings would be urban in style but may also incorporate green walls and roofs to help improve air quality, support sustainable urban drainage, provide habitats and breakdown the visual size of the buildings.

Figure 6.3 Service Buildings - Silvertown Portal



6.2.4 The ancillary service building would comprise a single storey with level direct access to all areas via the new access road. To enhance its appearance the tunnel side façade could incorporate a “green wall” planting.

Greenwich Portal

6.2.5 The illustrative design of the southern portal comprises four elements: the staggered portal; the ventilation building; the ancillary service buildings and the southbound A102 flyover.

6.2.6 The southern service compound is located to the south east of the portal with the ventilation building adjacent to Millennium Way and the ancillary service buildings behind.

6.2.7 The buildings would be designed to create landmark structures with distinctly different design principles on the vehicular (west) and pedestrian (east) sides of the buildings. To the west the style would recognise the transport infrastructure function of the buildings while to the east a more urban, human scale approach would be taken that breaks down the bulk of the buildings.

Figure 6.4 Illustrative Design: Greenwich Portal Aerial View

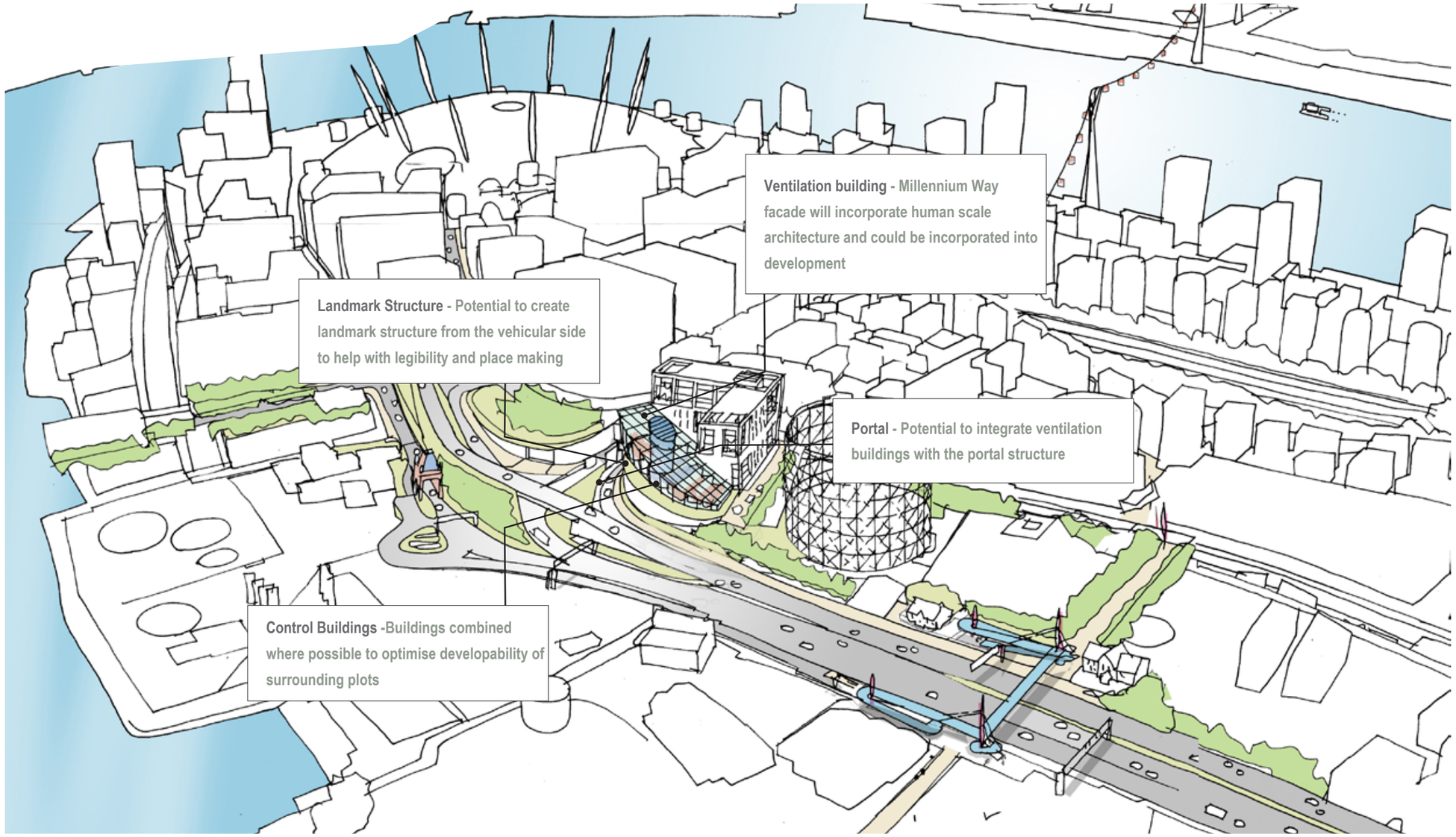


Figure 6.5 Precedent Images - Tunnel Portals

Figure 6.6 Precedent Images - Tunnel Portals

Figure 6.7 Precedent Images - Tunnel Ventilation Buildings & Structures

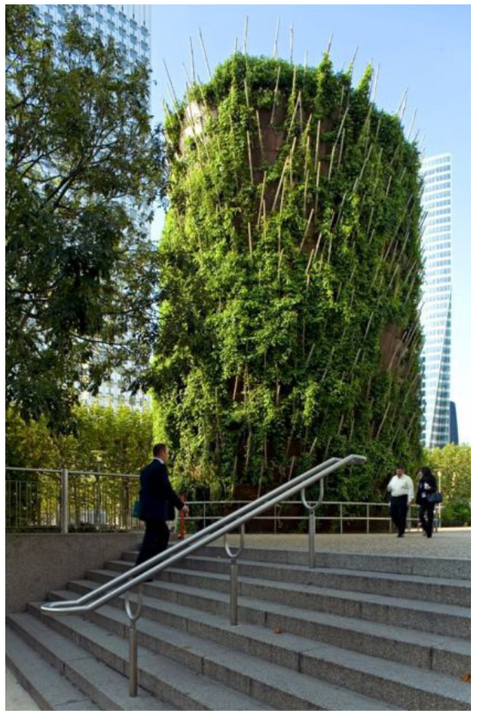


Figure 6.8 Precedent Images - Tunnel Ventilation Buildings & Structures

6.3 Next Steps

6.3.1 The design of the buildings and portal structures will be developed further prior to DCO submission, taking into consideration comments from public consultation, additional stakeholder engagement and also early engagement with potential DBFM contractors. The engagement would continue once the DCO application is submitted, in particular in relation to discussions with the local Boroughs on the buildings' appearance.

07
Scheme Integration

07
Scheme Integration

7.0.1 In addition to the core elements of the Silvertown Tunnel Scheme, TfL are developing a package of additional works which would help to integrate the Scheme into its local context, and improve connectivity in the surrounding areas. These would be particularly targeted at improvements for pedestrians and cyclists, to improve their access to the Emirates Air Line, which is the primary cross-river connection for these users. Some of these measures are outside of the boundary of works and exactly how they will be funded and delivered is yet to be finalised. TfL will continue to work with the boroughs and other stakeholders to agree this list before the DCO submission.

7.1 Local Pedestrian & Cycle Improvements - Silvertown

7.1.1 The Silvertown Tunnel project would enhance pedestrian and cycle provision within the site boundary. However there are also a number of projects on the edge or outside of the boundary that would help to create a better connected and more consistent pedestrian and cycle network. On the north, TfL is currently working with LB Newham to find ways to improve these connections. Figures 7.1 and 7.2 highlight a number of potential Schemes that are being considered to ensure the new street network is fully integrated into its surroundings.

Fig 7.1 Potential projects on the edge and outside of the DCO boundary - Pedestrians

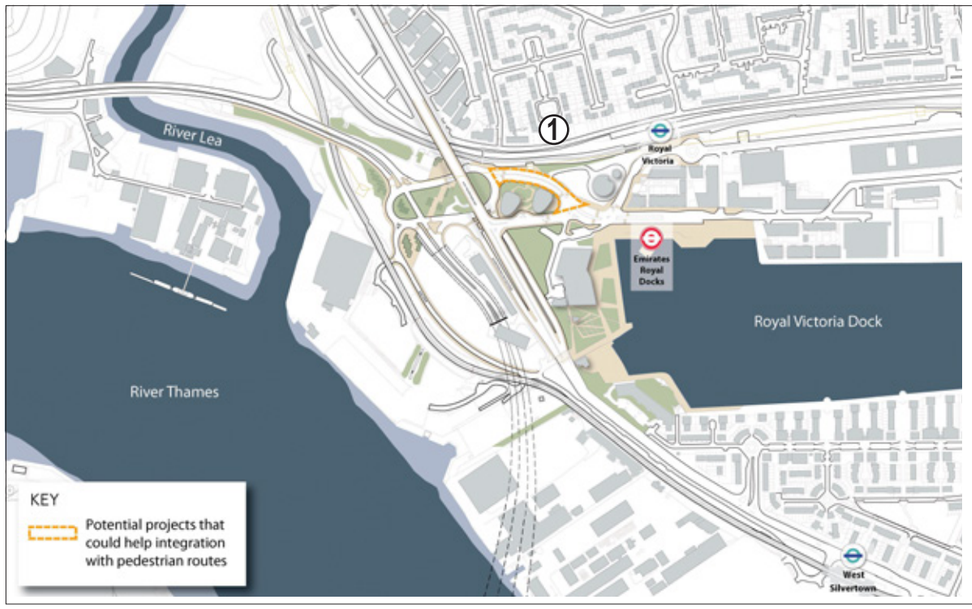


Fig 7.3 The existing environment on Tidal Basin Road (Source: Google)

1. Improvements to the pedestrian environment on Tidal Basin Road to address balance of movement and place.

Fig 7.2 Potential projects outside the DCO boundary - Cyclists

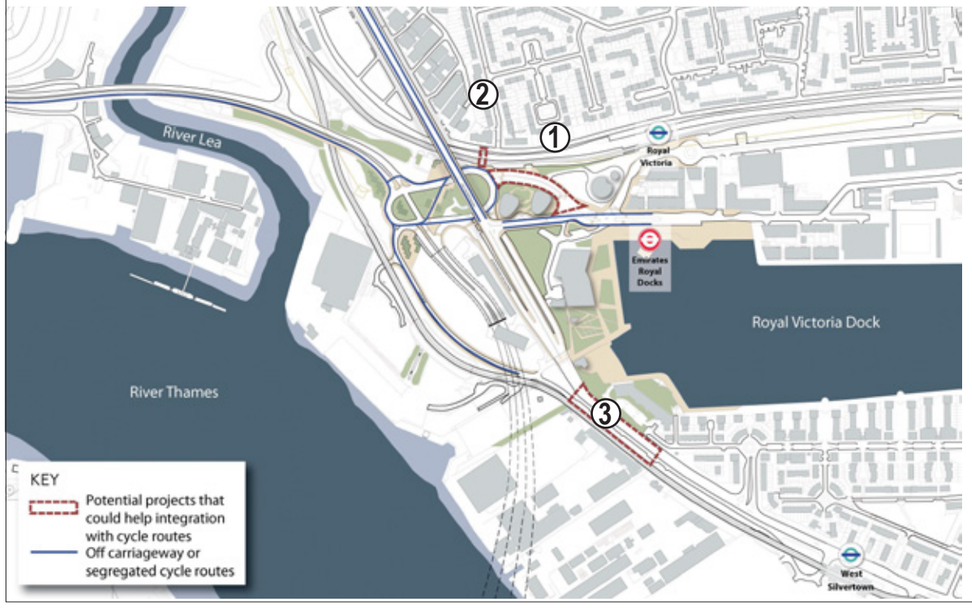


Fig 7.4 The existing environment on North Woolwich Road which is a signed cycle route (Source: Google)

1. Addition of dedicated off-carriageway cycle provision on Tidal Basin Road.
2. Improvements to the footbridge over the DLR.
3. Addition of cycle provision along North Woolwich Road from Dock Road to West Silvertown DLR station to match that provided by the project n Dock Road.

7.2 Local Pedestrian & Cycle Improvements - Greenwich

7.2.1 The proposed new Boord Street Pedestrian and Cycle bridge replaces the current concrete footbridge that crosses the A102 Blackwall Tunnel Approach road. The existing bridge needs to be demolished to allow the required widened highway alignment. The location would be south of the Greenwich portal at the west end of Boord Street.

7.2.2 Currently this location, and the wider Greenwich Peninsula area is undergoing extensive regeneration to provide 10,000 homes, plus offices and public spaces, and the backdrop for the footbridge will change from its current light industrial nature.

7.2.3 The Scheme is also exploring the possibility of improvements to the Boord Street route, with improved footways and a dedicated cycle infrastructure to support the link between the bridge and the wider Peninsula. This dedicated infrastructure could be a cycle lane at a higher level to the road, and lower than the footways. This would make the route more attractive than the current arrangement of an advisory on-road cycle lane with only cycle logos on the street. Proposals will be developed further before the DCO application submission.

Fig 7.5 The landing of the new foot and cycle bridge on Booard Street showing both steps and ramps.
Inset: The current ramp only arrangement (Source: Google)

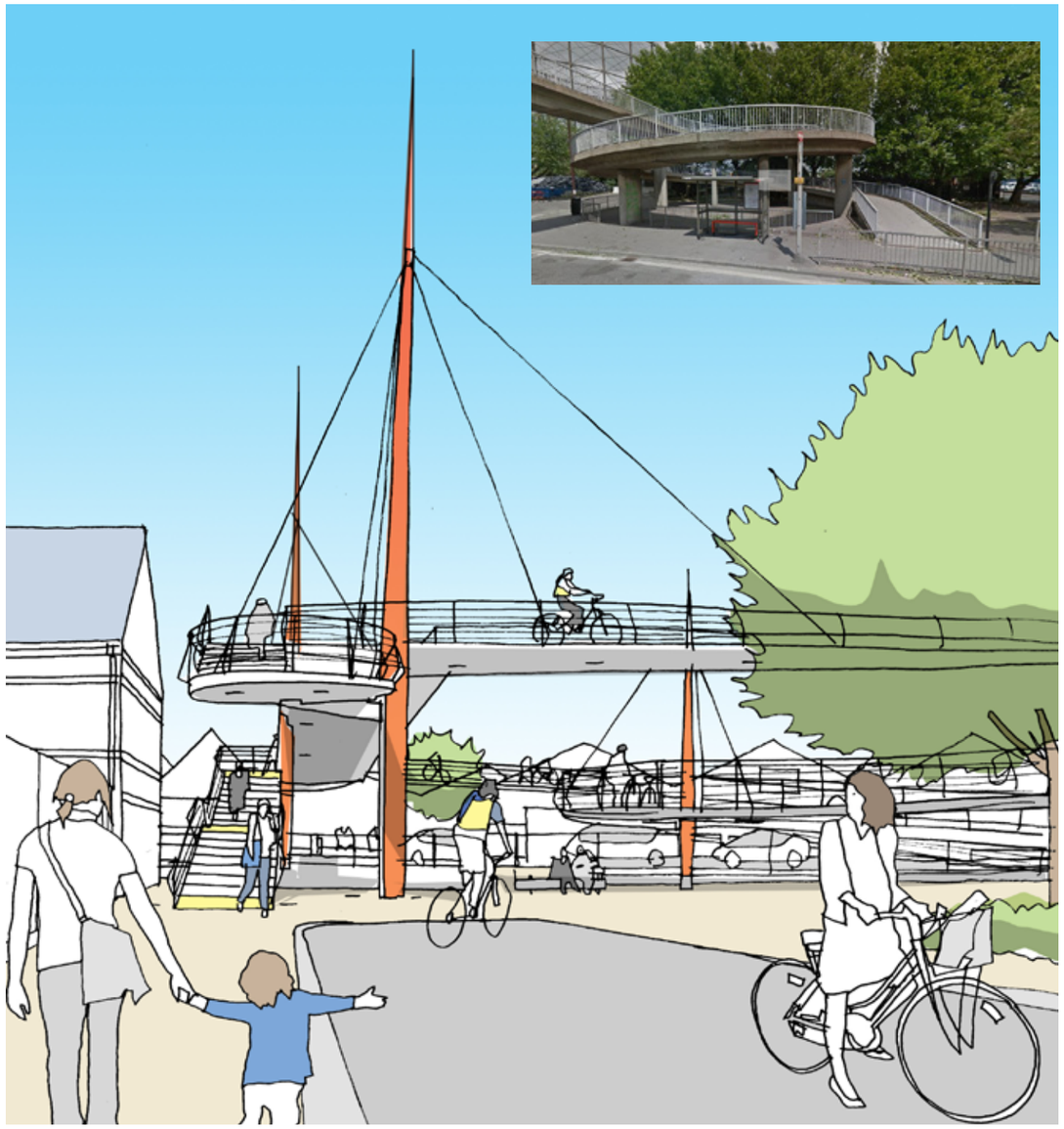
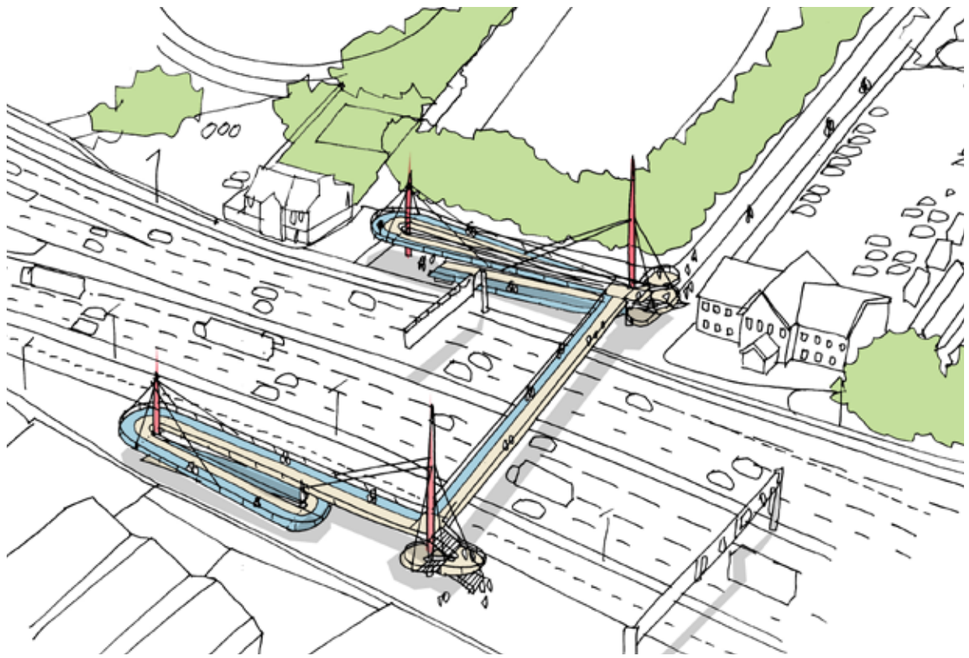


Figure 7.6 The existing Boord Street bridge (Source: Bing)

Figure 7.7 Illustrative design for Boord Street Pedestrian & Cycle Bridge



7.3 Boord Street Pedestrian & Cycle Bridge - Illustrative Design

7.3.1 The proposed new bridge would be widened, made more accessible to cyclists and improved aesthetically. The new location of the bridge would also make the local area more legible for pedestrians and cyclists.

7.3.2 The bridge could be designed as a gateway structure due to its strategic location, spanning the southern approaches to both the Blackwall and Silvertown Tunnels; and in time it could become an established landmark.

7.3.3 As part of the design process an options feasibility assessment was undertaken by the design team to identify potential options for the replacement footbridge. Six options were initially presented, and these were shortlisted to two options, including the one shown in Figure 7.7.

7.3.4 The illustrative bridge design is positioned so that it can be seen at the end of Boord Street from Millennium Way. The ramps and stairways land as close together as the site geometry will allow.

7.3.5 The landscape design has focused on two specific areas. Firstly the desire to maintain the existing row of mature trees which screen the road corridor from the adjacent car park (Evening Standard Depot) site. The design as it is currently proposed will allow these trees, which are a dominant townscape feature, to be retained.

7.3.6 The second aspect of the landscape design is paved areas around the base of each ramp, which are designed to be integrated with the surrounding urban areas, and on Boord Street in particular, to guide pedestrians and cyclists towards the crossing when approaching from The O2 and wider peninsula locations.

7.3.7 Due to the prominent location of the proposed bridge the architectural strategy has been to design a simple but elegant structure commensurate with the townscape aspirations of the area.

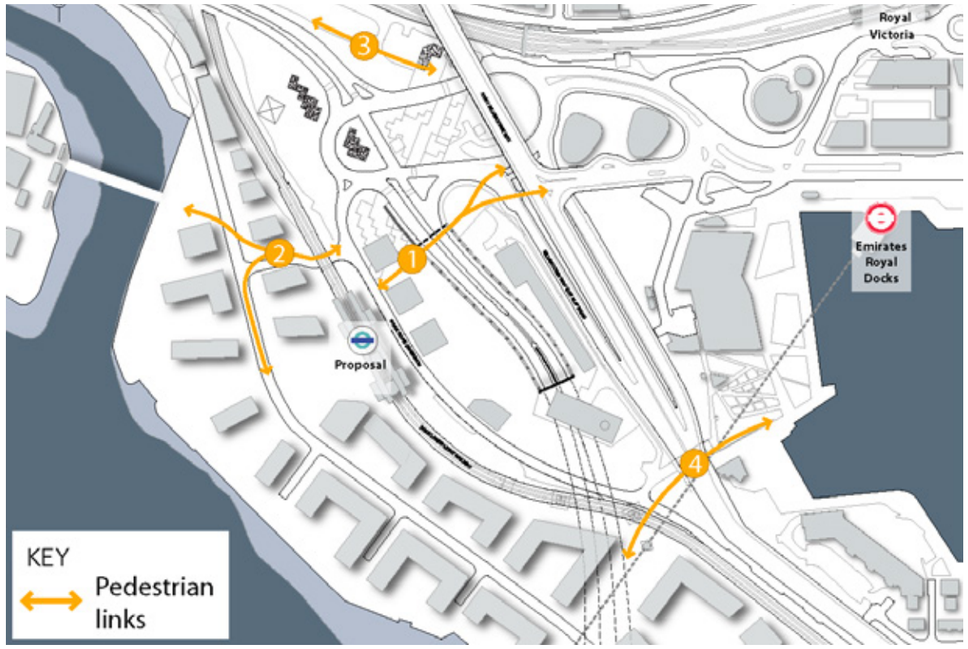
7.3.8 Due to site constraints the ramps are oriented to the north of the bridge with stairways to the south. In keeping with best practice, effort has been made to arrange the stairs and ramps to land as close together as possible. The proposed arrangement allows for the continued use of the existing bridge during the construction period.

7.4 Integration with future development

7.4.1 As already discussed, the use of land around the Silvertown portal is likely to change dramatically in the future. This will change the way that the spaces around the portal will be used and put additional demands on the pedestrian and cycle network.

7.4.2 The project would therefore include passive provision for the future development of the public realm and portal structures in order to fit into the future context. A number of potential projects are highlighted in the adjacent drawings. These would not be provided as part of the Silvertown Tunnel Scheme, however the Scheme proposals make allowances for these being added at a future date by a third party.

Fig 7.8 Project for which passive provision is included - Pedestrian

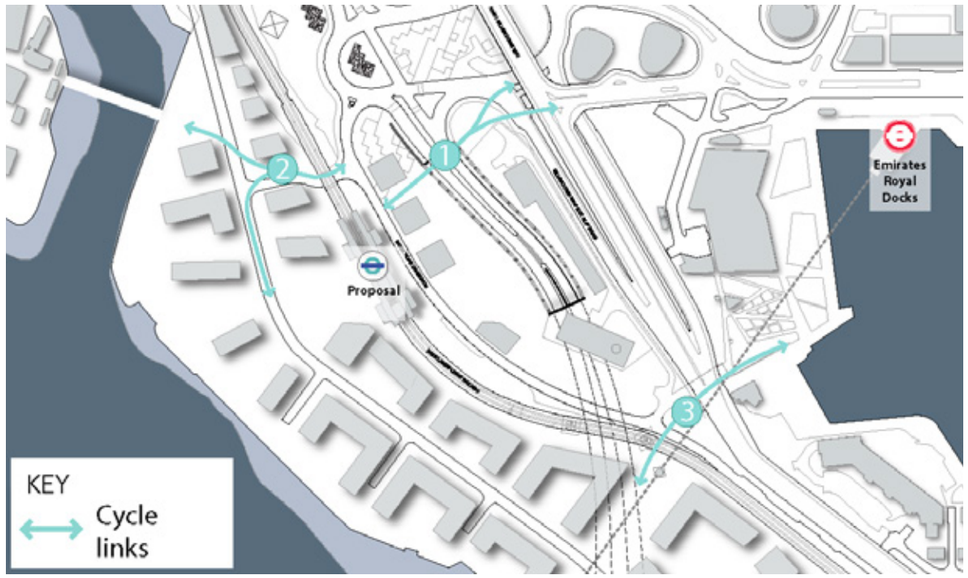


Pedestrian provision that could be provided or enhanced by a third party in the future which the Scheme wouldn't prevent, includes:

1. Grade separated connection over the tunnel approach to both Tidal Basin Roundabout and Silvertown Way
2. Improved access under the DLR to facilitate access to development sites
3. Pedestrian access to potential development sites
4. Enhanced connection between the docks and the river's edge.

Fig 7.10 A foot and cycle bridge could be added over the tunnel approach in the future

Fig 7.9 Project for which passive provision is included -Cyclists



Cycle provision that could be provided or enhanced by a third party in the future and is not prohibited by the Silvertown scheme:

1. Grade separated connection over the tunnel approach to both Tidal Basin Roundabout and Silvertown Way
2. Cycle access to potential development sites
3. Enhanced connection between the docks and the river's edge.

Fig 7.11 The connection under Silvertown Way could be improved in the future

08
Sustainability and Environment

08
Sustainability and Environment

8.1 Introduction

8.1.1 The Scheme has been designed to be sustainable in terms of its economic, environmental and social aspects. The proposal incorporates sustainable design principles that would guide the detailed design stages of the project. It seeks to ensure that the three main sustainability spheres, as shown on Figure 8.1, are fully integrated.

8.1.2 The following sections show how the Scheme would ensure sustainability in all three aspects.

Figure 8.1 The three spheres of sustainability

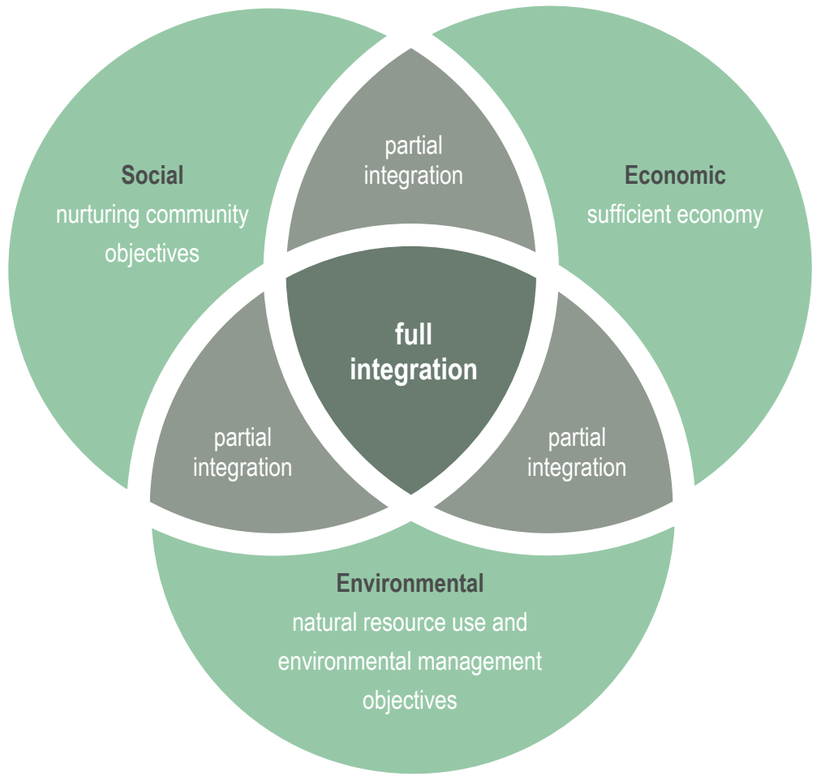


Figure 8.2 Example of a water retention pond as a potential wildlife habitat

8.2 Economy

8.2.1 The Scheme would have an overall positive economic effect on Greater London as a whole, through direct and indirect employment generation, improving access to employment opportunities for residents and improving connectivity between employment areas. The Scheme would enable the provision of new cross-river bus services offering improved public transport links in south east London. It would improve journey time reliability for all road users, by reducing congestion and by reducing the number of incidents that currently occur at the Blackwall Tunnel that cause delays and unpredictability in the operation of the road network.

8.2.2 The potential economic benefits are:

- Decreased business costs as a result of reduced routine congestion caused by the Blackwall Tunnel. This would have a positive effect on reliability, reducing delays and disruptions to business operations.
- Better access to labour market for both employers and employees, creating more job opportunities on both sides of the river.
- Better cross-river connectivity for visitors and customers using retail or leisure facilities. This would have a positive effect on local businesses providing good opportunities for the companies to develop and grow.
- Improved cross-river connectivity could encourage investment in the surrounding areas by making them more accessible and attractive for developers.

8.3 Environment

Ecology

8.3.1 The Scheme is located in a highly urbanised environment and one subject to high levels of pressure in terms of biodiversity loss. Therefore, the ecological receptors are considered to have a greater ecological value due to the lack of natural habitats in the wider area. Any loss of habitats would be mitigated, at least on a like-for-like basis in terms of quality and area, to ensure there is no net loss in biodiversity. Furthermore, the proposed green infrastructure would have a positive restorative effect on many other elements such as water, pollution, heat and climate change attenuation including public health and wellbeing in general. Opportunities to provide net gains in biodiversity are being explored. These include the planting of native trees, scrub and low-maintenance, low sward-length grassland mix. Other potential options include providing nesting opportunities for birds, including for the black redstart under a new viaduct, the creation of a new area of standing water with a reed-bed (see Fig. 8.2).

8.3.2 The possibility of incorporating living roofs is also being explored.

8.3.3 There is potential for the Silvertown Tunnel to be ecologically sustainable both in the short and long term once mitigation and enhancement measures are put in place.

Green walls and green façades

8.3.4 Green walls provide a series of environmental, commercial and aesthetic benefits. In cities green walls can significantly enhance a building's appearance transforming a plain concrete wall in a stunning visual piece of art and reduce locally generated pollution by absorbing carbon dioxide and releasing oxygen and by trapping dust and other pollutants. With a strong base from the trellis and appropriate planting, a green wall can provide an ideal habitat for wildlife. Furthermore, it adds a layer of insulation (both thermal and acoustic) making a positive impact for both building occupants and the local environment. In areas where graffiti is a potential problem, green walls can act as an effective deterrent. An example of Green Wall commissioned by TfL is on Marylebone Road, at Edgware Road Station (see Fig. 8.3). The Green Wall was built in a determined effort to counter air pollution in London. Plants were chosen based on their ability to remove particulate matter from the air.

8.3.5 Green façades, differ from green walls, as they are grown from a container or in ground. Green façades share similar benefits of green walls and they are made using climbers like ivy. An example of Green façade is at the entrance of Green Park Station also commissioned from Transport for London in the aim of reducing pollution in the city (see Fig 8.4).

Figure 8.3 Green Wall at Marylebone Road, Edgware Road Station, London

Figure 8.4 Green façade at Green Park Station, London

Climate Change

Energy and carbon

8.3.6 A number of measures have been looked at to reduce energy consumption and greenhouse gas emissions during the construction phase. The principal options include:

- Minimising the use of diesel or petrol powered generators and instead using mains electricity or battery powered equipment
- Powering down of equipment/plant when not in use
- Ensuring all vehicles and machinery are serviced at recommended intervals to guarantee optimum engine efficiencies and reduce waste energy
- Using fuel-efficient plant, machinery and vehicles
- Deploying correctly sized generators for electrical provision onsite
- The Scheme design also would optimise energy performance and CO2 emissions during the operational phase through the optimisation of daylighting, orientation, site layout and energy efficient lighting.

Flood risk and water consumption

8.3.7 The drainage system would be designed in a way which ensures pollution control measures are in place and flood risk is reduced. In addition, a Flood Management Plan, linked into the Environment Agency's advanced flood warning service has been produced covering both the construction and operational phases. Water consumption would be reduced through:

- Selection and specification of equipment to reduce the amount of water required
- Water reduction initiatives
- Collection of drainage water for dust suppression
- Installation of a water meter with a pulsed output on the mains supplies
- Leak detection system with an audible signal when a leak is detected

Waste and Materials

8.3.8 The materials would be suitable and robust, with durable long-life properties. The storage of materials would managed in accordance with best practice standards to minimise the potential of damage or wastage (e.g. off-ground storage, remaining in original packaging, and protection from rain damage or collision by plant or vehicles).

8.3.9 A Site Waste Management Plan has been developed as an internal waste management and monitoring tool. This would establish and implement a sustainable Resource and Waste Management Strategy and would support the monitoring of the Scheme's performance.

Figure 8.5 Roadside wildflower planting - Cricket Inn Road, Sheffield

Figure 8.6 Example of green roof

8.3.10 The Scheme has set a 95% target for recycling and reuse of the materials arising from the construction of the tunnels and operational infrastructure. 'Green procurement' objectives would be defined and integrated into the procurement and specification process to use reused or recycled products and construction materials.

Air quality

8.3.11 As a consequence of the Scheme there would be changes in traffic flows on the local road network, resulting in changes in emissions, both increases and decreases. The Scheme is located in a highly urbanised environment which already has poor air quality with pollutant concentrations that exceed the Mayor's Air Quality Strategy objectives/EU Limit Values for the key traffic related pollutants nitrogen dioxide (NO2) and particulate matter (PM10). The host boroughs (RBG & LBN) both have designated Air Quality Management Areas (AQMAs) as a result of exceedences of the air quality strategy objectives. In addition, the Scheme would have air quality impacts on roads that pass through other boroughs, that are also designated AQMAs.

8.3.12 The changes in traffic are as a result of rerouteing following the opening of the tunnel, which would impact on local air quality. DEFRA who are responsible for reporting compliance with the EU Directive on ambient air quality do not project the Greater London agglomeration would be compliant with Limit Values until after 2030 (after the Scheme is in operation).

8.3.13 Options to mitigate the Scheme's air quality impacts include:

- Changes to the toll regime, increasing or decreasing the charge as necessary can be used as a tool for managing demand;
- Mitigation relating to the tunnel emissions, the ventilation stack could include abatement technologies to filter pollutants from the exhaust gas;
- Low emission zoning, ensuring that only cleaner vehicles are allowed to use the tunnel or targeting particular vehicle classes e.g. Heavy Goods Vehicles.

8.3.14 It must be noted that there may be adverse impacts of some of the options on air quality that would need to be assessed, for example increasing the toll charge could displace traffic to an area where there are predicted exceedances. Mitigation measures would be investigated should the Scheme cause a significant impact on air quality.

Noise and vibration

8.3.15 The Scheme's design would seek out to reduce noise and vibration impacts to a minimum. Noise and vibration impacts would be minimised through the implementation of a construction and environmental management plan (CEMP) as well as employing best available techniques (BAT).

8.3.16 The Scheme is located in an area of existing high noise levels. The Scheme would reduce operational noise impacts through the use of noise barriers and low noise surfacing where possible. Impacts from the tunnel ventilation system would be reduced through design and commercially available stack silencers.

8.4 Society

Safety and security

8.4.1 The Scheme's design would seek to design out crime and to help people feel safe. 'Secured by Design' principles would be observed. The design of the tunnel would incorporate a range of security measures through the layout, lighting, alarm, closed-circuit television (CCTV) coverage and signage used to reduce the potential and perception of crime.

Quality of Life

8.4.2 The Scheme landscape design would contribute positively to the development of the area in terms of visual amenity. The design includes a varied and visually interesting combination of trees and herbaceous plants, including wildflower meadow planting (see Figure 8.5).

8.4.3 At the northern portal, where at-grade pedestrian and cycle links are incorporated, the design includes areas of green space and brings together areas of hard surfacing with clusters of tree planting and under-storey vegetation. This would enhance the urban realm and improve the quality of life of the local residents.

8.4.4 Other indirect benefits are:

- Increased job opportunities and improved accessibility to jobs with indirect benefits on mental health and well-being;
- Safety and security of the tunnel with both direct benefits on both physical and mental health;
- Reduced risk of road accidents due to traffic management measures, relieved congestion and appropriate design measures;
- Reduced flood risk and resilience during all seasons.

8.4.5 The Scheme would also improve the certainty of journey time and therefore is likely to reduce driver stress. The reduction in incidents currently occurring in the Blackwall Tunnel would also have a strong positive impact on drivers' perception of safety.

09
Scheme-wide Strategies

09
Scheme-wide Strategies

9.0.1 Alongside the specific illustrative design of spaces, structures and buildings there are a number of Scheme-wide strategies which cover topics common to all parts of the Silvertown Tunnel project. This chapter of the DAS covers a number of these in more detail, establishing the ideas which would be realised in the illustrative Scheme.

9.1 Public Art

9.1.1 Public art is a part of our public history, part of our evolving culture and our collective memory. It reflects and reveals our society and adds meaning to our cities. It comes in all scales and sizes, and across a broad spectrum of media. Sometimes it is curated, sometimes it is active, other times it is just a passive expression, but in all cases it signifies a working practice of site specificity, community involvement and collaboration. It is the community aspect which is most important, as it provides a direct opportunity for people to engage with specific design elements of the Scheme.

9.1.2 While the primary function, safety and operation of the tunnel must not be compromised by any public art, the potential for embedding art into infrastructure projects is something that has been established for many years, partly because the scale of the works often lend themselves to Art (by acting as a 'canvas') and also because the materials used in major infrastructure projects - such as steel and concrete - are also great mediums for sculpture and for artistic manipulation.

9.1.3 There are many examples from around the world of how art has been successfully applied to major infrastructure Schemes, and some of these are explored in the next section. What links all of those shown is that it is *embedded* art that has been thought about from the beginning, and forms part of the fabric of the Scheme. It could be materials, colours or lighting and in many cases is a combination of all three.

Precedents

9.1.4 This section shows a number of precedent images from other infrastructure projects around the globe from Australia to a short walk up the Lea Valley. Each has been chosen to demonstrate an idea which could be used at Silvertown - some are similar highway tunnels, others are different types of infrastructure, but what they all have in common is that they provide visual interest through artistic endeavour.

Primary Olympic Pumping Station, Stratford

9.1.5 At the southern end of the Queen Elizabeth Olympic Park is the primary sewage pumping station for the park. Built ahead of the Games in 2010. Designed by Lyall Bills & Young Architects, visual interest was created through the integration of a form of public art into the core design, and it combines colour, lighting and materials in a way that celebrates, rather than hides, the infrastructure within.

Figure 9.1 The 'engraved' image as it appears when viewed obliquely

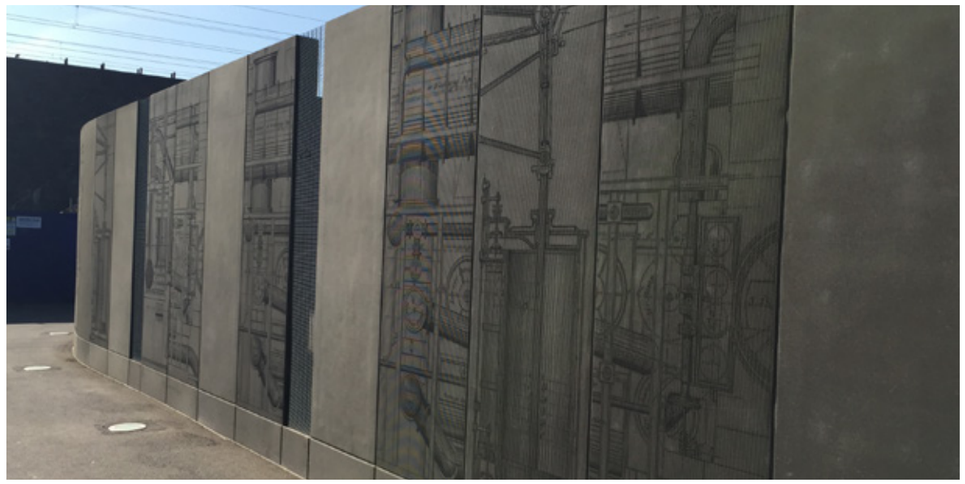
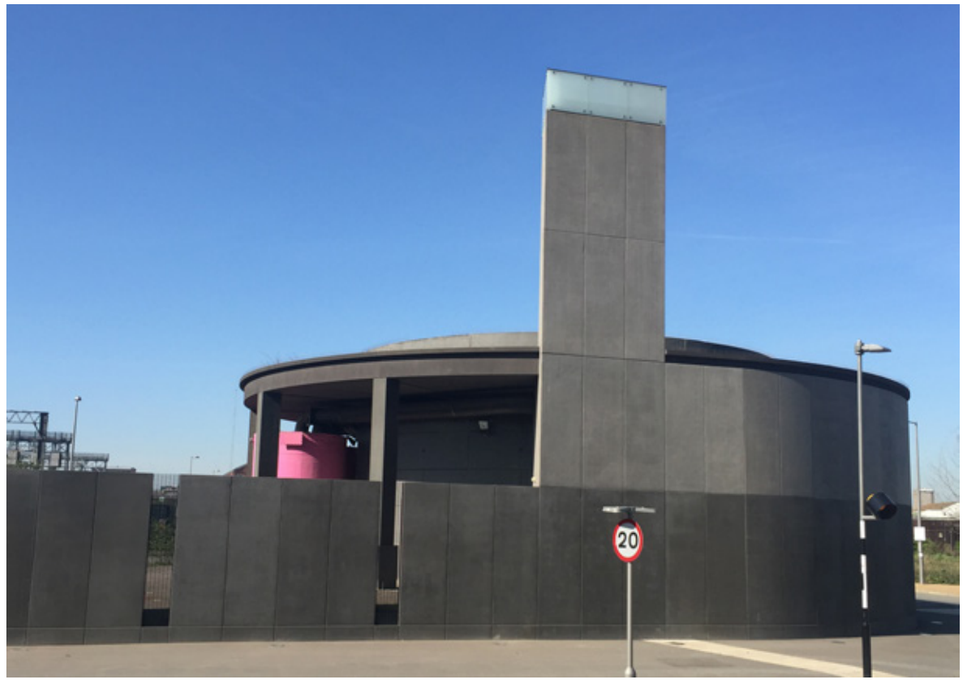


Figure 9.2 When viewed 'head-on' the image is barely perceptible



9.1.6 Of particular interest and relevance to the Silvertown Tunnel is the 'graphic' that has been applied to the surface of the concrete walls. The pre-cast concrete panels of the outer wall are pigmented and some are cast with a relief pattern, inspired by the Victorian engineering drawings of Joseph Bazalgette. This technique produces a stunning yet dynamic design, which from some angles, in some lights, is very pronounced, yet from others is invisible. This technique would work well in a dynamic environment such as the Tunnel portals and entrance areas, as well as on the various control buildings that sit alongside.

Precedent Ringwood Tunnel, Melbourne Australia

9.1.7 Part of the M3 (Eastlink) road Scheme in northeast Melbourne, the twin bore Ringwood Tunnel (known as 'Melba' and 'Mullum Mullum') incorporates public art in numerous ways.

9.1.8 The most dramatic art is the centrally located ventilation towers that sits between the two bores of the tunnel. This has a combination of imprinted and applied graphics which are based on the leaves and flowers that can be found in the Mullum Mullum valley under which it passes.

9.1.9 This stack is integrated with imprinted concrete panels, which have an undulating top edge to reflect the rolling landscape beyond, and there are also public parks that have been created on top of each of the portals themselves, linked to a cycle / walking trail which has been created parallel to the route of the tunnel.

9.1.10 Additionally, the retaining walls and environmental screens (noise / visual) which sit along the sides of the road at various points also have imprinted textures and patterns, and in some locations are made of coloured perspex, rather than a solid opaque material. The combination of all these features makes the whole Eastlink Scheme into something of an 'outdoor gallery' with different experiences for the driver as they pass along.

9.1.11 There is scope to integrate a number of these features into the Silvertown Scheme, in particular looking at the way the ventilation tower is made into a landmark feature to be celebrated. Also understanding that the patterns and prints are a large scale, designed to be viewed from a distance or moving vehicle, rather than at a human scale for people to experience close-up.

Figure 9.3 Detail of applied / imprinted patterns on ventilation shaft

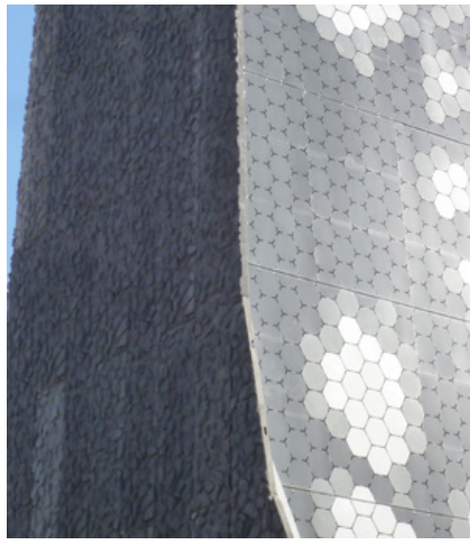


Figure 9.4 Entrance to tunnel Ringwood Australia

Figure 9.5 Detail of imprinted patterns on environmental / noise barriers

9.2 Advertising

9.2.1 In addition to considering the scope for integrating public art into the Scheme, we have also reviewed the potential for advertising within the Scheme, as a source of revenue, to help contribute to costs. If thought about from the outset, it is much easier to carefully absorb advertising opportunities into the fabric of the structures at this stage, and it can be done in a more sensitive manner.

9.2.2 Modern LED technology allows for almost any shape or form to be created, and to be fully integrated into the fabric of the portal, which would create an opportunity to make it more than just an applied feature, but instead allow it to be an integral part of the overall design.

Figure 9.6 Integrated advertising screen - Peninsula Square, O2 Arena

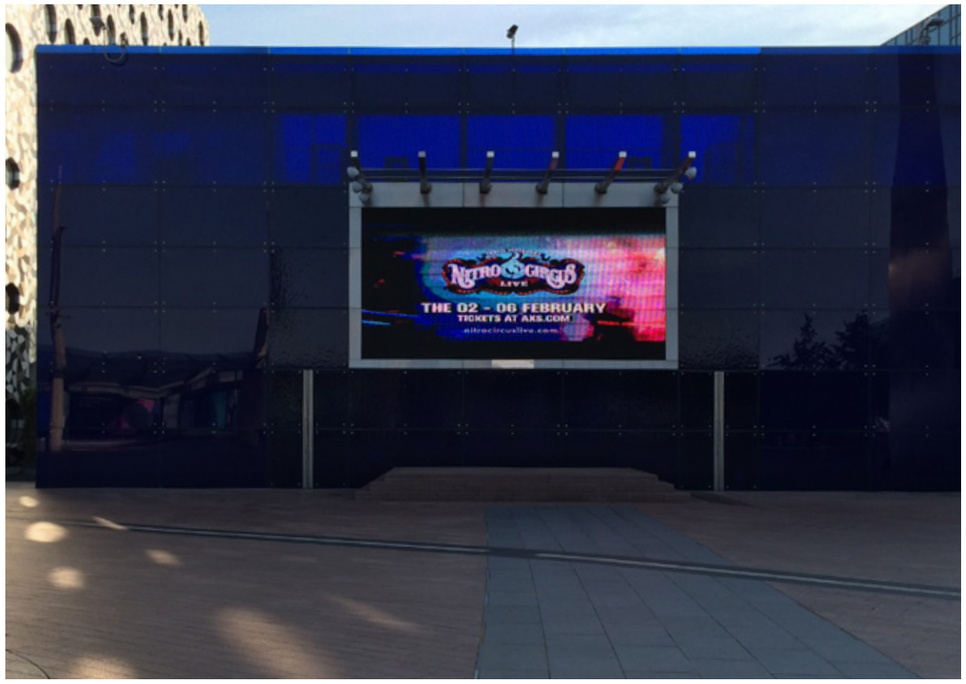


Figure 9.7 Legible London Wayfinding Minilith

9.3 Signage

9.3.1 The Silvertown Tunnel project would follow best practice in seeking to minimise street clutter by reducing the amount of signage (and other street furniture) to the minimum required.

9.3.2 Much of the directional signage for motorists would be affixed to over-road gantries, and these have been located at the locations for optimal decision-making time and to ensure no conflicts with sight-lines or other safety issues.

9.3.3 Pedestrian signage would be delivered through the use of Legible London, the standard city-wide wayfinding system. This comprises a series of finger posts, 'miniliths' and 'monolith' signs, including local area maps, located at key nodes and decision making points. The precise location of these is yet to be determined, but there is a recognised and approved methodology for identifying the appropriate locations for signs, which would be used in determining their siting.

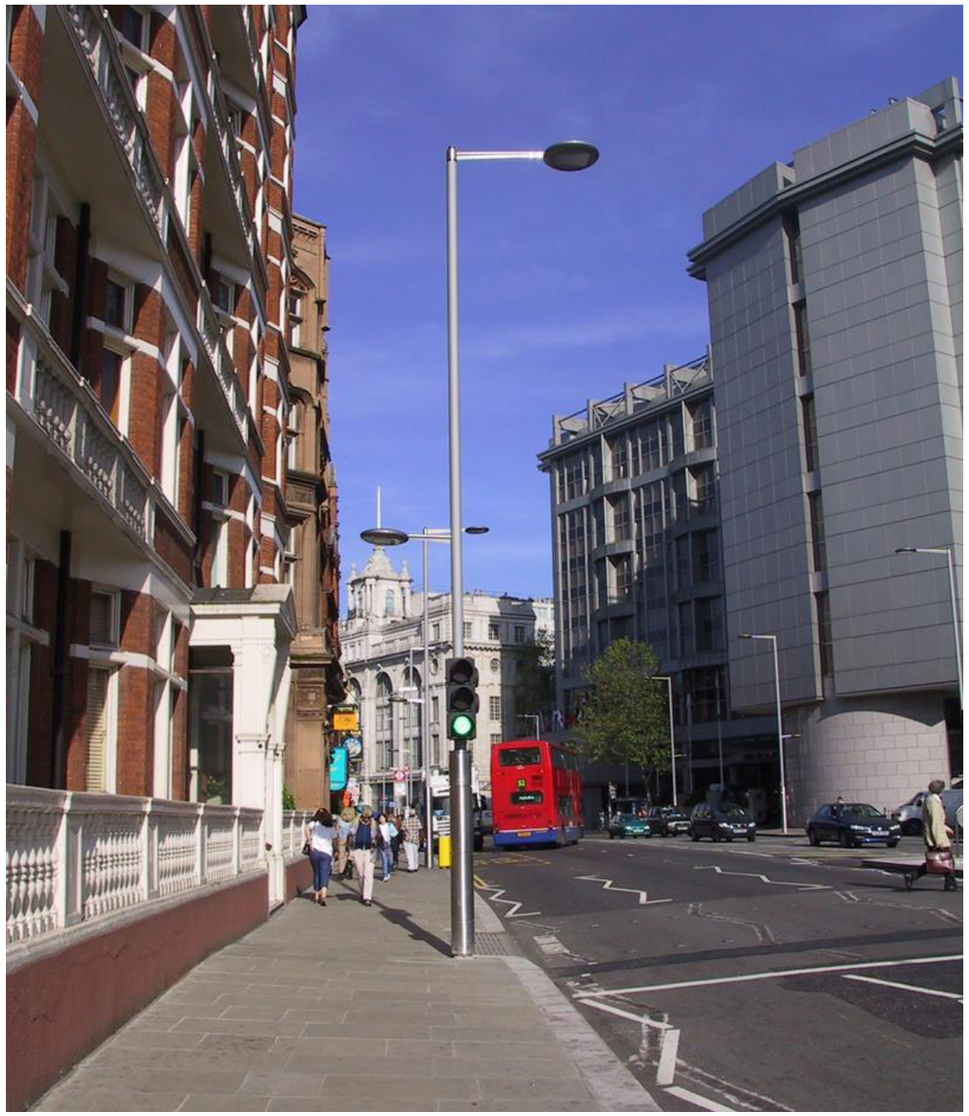
9.3.4 More generally, there would be a need to make sure that street furniture is fixed to buildings and structures where possible and practicable, rather than on individual poles or columns, and where there is a need for multiple signs or elements, they should share columns - for example putting traffic lights on the same column as highway lights.

9.4 Lighting & CCTV

9.4.1 The Scheme includes provision of both CCTV and lighting, which will be required to meet safety and security standards. A good practice approach would be to use two levels of lighting. A high level lighting network to provide the required levels for illuminating the carriageway, with a secondary network of lower level lighting at a more human scale to be used along the paths and off-road stretches of cycleway and footway. This approach would make the environment less harsh for non-motorised users, while at the same time providing adequate levels of lighting for personal safety.

9.4.2 The roadways will be covered by CCTV as part of the management of the Silvertown Tunnel, and columns for this have been identified at suitable locations. These will be sited to minimise visual impact and also to ensure they do not form any obstructions for pedestrian and cycle movement. The expectation is that where possible these will be sited on gantry and other structures that are required for signage.

Figure 9.8 Light column with split level highway / footway lighting, and integrated traffic lights.



9.5 Maintenance

9.5.1 The planting has been designed to be low maintenance, with grassland that only requires periodic cutting, and trees which will need annual works only.

9.5.2 The strategy has been to work on the basis of all maintenance being undertaken without the need for lane closures, or by means of rolling lane closures only. This can also tie into any maintenance requirements for the roadway itself, and this is covered in more detail in the separate Engineering Design Report.