Romal Capital

# Plot C-02

Environmental Statement
Volume I: Main Text

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Job number 262812

**Ove Arup & Partners Ltd**
10th Floor The Plaza
100 Old Hall Street
Liverpool L3 9QJ
United Kingdom
www.arup.com

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# Contents

# 1 Introduction

The findings of the Environmental Impact Assessment (EIA) are presented within this Environmental Statement (ES). The EIA assesses the proposed project (hereafter referred to as ‘the proposed scheme’) as described in this ES.

The ES is designed to inform readers of the likely significant environmental effects associated with the proposed Scheme and the mitigation measures which have been included as part of its design or is to be provided to protect or minimise those effects on the environment.

This ES has been prepared on behalf of Romal Capital (‘the Applicant’) to support proposals for:

*Full planning consent for residential development of up to 538 units (Use Class C3) and ground floor commercial space (Use Classes A1, A3 or A4) with associated partial dock infill of West Waterloo Dock, access, parking, servicing, soft and hard landscaping and public open space including a floating timber jetty and dockside walkway.*

## 1.1 The Development Site

### 1.1.1 Site overview

The site is located on vacant but previously developed land within Central Docks. It covers approximately 1.12ha and comprises areas of hardstanding, historic infilling and waterspace (part of West Waterloo Dock). Figure 1 depicts the site and its surrounding context. The proposed scheme has retained its development name ‘C02’ for the sake of this application and the scheme is referred to as C02 through this application.

Further hardstanding is located to the north and south of the site where future development is proposed as part of the Liverpool Waters Outline consent (10O/2424) and the Isle of Man Ferry Terminal consent (18F/3231). The West Waterloo Dock is located to the east of the site along with adjacent residential amenity in the form of Waterloo Dock apartments and Waterloo Warehouse. To the west, road infrastructure is currently being constructed to service development within this area of Central Docks (17F/2628) and further west of this lies the River Mersey.

A detailed description of the proposed Scheme site is contained in Chapter 2: Scheme Description.

### 1.1.2 Surrounding and development site history

One of the key attributes of Liverpool, and a fundamental reason for the inscription of the WHS, is the presence of the docks. At their peak the operational docks ran for c.12km north to south along the Mersey waterfront, and were a feat of engineering marked by innovative water management techniques and advances in cargo handling, that made them the most effective docks of the period. This was accomplished not through a long, drawn out process of gradual evolution, but over a relatively short time-frame, starting with the opening of the Old Dock by Thomas Steers in 1715, and which at the time was the world's first commercial wet dock, to the south of the development site.

Following on from the Steers Dock, an octagonal tidal entrance basin was built, with graving docks and a landing stage, and the first sea wall was constructed that started to define the new shoreline. The huge investment in land reclamation, with docks and sea walls built into the river, was supported by the requisitioning of waste material from the growing population of the city, including pottery, quarry waste, and organic matter generated by the butchers, tanners etc who were increasingly based along the new waterfront. The area known as Nova Scotia, constructed around a slipway to the river, and located in the present-day Mann Island area, provided a ready supply of infill material, and led to further westward expansion of the sea walls, and the Manchester Basin. By 1771, the area of Pier Head had also been reclaimed, with the central area of that location occupied by Georges Dock, and linked to Canning Dock via George's Dock passage to the south. Further change came with the construction of Georges Dock Basin and Georges Ferry, which effectively created a series of small 'islands' linked by swing bridges. At this stage, the northern docks, including Waterloo and Victoria Docks were not constructed, with the development site still within the River Mersey at this time.

To the north of Georges Dock, there followed a series of construction projects in quick succession. Princes Dock was completed in 1821, with a connection to Georges Dock to the south, and accessed from the Mersey via the Princes Dock Basin to the north. At the same time, the first of the Dock boundary walls was provided, to control access between the operational docks and the city.

The next phase of dock construction was overseen by Jesse Hartley, between 1824 and 1860, the pre-eminent engineer who more than doubled the dock accommodation in the city. Clarence Dock and Clarence Graving Dock opened in 1830, with Waterloo Dock completed in 1834. By 1836, Victoria and Trafalgar Docks were open, and along with Waterloo Dock they formed a uniform trio of inter-connecting water spaces, with river access gained through the Victoria Dock lock gate. However, this access was closed after just 10 years, meaning that access could only be gained through the dock network. This made the trio of docks the first real examples of spine and branch dock, with the docks aligned on an east-west axis, and transit sheds surrounding them on each side.

Whilst Princes Dock was constructed as the hub for trans-Atlantic trade, Waterloo Dock was also the location for the American packet ships, and was instrumental in the migration of people and goods. It was also at the centre for the traffic from Ireland, and played an important role in the Irish diaspora following the potato famine in the 1840's. This aspect of Waterloo Dock was significantly reduced after the 1860's, as Princes Dock, and its new landing stage, once again became the focus for the American trade.

Hartley's successor, GF Lyster, was responsible for re-modelling a number of the docks, including Princes Basin in 1868, which was re-modelled and re-named as Princes Half-Tide Dock. In 1873, Georges Dock Basin was infilled allowing for a floating roadway leading down to the landing stage. Georges Dock itself was infilled c.1900, and the area of the former dock was used as the site for the construction of the Three Graces.

Waterloo Dock was re-developed in 1868 following the repeal of the Corn Laws, and this allowed the Dock to become the world's first specialist grain dock. From its original 5-acre space, the new dock was completely re-orientated, and two basins were constructed, on a north-south axis, and named Waterloo Docks East and West.

East Waterloo Dock became the specialist grain dock, with huge brick warehouses with colonnades. The three buildings were located on all three sides of the dock, with that on the northern quay being shorter than those to east and west. The long warehouses had granite bases with limestone floors, of 5 working storeys, plus basement and mezzanine. These levels housed machinery and conveyor belts, operated hydraulically, which in turn worked three bridges, ten ship capstans, and 24 gate engines. West Waterloo Dock was used for general cargo and provided a passage between Victoria Dock and Princes Half-Tide Dock, as well as berths for ocean going vessels. It had long transit sheds on its east and west quays, with a smaller one to the south. The northern warehouse was destroyed in the air-raids of 1941, whilst the western warehouse was demolished in 1969, along with the smaller transit buildings.

The eastern warehouse remains, although it was converted into residential accommodation in the 1980s, and is now a grade II listed building. The site of the northern warehouse is now partially a car-park for the residents of the former eastern warehouse.

In 1929, a modernization programme was undertaken that saw the in-filling of Clarence Dock, Clarence Half-Tide Dock and part of Victoria Dock, whilst Trafalgar Dock was substantially re-ordered, and a power station was constructed within the in-filled Clarence Dock.

With the provision of lock gates as part of the re-modelled West Waterloo Dock in 1949, which allowed direct access to the Mersey, the dock water space essentially merged with Victoria Dock to the north as a larger L-shaped dock, and was used as a small container port in the 1970's. However, this proved short-lived, and the Dock closed in 1988. Following its in-filling, it was partially re-excavated with the construction of the Leeds-Liverpool canal link in 2007.

The changes made to West Waterloo Dock included the demolition of its northern wall to allow for the breaking through into Victoria Dock, and the re-orientation of its western retaining wall to accommodate the canted river lock. This also led to a new sea wall being constructed in mass concrete, and its re-alignment. In the 1990's, the northern part of West Waterloo dock was infilled, along with Victoria Dock, and then partially re-excavated during the Leeds-Liverpool canal extension works in 2007.

The current dock retains none of the original form as designed by Hartley, and the only remaining works relating to the 1868 Lyster re-ordering is the eastern retaining wall. The remainder of the dock dates from the 1949 re-modelling to accommodate the river lock.

The site is currently vacant and holds no recreational value due to it not being publicly accessible. As mentioned in section 1.1.1, development is currently taking new road infrastructure (17F/2628) and a neighbouring Isle of Man Ferry Terminal consent (18F/3231).

## 1.2 The requirement for EIA

This ES has been prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (referred to in this ES as the 'EIA Regulations').

Schedule 1 of the EIA Regulations sets out the development criteria which EIA's must be submitted. Other developments which may require assessment are set out in Schedule 2. The Local Planning Authority (LPA) must determine whether Schedule 2 development is likely to give rise to any significant environmental impacts. If the LPA determines that the development may give rise to any significant environmental effects, an EIA must be undertaken. The LPA's determination is made using Schedule 3 of the EIA regulations.

The proposed scheme is considered to fall under Schedule 2, Category 10b of the EIA Regulations (an urban development infrastructure project where the development includes more than 150 dwellings).

Schedule 3 of the EIA Regulations also sets out further criteria to determine whether a Schedule 2 development should be considered as an EIA development. The characteristics, location and potential impact of the development confirmed this proposal should be considered as EIA and therefore a formal EIA screening request was considered unnecessary to submit to the LPA.

Early discussions with Liverpool City Council (LCC) in its role as LPA indicated that due to development being in a sensitive area (World Heritage Site Buffer Zone) and the potential for significant effects in the absence of mitigation the proposed scheme an EIA should take place as part of the application.

Also, previous applications in the area, which are of a similar scale to the proposed scheme, have required an EIA process. Further information on the scoping process are provided in Chapter 3: EIA Assessment Method.

Planning permission for the proposed Scheme is to be sought under the Town and Country Planning Act (TCPA) 1990.

## 1.3 Structure of this Environmental Statement

This ES is divided into three separate volumes as follows:

- Volume I: Main Report (this document). This comprises the main text including a description of the proposed scheme and the Site, the baseline conditions, an assessment of the likely significant environmental effects resulting from the proposed scheme, and proposed measures to mitigate those effects.

- Volume II: Additional Figures and Technical Appendices. This comprises supporting figures, plans and other illustrations or visualisations which are cross-referenced throughout Volume I and are not considered appropriate to be added into Volume I. Volume II also comprises the supporting technical information such as baseline surveys which are cross-references throughout Volume I in specific chapters.
- Volume III: Non-Technical Summary (NTS). This is intended to be readily accessible to the general public. It is concise and written in non-technical language providing a description of the proposed scheme, a summary of the significant environmental effects and proposed mitigation measures.

The requirement for information to be included in an ES are set out in Schedule 4 of the EIA Regulations and are further detailed in Chapter 3: EIA Assessment Methods.

Volume I of the ES comprises the following chapters:

- Chapter 1 – Introduction;
- Chapter 2 – Scheme Description;
- Chapter 3 – Assessment of Methodology;
- Chapter 4 – Alternatives and Design Evolution;
- Chapter 5 to 16 – Technical environmental assessments; and
- Chapter 17 – Summary of Significant Effects and Mitigation.

## 1.4 Statement of Competence

### 1.4.1 Competent Experts

The following team members have been responsible for their specialist discipline within this ES. Other team members producing supporting documentation for this application have also been included in Table 1.1 below.

**Table 1.1: Project Team**

| Role and Responsibility | Organisation |
|---|---|
| Applicant | Romal Capital |
| Architect | Ollier Smurthwaite |
| Landscape Architect | Planit-IE |
| Planning Consultant and EIA Co-Ordinator | Arup |
| ES Technical Chapters | |

| | |
|---|---|
| • Transport and Access;<br>• Air Quality;<br>• Noise and Vibration;<br>• Townscape and Visual Impact;<br>• Cultural Heritage & Archaeology;<br>• Ground Conditions & Contamination;<br>• Dock Infill Methodology;<br>• Flood Risk and Drainage;<br>• Wind;<br>• Daylight and Sunlight;<br>• Terrestrial Ecology;<br>• Marine Ecology. | • SCP Transport<br>• REC<br>• ADC<br>• Rob Burns Heritage & Urban Design<br>• Rob Burns Heritage & Urban Design<br>• CCG Geotechnical<br>• Clancy Consulting<br>• Clancy Consulting<br>• Buro Happold<br>• Buro Happold<br>• Middlemarch Environmental<br>• Ecospan |
| Design and Access Statement | Ollier Smurthwaite |
| Transport Assessment and Travel Plan | SCP Transport |
| Dock Infill Methodology | Clancy Consulting |
| Flood Risk Assessment | Clancy Consulting |
| Drainage Strategy | Clancy Consulting |
| Preliminary Ecological Appraisal | Middlemarch Environmental |
| Shadow Habitats Regulation Assessment | Middlemarch Environmental |
| Marine Ecology Report | Ecospan |
| Phase 1 and 2 Ground Contamination Report | CCG Geotechnical |
| ICOMOS Heritage Impact Assessment | Rob Burns Heritage and Urban Design |
| Planning Statement | Arup |
| Liverpool Waters Conformity Statement | Arup |
| Consultation Statement | Arup |

The ES has been undertaken by specialists and project managers who are experienced in their field, qualified to at least degree level and, where applicable, chartered with a relevant professional body. The experts who prepared the ES for the proposed scheme, along with their relevant expertise and experience are set out below. Names and CVs are available to the LPA on request.

**Table 1.2: Competent Experts**

| Technical Discipline | Experience and Qualifications |
|---|---|
| EIA Project Management | 8 years' experience in preparing large scale planning applications and Environmental Impact Assessments.<br><br>Qualifications:<br><br>BSC(Hons) Geography<br>MCD Town Planning<br>MRTPI Chartered Town Planner |
| Transport and Access | Over 13 years' experience in providing transport and highways advice on a wide range of EIA developments across the UK.<br><br>Qualifications:<br><br>Bsc Msc<br>CMIHT |
| Air Quality | Over 20 years of experience within the environmental sector and has worked for Environment Agency, Cheshire County Council and Cheshire East Council before working in private consultancy.<br><br>Qualifications:<br><br>MSc, Environmental Science<br>BEng (Hons) Civil Engineering |
| Noise and Vibration | 30 years experience, specialising in planning and licensing, environmental noise assessment and control and industrial noise assessment and control.<br><br>Qualifications:<br><br>MBA<br>BSc, Acoustics |
| Townscape and Visual Impact | Over 35 years' experience working within the built environment sector, specialising in new development and the historic environment.<br><br>Previously experience as a consultant for UNESCO, English Heritage and Design Officer (Wirral MBC); English Heritage as Historic Areas Advisor for the North West Region; and Urban Design and Heritage Manager for Liverpool City Council. |

| | |
|---|---|
| | Qualifications:<br><br>BA Hons Arch and Architectural History<br>MCD Town Planning |
| Cultural Heritage & Archaeology | Over 35 years' experience working within the built environment sector, specialising in new development and the historic environment.<br><br>Previously experience as a consultant for UNESCO, English Heritage and Design Officer (Wirral MBC); English Heritage as Historic Areas Advisor for the North West Region; and Urban Design and Heritage Manager for Liverpool City Council.<br><br>Qualifications:<br><br>BA Hons Arch and Architectural History<br>MCD Town Planning |
| Ground Conditions and Contamination | A Chartered Civil / Geotechnical Engineer and Chartered Environmentalist with 40 years` experience in design, execution, interpretation of geotechnical and geo-environmental ground investigations.<br><br>Qualifications:<br><br>MSc CEng MICE CEnv |
| Dock Infill Methodology | Over 10 years' experience in designing structures and civil engineering projects in and around Liverpool.<br><br>Qualifications:<br><br>BEng (Hons) Civil Engineering |
| Flood Risk and Drainage | Over 10 years' experience in designing structures and civil engineering projects in and around Liverpool.<br><br>Qualifications:<br><br>BEng (Hons) Civil Engineering |
| Wind | Over 11 years' experience in CFD modelling in various industries, including over 6 years' experience in Wind Engineering undertaking many studies concerning pedestrian comfort and thermal comfort in and around buildings in various parts of the world.<br><br>Qualifications:<br><br>MEng (Hons) Mechanical Engineering<br>Senior CFD Engineer |
| Daylight and Sunlight | 14 years' consulting experience in environmental analysis of buildings, including visual comfort studies and daylight, sunlight and overshadowing assessments for EIAs and planning reports. |

| | |
|---|---|
| | Qualifications:<br>B.Eng, Ph.D<br>C.Eng, MCIBSE |
| Terrestrial Ecology | Over 17 years' experience working as an ecologist. Experienced at working on a range of ecological projects specialising in ecological assessment and habitat design.<br>Qualifications:<br>CEcol CEnv MCIWEM MCIEEM DipSM |
| Marine Ecology | 15 years of experience in survey design, interpretation and reporting for the purpose of baseline surveys, Environmental Impact Assessments, Natura 2000 site condition assessments, Habitat Regulations Assessments and regulatory compliance.<br>Qualifications:<br>Benthic Taxonomist BSc (Hons) Marine Biology and Coastal Ecology, MSc Environmental Consultancy |

## 1.5 Availability of the Environmental Statement

Hard copies of the ES are available for public viewing at Liverpool City Council, Cunard Building, Water Street, Liverpool, L3 1AH, during normal office hours.

Electronic copies of the ES can also be downloaded from the LCC planning website (www.liverpool.gov.uk).

Additional hard or electronic copies of the ES can be purchased from Arup on request:

Arup
The Plaza
100 Old Hall Street
Liverpool
L3 9QJ
Tel: 0151 227 9397
Email: liverpool@arup.com

# 2 Scheme description

## 2.1 Introduction

This chapter of the ES describes the site and the proposed scheme that form the basis of the assessment of impacts undertaken in the technical assessments reported in technical chapters 5 – 16 of this ES.

## 2.2 Description of the Site

The site is located on vacant, previously developed land within Central Docks. It covers approximately 1.12ha and comprises areas of hardstanding, historic infilling, waterspace (part of West Waterloo Dock) and low-quality vegetation. Figure 1 depicts the site and its surrounding context.

Further hardstanding is located to the north and south of the site where future development is proposed as part of the Liverpool Waters Outline consent (10O/2424) and the Isle of Man Ferry Terminal consent (18F/3231). The West Waterloo Dock is located to the east of the site along with adjacent residential amenity in the form of Waterloo Dock apartments and Waterloo Warehouse. To the west, road infrastructure is currently being constructed to service development within this area of Central Docks (17F/2628) and further west of this lies the River Mersey.

The consented Northern Link Road (17F/2628) will help service the development and provide connectivity into and out of the site. The proposed Isle of Man Ferry Terminal (18F/3231) will also contribute to greater connectivity between Princes Dock and Central Dock via a pedestrian walkway. The Isle of Man Ferry Terminal connects to an existing pedestrian bridge link to Princes Dock which Peel Holdings are looking to improve and re-open prior to the ferry terminal being in operation.

The Site is within an area of historical industrial docklands which, as set out within section 1.1.2 has changed throughout the times. The current site dates from the 1949 re-modelling to accommodate the existing river lock.

To the south of Central Docks, Princes Dock has been developed to provide high-rise residential apartments, office blocks, hotel development, a multi storey car park and other commercial and ancillary uses. Residential development has started to commence in Central Docks through the construction of C04 & C06 (17F/1628) in addition to the aforementioned road infrastructure and Isle of Man Ferry Terminal.

Therefore, the main land uses and activities surrounding the Site are therefore varied and include:

- The Northern Link Road (currently being constructed), approximately 30m to the west;
- The proposed Isle of Man Ferry Terminal (consented), approximately 150m to the south;

- The Kingsway Tunnel, approximately 100m to the north at its closest point and running east to west underground;
- C04 & C06 (currently being constructed), approximately 150m to the north/north-east;
- A self-storage and transport company, approximately 200m to the north;
- Waterloo Dock Apartments, approximately 35m to the east, at their closest point;
- East Waterloo Dock, approximately 100m to the east;
- Waterloo Warehouse Apartments, approximately 180m to the east;
- Waterside Apartments, approximately 200m to the east;
- Waterloo Road, approximately 230m to the east;
- Costco, approximately 300m to the east, immediately beyond Waterloo Road;
- Alexandra Tower residential block, approximately 300m to the south/south-east;
- Princes Dock, approximately 300m to the south/south-east;
- City Loft Apartments, approximately 360m to the south/south-east; and
- The Three Graces (the Royal Liver Building, Cunard Building and Port of Liverpool Building) approximately 1.10km to the south/south-east.

## 2.3 Site Designations

The application site is allocated as a 'Site for Various Types of Development' in the current Development Plan which is the Liverpool Unitary Development Plan ("Liverpool UDP") (2012) and as a 'Mixed Use Area' in the submission draft of the Liverpool Local Plan (May 2018) ("emerging Local Plan").

The application site lies outside the World Heritage Site but is within the Buffer Zone. The site lies within close proximity to the Stanley Dock Conservation Area, a designated character area of Liverpool's World Heritage Site but is not situated within it. These characteristics are detailed further in Chapter 9: Cultural Heritage and Archaeology.

The Liverpool Bay Special Protection Area (SPA) Statutory Designated Site is located adjacent to the development area. A number of other European Statutory Sites are located close to the area; these are detailed further in Chapter 15: Terrestrial Ecology.

The nearest open watercourses are the West Waterloo Dock which forms the site's eastern boundary, and the River Mersey which is less than 50m to the west of the site. Princes Half Tide Dock is located to the south.

The site is located predominantly in Flood Zone 1 and therefore has a low probability of flooding, less than 4% of the site is considered to be within Flood Zone 3. Chapter 12: Flood Risk and Drainage details this allocation further and concludes that all forms of development are acceptable within the site boundary.

Further information regarding the existing site specific to certain disciplines can be found in the baseline section of each technical chapter.

## 2.4 Site access

The site is within acceptable walking distance of Liverpool city centre and the vast array of amenities the city of Liverpool has on offer. The site is also within acceptable walking distance of numerous transport facilities. The closest bus stop is located on Waterloo Road approximately 100m north of the approved Waterloo Road / northern link road junction. Moorfields and James Street Merseyrail stations can both be accessed in under a 23-minute walk time (or <1.9km walk distance).

Waterloo Road is located approximately 200m to the east of the site and is a strategic link connecting the Central Docks to Liverpool city centre. Waterloo Road, which is subject to a 30mph speed limit, turns into Regents Road in the north, leading to Bootle, and to the south provides a link to Princes Dock and the A5052 New Quay via Bath Street. Within the vicinity of the approved Waterloo Road / Northern Link Road signalised junction, Waterloo Road has a carriageway width of approximately 12.0m and benefits from regularly spaced street lighting columns and footways of over 2.0m in width on both sides of the carriageway. There is a signal-controlled pedestrian crossing, approximately 150m south of the approved Waterloo Road / Northern Link Road junction and a pedestrian refuge, less than 400m south of the approved junction on Waterloo Road.

The A5052 New Quay is located approximately 800m south-east of the development site and is subject to a 30mph speed limit. The A5052 New Quay is an urban A-road running on the western side of Liverpool city centre by the docks. In a southerly direction the A5052 New Quay turns into the A562 which links Liverpool to Widnes and to the north it links with Great Howard Street, leading to Bootle, and the A5053 which joins to the A59 linking Liverpool to Preston. The A5052 New Quay carriageway varies in width and benefits from footways of over 2.0m wide on both sides, dropped kerbs, signalised pedestrian crossings and street lighting.

As the development site is located within a close proximity to Liverpool city centre, walking infrastructure is generally well developed and of a good standard on route from the site to the city centre. Generally, the footways are wide and benefit from dropped kerbs, to help pedestrians with crossing roads, and regularly spaced lighting columns.

There are a number of pedestrian crossings provided at various points on the route to Liverpool city centre including two pedestrian refuge points along Waterloo Road and 4 signalised crossing points on the A5052 New Quay road.

The consented Isle of Man Ferry Terminal to the south of the proposed scheme will enhance the pedestrian connectivity between Central Docks and Princes Dock which the proposed scheme will contribute to through its enhancements to the pedestrian connectivity within Liverpool Waters.

When developed out, the Isle of Man Ferry Terminal development will connect to an existing pedestrian bridge link to Princes Dock, which Peel Holdings are looking to improve and re-open prior to the ferry terminal being in operation.

## 2.5 Liverpool Waters

The proposed scheme is located within land known as Liverpool Waters. Liverpool Waters is a waterfront site covering approximately 60ha of derelict dockspace which extends from Princes Dock to Bramley Moore Dock, owned by Peel Holdings.

Liverpool Waters benefits from an outline consent (10O/2424) for a range of uses including approximately 9,000 residential units, 300,000sqm commercial space, 53,000sqm of hotel space and a range of retail and community facilities in addition to enhanced public realm across the site.

The outline consent sets out 5 neighbourhoods, these being:

- Neighbourhood A – Princes Dock
- Neighbourhood B – King Edward Triangle
- Neighbourhood C – Central Docks
- Neighbourhood D – Clarence Docks
- Neighbourhood E – Northern Docks

The proposed scheme is situated within Neighbourhood C - Central Docks. However, the planning application is not considered to be part of the Liverpool Waters consent and is being processed as a standalone planning application. This is explained further through the Planning Statement and Liverpool Waters Conformity Statement which are supporting documents as part of this planning application.

Therefore, the cumulative effects of the proposed scheme and the development set out within Liverpool Waters are considered through the technical chapters (chapters 5-16) within the Cumulative Effects section.

## 2.6 Sensitive Receptors and Environmental Constraints

Receptors and constrains have been identified within the technical chapters (chapters 5-16) and have been summarised within the below list. The technical chapters detail how the scheme has responded to the potential effects to these receptors in addition to any constraints.

### Residential

Waterloo Docks Apartments, approximately 35m to the east;

Waterloo Warehouse Apartments, approximately 180m to the east;

Waterside Apartments, approximately 200m to the east;

Princes Dock, approximately 300m to the south/south-east;

City Loft Apartments, approximately 360m to the south/south-east; and

C04 & C06 (currently being constructed), approximately 150m to the north/north-east.

### Retail / Business

Costco, approximately 300m to the east, immediately beyond Waterloo Road.

### Recreational

Leeds / Liverpool Canal and waterspace, on site.

### Infrastructure

Northern Link Road, approximately 30m to the west;

Waterloo Road, approximately 230m to the east;

Kingsway Tunnel (underground), approximately 100m to the north.

### Historic Environment

Liverpool Maritime Mercantile City World Heritage Site, approximately 100m to the south;

Liverpool Maritime Mercantile City World Heritage Site Buffer Zone, on site.

### Controlled Waters

River Mersey, approximately 50m to the west;

West Waterloo Docks, on site;

East Waterloo Docks, approximately 150m to the east;

Princes Half-Tide Docks, approximately 200m to the south;

Princes Dock, approximately 200m to the south.

### Air Quality Management Area

Air Quality Management Area, on site.

### Ecological

Liverpool Bay SPA, onsite;

Mersey Estuary SPA / Ramsar, approximately 5km to the south;

Mersey Narrows and North Wirral Foreshore SPA / SSSI / Ramsar, approximately 1km to the west;

Ribble and Alt Estuaries SPA / Ramsar, approximately 7km to the north;

Dee Estuary SPA / Ramsar / SAC, approximately 5km to the north;

Sefton Coast SAC, approximately 7km to the north.

## 2.7 The Proposed Scheme

### 2.7.1 Development Description

This planning application seeks full consent for the construction of a new residential development with supporting commercial floorspace and enhanced public realm within Central Docks, Liverpool Waters.

The proposed scheme is described as:

*Full planning consent for residential development of up to 538 units (Use Class C3) and ground floor commercial space (Use Classes A1, A3 or A4) with associated partial dock infill of West Waterloo Dock, access, parking, servicing, soft and hard landscaping and public open space including a floating timber jetty and dockside walkway.*

### 2.7.2 Land Use and Quantum of Development

The proposed scheme consists of four separate residential blocks (A-D) that are all rectangular in form and reference the historic warehouse buildings that were located within this area, including the existing Waterloo Warehouse. Blocks A and B front the West Waterloo Dock and will extend over the dock, creating a colonnade with the ends of the buildings constructed within West Waterloo Dock itself. Blocks C and D front the River Mersey and sit in line with the Northern Link Road.

The main elements of the proposal are summarised as follows:

Construction of a residential development consisting of four 10 storey blocks, 32.4m blocks accumulating in 538 residential units and commercial floorspace consisting of:

- 400sqm of commercial space with the consent for either use classes A1, A3 or A4
- 379 1-bedroom apartments (70%);
- 137 2-bedroom apartments (26%); and
- 22 3-bedroom apartments (4%).

165 car parking spaces (equating to an 31% parking provision) comprising of:

- 142 car spaces
- 10 disabled spaces
- 13 electric vehicle spaces
- 280 secure cycle spaces

Partial infill of the West Waterloo Dock to create new land to construct the development;

Creation of new public open space, a 6m dockside walkway, timber jetties for mooring of boats within West Waterloo Dock;

Provision of an enhanced pedestrian and cycle link to further support connection into the wider Central Docks neighbourhood. This enhanced pedestrian and cycle link will connect to the proposed pedestrian link within the neighbouring Isle of Man Ferry Terminal development.

### 2.7.3 Proposed Site Access

Vehicular access to the proposed scheme will be provided from a priority-controlled access located to the north-west of the site, off the approved new spine linking Waterloo Road to the Northern Link Road currently being constructed. The proposed access has a carriageway width of approximately 6m and operates on a two-way basis.

Pedestrian access will also be provided from the new link road. Whilst not part of this proposed scheme, future aspirations for the area include a pedestrian and cycle link between the proposed Isle of Man Ferry Terminal and Princes Dock. As part of the consented Isle of Man Ferry Terminal proposals, a pedestrian and cycle link will be provided along the eastern boundary of the site, adjacent to the dock, which will connect to the future link, providing a direct route for pedestrians into the city centre.

The proposed scheme proposed to continue and enhance this pedestrian and cycle link along the Waterloo Dock to ensure a protected route along the historic waterfront. There is then an opportunity for this link to continue towards the north of Liverpool Waters as further development comes forward.

### 2.7.4 Servicing and Parking

The access and internal site layout has been designed to accommodate a large refuse vehicle and a 12m rigid vehicle to avoid servicing and deliveries taking place on the Northern Link Road outside the site boundary. A turning head is provided at the south west of the site to allow vehicles to turn around safely.

The car park will provide a total of 165 spaces (including 10 disabled bays) for the residential use which equates to a 31% parking provision. In addition to the car parking spaces, 280 secure cycle parking spaces will be provided which equates to a 52% parking provision. Further details regarding proposed transport can be found in Chapter 5: Transport and Access.

## 2.8 Construction Phase

This section sets out indicative details of the site reclamation and construction for the proposed scheme. Each of the technical chapters (chapters 5-16) within the ES consider any likely significant environmental effects resulted from this part of works which are required to complete the proposed scheme.

Due to the limitation of not having a confirmed contractor agreed for the construction of the proposed scheme yet (which is usual at this stage of the development process) the details are necessarily broad and may be subject to modification. However, it is considered that likely significant environments relating to the construction phase have been able to be identified correctly, with suitable confidence based on the experience and knowledge of the authors of the technical chapters within the ES. The mitigation measures which have also been identified where appropriate also contain sufficient flexibility should modifications be required. Where there is uncertainty, assessments have assumed a reasonable worst case scenario.

### 2.8.1 Indicative Programme

An approximate programme is set out below.

- February – August 2020: Enabling Works
- August 2020 – August 2022: Construction of Buildings
- September 2022: Occupation of buildings

Although the dates set out below may be subject to change, the period of time required to complete each stage should still apply.

### 2.8.2 Construction Environmental Management Plan

A detailed CEMP will be updated and implemented to outline environmental issues identified within the site; provide a register of legislation and consents; define agreed mitigation measures in work method statements; and ensure compliance with current legislation, works licences and permits, planning approvals and best practice guidance.

Issues that could be considered within the CEMP could include:

- Noise, Vibration and Dust Management;
- Public Safety, Emergencies and Accident Mitigation;
- Management of sub-contractors;
- Waste Management, Recycling and Disposal of Materials;
- Hazardous Materials and Ground Contamination;
- Site Drainage and Water Resources;
- Protection of Ecological Resources.

This document will be agreed with the LPA and will be prepared as part of a suitably worded condition within the decision notice.

### 2.8.3 Hours of Work

Construction work hours will typically be Monday to Friday 08:00 to 18:00 and Saturday 08:00 to 13:00 with no working on Sundays or bank holidays. Where on-site works are to be conducted outside the core hours these will be agreed with the LPA before work commences, and any residents that may be affected by the out of hours works will be notified in advance. The final construction work hours will be agreed through a suitable worded planning condition.

### 2.8.4 Construction laydown and traffic

As the majority of the site is vacant, the construction phase is expected to involve the use of plant, machinery and HGVs required for site clearance and earthworks, followed by the construction of the development. Construction traffic is expected to access the site via a dedicated construction access.

The level of construction traffic has been estimated during the infill period, which is considered to be the worst-case scenario in terms of material movement. The infill period is estimated to generate approximately 131 HGV movements (two-way) and 60 LGV movements (two-way) during the day. Compared to the existing traffic flows on the highway network, this increase in traffic is significantly less than 10%.

Further information on the dock infill methodology can be found in Chapter 11: Dock Infill Methodology and Impact.

### 2.8.5 Staff

It is estimated the proposed scheme will require approximately 100 personnel on-site per day over the entire construction phase.

Construction staff are anticipated to travel to the site via the existing local road network to temporary construction parking located within the Liverpool Waters site, general labourers are expected to be located in the local area, whilst management staff are more likely to travel further from within North West England.

The contractor will seek to maximise sustainable options such as public transport, cycling and car share which could be detailed as part of the Construction Environment Management Plan (CEMP) which will be agreed with the LPA as part of a suitable worded condition.

### 2.8.6 Partial Infill of West Waterloo Dock and Land Reclamation

As set out in Figure 2.1 the proposed scheme requires land reclamation works to accommodate new development. This would include partial infill of West Waterloo Dock. An area of West Waterloo Dock which has been remodelled several times, the last being in 1949 to accommodate the river lock.

The area of infill would provide land which would be utilised by built development, access roads, soft and hard landscaping in addition to service car parking. The infill would also adjoin with the consented infill for the Isle of Man Ferry Terminal allowing a continuous link between developments to occur. Both responsible parties will need to communicate with each other to ensure consideration for both developments are taken place.

Without infill, the site would be insufficient to deliver the development and bring about the much-needed public, protected connectivity into the wider site which is being proposed through by the scheme.  It would also hinder this aspect of the vision for Liverpool Waters.

Further information regarding the dock infill can be found within Chapter 11: Dock Infill Methodology and Impact.

### 2.8.7 Lighting

It is likely that temporary site lighting will be required during the winter months in the early and late parts of the day to enable safe working.  Plant and equipment will also have safety lighting during dark working hours.  Temporary lighting will be arranged to that glare is minimised outside the construction site and so not to significantly impact on nearby receptors, this will be set out in the aforementioned CEMP.

Security lighting will also be required during works.

### 2.8.8 Operation Phase

Once construction is completed and the building is occupied, the development will be used as residential use with ground floor commercial activities.  This will bring about an increase of vehicular and pedestrian activity to the site compared to the current baseline.

The development will provide a total of 169 car parking spaces for residents which equates to a 31% provision. The vehicle trip generation undertaken suggests that there would be between 124 two-way trips generated within the AM peak hour and 135 two-way trips generated within the PM peak hour.

The pedestrian trip generation undertaken within the TA suggests that the development would result in approximately 85 pedestrian movements within the AM peak and 111 pedestrian movements within the PM peak.

# 3 EIA Assessment Methods

This chapter of the ES sets out the overall approach and methodology for undertaking the EIA of the proposed scheme, including the process for determining the issues to be included within the scope of assessment and the approach to assessing the significance of environmental effects that are anticipated to arise as a result of the proposed scheme.

## 3.1 The requirement for EIA

This ES has been prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (referred to in this ES as the 'EIA Regulations').

Schedule 1 of the EIA Regulations sets out the development criteria which EIA's must be submitted. Other developments which may require assessment are set out in Schedule 2. The Local Planning Authority (LPA) must determine whether Schedule 2 development is likely to give rise to any significant environmental impacts. If the LPA determines that the development may give rise to any significant environmental effects, an EIA must be undertaken. The LPA's determination is made using Schedule 3 of the EIA regulations.

The proposed scheme is considered to fall under Schedule 2, Category 10b of the EIA Regulations (an urban development infrastructure project where the development includes more than 150 dwellings).

Schedule 3 of the EIA Regulations also sets out further criteria to determine whether a Schedule 2 development should be considered as an EIA development. The characteristics, location and potential impact of the development confirmed this proposal should be considered as EIA and therefore a formal EIA screening request was considered unnecessary to submit to the LPA

Early discussions with Liverpool City Council (LCC) in its role as LPA indicated that due to development being in a sensitive area (World Heritage Site Buffer Zone) and the potential for significant effects in the absence of mitigation the proposed scheme an EIA should take place as part of the application.

Also, previous applications in the area, which are of a similar scale to the proposed scheme, have required an EIA process.

## 3.2 Information for inclusion in the Environmental Statement

The requirements with regard to the content of an ES are outlined in Schedule 4 of the 2017 EIA Regulations. The ES must provide all information included as is reasonably required to assess the environmental effects of the proposed Scheme. Table 3.1 sets out where the relevant information required under Schedule 4 is located within the ES.

**Table 3.1: Requirements of Schedule 4 of the 2017 EIA Regulations**

| Summary of requirements of Schedule 4, Part 1, by paragraphs | Location of information in this ES |
|---|---|
| Description of the development, including in particular: | |
| (a) A description of the location of the development | Chapter 2: Scheme Description |
| (b) A description of the physical characteristics of the whole development | Chapter 2: Scheme Description |
| (c) A description of the main characteristics of the operational phase of the development | Chapter 2: Scheme Description |
| (d) An estimate, by type and quantity, of expected residues and emissions produced during the construction and operation phases | Chapters 5-16: Technical Chapters |
| A description of the reasonable alternatives studied by the applicant and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects. | Chapter 4: Alternatives and Design Evolution |
| A description of the aspects of the current state of the environment and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge. | Chapter 5-16: Technical Chapters |
| A description of the likely significant effects of the Scheme on the environment, including cumulative effects. | Chapter 5-16: Technical Chapters |
| A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment. | Chapter 5-16: Technical Chapters |
| An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information | Chapter 5-16: Technical Chapters |
| A non-technical summary | Volume III of the ES is the Non-Technical Summary. |

## 3.3 Screening, Scoping and Consultation

As mentioned previously, a formal EIA screening letter has not been issued to LCC as it was considered an EIA would be required for proposed scheme due to the location of the proposed scheme and based on nearby development of similar scale requiring EIAs as part of their planning applications too.

The development falls under Schedule 2, Category 10b of the EIA Regulations and is situated within a sensitive area as defined by Schedule 3 (Liverpool Mercantile Maritime UNESCO World Heritage Site Buffer Zone).

Under Regulation 15 of the 2017 EIA Regulations under which this proposed Scheme was scoped *"a person who is minded to make an EIA application may ask the relevant planning authority to state in writing their opinion as to the scope and level of detail of the information to be provided in the environmental statement (a "scoping opinion*).

Consultation is a core component in the development of a scope of assessment that is comprehensive, proportionate and balanced. The considerations of interested parties provide insight on site-specific issues, which assists in focusing environmental studies on those issues most relevant to the proposed Scheme and is also important in shaping the design. The ES includes consideration of topics/issues raised by statutory consultees and other stakeholders that have been consulted with throughout the process. This consultation is summarised in the relevant technical chapters where relevant.

Through pre-application process, the project team have liaised with key stakeholders and consultees to ensure the planning application has picked up on issues which need to be considered and assessed to show the proposed scheme doesn't produce any adverse impact onto the environment. Consultees have included:

- Liverpool City Council;
- MEAS;
- Natural England;
- Historic England;
- Environment Agency;
- Canal and River Trust;
- Marine Management Organisation;
- Places Matter!;
- Liverpool Waters Conservation Management Board;
- Peel Land and Property; and
- Local residents and businesses.

Through discussions with LCC and relevant consultees such as MEAS, Natural England and Environment Agency the scope of the EIA was agreed which aligned with similar methodologies for similar applications which produced ES's in close proximity to the development site. Specifically:

- 17F/2056 – The Lexington;
- 17F/0456 – Hive City Docks;
- 17F/0913 – Plaza 1821;
- 17F/1628 – Park Central (C04/C06);
- 18F/3231 – Isle of Man Ferry Terminal.

### 3.3.1 Scoped in topics

Based on the above, the following topic areas are addressed within the ES:

- Transport and Access;
- Air Quality;
- Noise and Vibration;
- Townscape and Visual Impact;
- Cultural Heritage and Archaeology;
- Ground Conditions and Contamination;
- Dock Infill Methodology and Impact;
- Flood Risk and Drainage;
- Wind;
- Daylight and Sunlight;
- Terrestrial Ecology; and
- Marine Ecology.

### 3.3.2 Scoped out topics

The following topics have been excluded from the EIA on the basis that it was considered that there would be no significant effects or that the topics would be dealt with within other ES chapters or other documents supporting the planning application.

- Sustainability and Energy;
- Socio-Economics;
- Population and Human Health (considered within Air Quality, Noise and Vibration and Ground Conditions and Contamination);

- Climate Change (considered within Flood Risk and Drainage and Air Quality); and
- Major accidents and disasters.

## 3.4 Means of Assessment

Each technical chapter (chapter 5-16) details the specific methodology undertaken to assess the impacts on that discipline from the proposed scheme. However, generally the EIA has been based upon:

- Baseline review of the site and surrounding area via various sources of existing information, data and reports;
- Desk-top and specific site surveys;
- Legislation and planning policy consideration in additional to technical guidance and best practice;
- Identification of potential environmental effects and an evaluation of their likely duration, magnitude and significance;
- Consideration of potentially sensitive receptors that could be affected by the Development;
- Expert opinion; and
- Where relevant, consultation with appropriate organisations and stakeholders.

## 3.5 Baseline Data Gathering

A wide range of baseline data on the local environmental conditions has been used for the purposes of the assessment. Data has been gathered from a combination of sources, including:

- published documentary information from a variety of sources including historical and contemporary records;
- field survey information including background noise levels, ecological features, landscape character and traffic levels on the road network; and
- other survey information including topographic surveys, aerial photography and geotechnical data.

More detailed information is included in each of the technical chapters, as required to describe the aspects of the environment that have the potential to be significantly affected by the proposed Scheme. Where relevant, the technical chapters (Chapters 5-16) of this ES describe their spatial scope, which includes the rationale for determining the specific area within which the assessment is focused. The study areas take into account the nature of the potential impacts, and the locations of potentially affected environmental resources and receptors.

The EIA assesses the environmental impacts of the proposed scheme at both the construction and operation phase (where appropriate). For the purposes of the ES, the construction phase includes the proposed partial dock infill and the operational phase of the proposed scheme is considered to be when the build is occupied by residents and commercial uses.

## 3.6 Scope of Work

The EIA covers the physical extent of the proposed scheme as described in Section 2. It is defined by the area of land to be used, the nature of the current environmental conditions and the manner in which impacts are likely to be generated.

It is important to note however that the influence of many predicted impacts can extend beyond the immediate site boundary. Where identified and relevant, these impacts have also been assessed as part of the EIA.

## 3.7 Design Development and Impact Avoidance

Where appropriate, technical chapters set out specific measures that have been incorporated into the design of the proposed scheme to avoid or minimise impacts, this includes any industry standard impact avoidance measures or best practice guidance to be implemented during construction or operation.

## 3.8 Impact Assessment Method and Significance Criteria

This ES contains a comprehensive assessment of the likely significant effects on the environment arising from the proposed scheme.

In accordance with the 2017 EIA Regulations each assessment describes *"the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development*". Where it has not been possible to quantify effects, qualitative assessments have been carried out, based on available knowledge and professional judgment. Where uncertainty exists, this has been noted in the relevant technical chapter and a precautionary approach taken.

Where appropriate, the individual topic assessments consider and describe each of the above effects during the construction phase and the operational phase of the proposed scheme. The methodologies used for individual technical assessments within the EIA vary from topic to topic, in accordance with topic specific guidance. An assessment of significance is made by each technical assessment having regard to aspects such as the scale, duration and permanence of the impact and sensitivity of the receptors. The methodologies used for individual technical assessments are set out in detail in the topic sections (Chapters 5-16 of this ES).

To enable comparison between technical topics and aid understanding of the EIA findings the following standard terms are used wherever possible to describe the relative significance of effects throughout the ES.

- **Negligible**: no significant effect (either adverse or beneficial) to an environmental resource or receptor;
- **Minor significance**: slight, very short or highly localised effect of low significance;
- **Moderate significance**: some effect (by extent, duration or magnitude) which may be considered of moderate significance; or
- **Major significance**: considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards which may be considered of substantial significance.

Effects identified are also expressed as:

- **Adverse**: detrimental or negative effects on an environmental resource or receptor:
- **Beneficial**: advantageous or positive effects on an environmental resource or receptor.

Moderate and major effects are generally considered to be '**significant**' for the purposes of the EIA Regulations, in accordance with standard EIA practice.

Table 3.2 shows how the interaction of magnitude and sensitivity can be combined to determine the significance of an effect. Where there are deviations away from this matrix (due to the technical guidance or approach of a specific discipline), this is highlighted within the relevant technical chapter and the reason for the variation explained.

**Table 3.2: Matrix defining the relative significance of effects**

| **Magnitude of Impact** | **Sensitivity/Importance of Receptor** | | | |
|---|---|---|---|---|
| | **High** | **Medium** | **Low** | **Very Low** |
| **High** | Major | Major | Moderate | Minor |
| **Medium** | Major | Moderate | Minor | Negligible |
| **Low** | Moderate | Minor | Negligible | Negligible |
| **Very Low** | Minor | Negligible | Negligible | Negligible |

## 3.9 Identification of Effects

### 3.9.1 Construction effects

Construction effects are those that will be temporary effect that arise during construction aspects including:

- Earthworks;
- Partial Dock Infill;
- Construction of buildings; and
- Landscaping.

The effects generally cease after the completion of the construction and landscaping phases and are generally considered to be short-term. Examples include construction noise, vibration and dust effects arising from construction traffic and earthworks.

### 3.9.2 Operational effects

Once the construction and landscaping of the proposed scheme is complete, the operational phase of the proposed scheme is considered to be a period during which the development is in use. In this instance, the predominant use will be for residential with some low scale commercial activity taking place on the ground floor.

The operational assessment identifies effects arising from both the existence and operation of the proposed scheme:

- Long-term existing effects arise from the physical presence of the development and are generally unchanging over time e.g. effects from land take for the proposed scheme such as change in the visual impact; and
- Effects from operational activities through the proposed scheme such as operational noise or vehicular movements.

## 3.10 Mitigation

Schedule 4 of the 2017 EIA Regulations requires an ES to include "*A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements*".

These measures are generally referred to as mitigation measures (although it is noted that offset measures are more akin to compensation measures where mitigation of the effect is not possible).

For the purposes of this ES, mitigation measures have been broadly defined to incorporate the following:

- measures to prevent or avoid significant adverse effects on the environment;
- measures to reduce significant adverse effects on the environment; and
- measures to remedy significant adverse effects on the environment through enhancement.

In general, a 'hierarchy' of mitigation has been adopted during this EIA, such that potentially significant adverse environmental effects have been firstly prevented or avoided through the iterative design process. Where it has not been possible to design-out environmental effects, they have been reduced or ameliorated as far as practicable through mitigation. All types of mitigation measures, including those which are recommended through best practice, are described within the individual topic sections. A summary of the significant effects and mitigation is provided in Chapter 17: Summary of Significant Effects and Mitigation.

## 3.11 Residual Effects

The effects which remain following the implementation of mitigation measures are known as 'residual effects'. This ES assesses the significance of the identified effects, following the implementation of the proposed mitigation measures, and considers if the proposed scheme is likely to cause significant residual effects.

These residual effects and mitigation relied on in the assessments are also summarised in Chapter 17: Summary of Significant Effects and Mitigation.

### 3.11.1 Construction effects

Construction effects are defined in this ES as those temporary effects that arise during construction aspects including:

- Earthworks;
- Partial Dock Infill;
- Construction of buildings; and
- Landscaping.

The effects generally cease after the completion of the construction phase and are generally considered to be short-term. Examples include construction noise, vibration and dust effects arising from construction traffic and earthworks.

### 3.11.2 Operational effects

Once the construction and landscaping of the proposed scheme is complete, the operational phase of the proposed scheme is considered to be a period during which the development is in use. In this instance, the predominant use will be for residential with some low scale commercial activity taking place on the ground floor.

The operational assessment identifies effects arising from both the existence and operation of the proposed scheme:

- Long-term existing effects arise from the physical presence of the development and are generally unchanging over time e.g. effects from land take for the proposed scheme such as change in the visual impact; and
- Effects from operational activities through the proposed scheme such as operational noise or vehicular movements.

## 3.12 Cumulative Effects

As required by Schedule 4 of the 2017 EIA Regulations, the ES also considers the potential for cumulative effects with other developments within each technical chapter. Committed development (i.e. those that have planning permission but not yet constructed) has been identified with potential for cumulative effects with the proposed scheme.

The various technical chapters (chapters 5-16) consider the committed development where appropriate to understand if there are any significant effects caused by the combination of development.

The assessment to be presented within the ES must consider the potential for significant environmental impacts to affect the baseline conditions as a direct/indirect result of the proposed scheme. The baseline conditions are defined as the existing state of the environment and how it may develop in the future in the absence of the proposals. Therefore, it is important to state that only the following scenarios have been assessed for:

- The proposal in the context of the existing site at the time of the assessment (baseline);
- The proposal in the context of relevant committed development.

Cumulative effects can be categorised into two types.

**Type 1 Effects:** The combined effects of individual effects resultant from the proposed scheme upon a set of defined sensitive receptors, for example noise, dust and visual effects; and

**Type 2 Effects:** The combined effects arising from another development site or sites, which individually might be insignificant, but when considered together, could create a significant cumulative effect.

Type 1 effects could relate to the construction works where effects such as noise and dust nuisance can occur together at nearby sensitive receptors.

Type 2 effects, a review of planning applications has been undertaken to identify the other schemes to be considered within the cumulative effects assessment and these have been identified in Table 3.3 below.

## Table 3.3: Committed Developments

| Planning Application Reference & Location | Development Description |
|---|---|
| 10O/2424 - Liverpool Waters<br><br>Entire Liverpool Waters Site | The comprehensive redevelopment of up to 60 hectares of former dock land to provide a mixed use development of up to 1,691,100 sq m, comprising: up to 733,200 sq m residential (Class C3) (9,000 units), up to 314,500 sq m business (Class B1), up to 53,000 sq m of hotel and conference facilities (Class C1 ) (654 rooms), up to 19,100 sq m of comparison retailing (Class A1), up to 7,800 sq m of convenience retailing (Class A1), up to 8,600 sq m of financial and professional services (Class A2), up to 27,100 sq m of restaurants and cafes (Class A3), up to 19,200 sq m of drinking establishments (Class A4), up to 8,900 sq m of community uses (Class D1), up to 33,300 sq m of assembly and leisure (Class D2) up to 17,600 sq m for a cruise liner facility and energy centre (Sui Generis), up to 36,000 sq m for servicing (Sui Generis), and up to 412,800 sq m for parking (Sui Generis) together with structural landscaping, means of access, formation of public spaces and associated infrastructure and public realm works. (Outline Application) |
| **Applications within the LW site which have commenced or have received consent** | |
| 15F/0560 – William Jessop House<br><br>A-03 Princes Dock<br><br>Consented | To erect an eight-storey office building (Use Class B1) with flexible ground floor space for retail, financial and professional, food and drink and office use (Use Classes A1/A2/A3/A4/B1) |
| 17F/2056 – The Lexington<br><br>A-04 Princes Dock<br><br>Commenced | To enable construction of a 35 storey residential tower (Use Class C3) comprising 325 private rented sector apartments and 40 car parking spaces, 80 cycle parking spaces together with plant, storage, reception, residential amenity areas, hard and soft landscaping and associated works on currently vacant land at William Jessop Way, Princes Dock, Liverpool 3. |
| 17F/0913 – Plaza 1821<br><br>A-05 Princes Dock<br><br>Commenced | To erect 15 storey residential tower comprising 105 apartments and two ground floor commercial units (A1/A3/A4 Use) with 26 external car parking spaces and landscaping works |
| 17F/0456 – Hive City Docks | To erect 31 storey residential tower (Use Class C3) comprising 278 private rented sector apartments and 27 car parking spaces (2 disabled), 3 motorcycle bays, 90 cycle parking spaces in addition |

| | |
|---|---|
| A-06 Princes Dock<br><br>Consented | to a ground and top floor restaurant/cafe (Use Class A3) together with plant, storage, reception, residential amenity areas and hard and soft landscaping. |
| 17O/3230 – Cruise Liner Terminal<br><br>Located on Princes Jetty<br><br>Consented | Hybrid application comprising Full application for the controlled dismantling and removal of the building shown on the Demolition Parameter Plan (Plan No.2), redundant mooring dolphins and dilapidated structures including the (timber framed and concrete decked) Princes Jetty in the River Mersey and; Outline planning application for the construction of a new Cruise Liner Terminal (to cater for an increase in the number of cruise passengers) on a suspended deck structure in the River Mersey at the Princes Jetty site, together with the erection of a vehicular link span bridge and pedestrian bridge/walkways (linking the new cruise terminal building and existing floating pontoons which act as the landing stage/berth for cruise ships, naval ships, working ships and prestige vessels); improvements to the existing landing stage (floating pontoons), including modification of existing buildings shown on the Demolition Parameter Plan (Plan No.2) and creation of an ancillary building for storage and for use by cruise related operational staff; improvements to Princes Parade to incorporate pedestrian crossing facilities, provision of terminal parking, pick up and drop off facilities and supporting development. The new cruise terminal building is intended to be used for city events when not in use for its primary cruise operations/port related purposes. All matters are reserved. |
| 18F/3231 – Isle of Man Ferry Terminal<br><br>C- 01 Central Docks<br><br>Consented | Construction of two-storey ferry terminal building with parking, vehicle queuing areas, security infrastructure, link space bridge and pedestrian route. |
| 17F/1628 – Park Central<br><br>C-04 and C-06 Central Docks<br><br>Commenced | To erect a part 14 and part 8 storey residential block (Use Class C3) comprising 237 apartments for market sale with commercial space at ground level to incorporate B1a (Office); A3 (Restaurant/cafe); and D2 (Leisure/gym) use; 51 parking spaces; 120 cycle parking spaces, together with plant; reception; hard and soft landscaping; access and associated works. |
| 17F/2628 – Northern Link Road<br><br>Central Docks<br><br>Commenced | To construct new link road, leading from Waterloo Road into West Waterloo Dock to provide access to the proposed relocation of the Isle of Mann Ferry Terminal. Works to include widening of West Waterloo Dock Canal Bridge to accommodate new link. |

| Other nearby developments | |
|---|---|
| 19F/1290 – Site bounded by Waterloo Road / Paisley Street / Roberts Street / Greenock Street<br><br>Consented | To demolish existing building and erect 17-storey building comprising 140 residential units with associated mezzanine, residents lounge and gym, cycle store, refuse storage, rooftop plant, basement level carpark, and commercial unit at ground + mezzanine floor (use class A1, A2, A3, A4) |
| 17F/0042 – Ovatus<br><br>Leeds Street<br><br>Consented | Erection of 27 storey residential development plus basement levels, comprising 168 dwellings, plus associated public spaces. |
| 17F/0340 – Infinity<br><br>Leeds Street<br><br>Commenced | Demolition of existing buildings and construction of three towers (39, 33 and 27 storeys) together with a two-storey podium and basement, comprising 1,002 residential units together with commercial/retail uses, offices, leisure and parking spaces. |
| 16F/2634 - 30-36 Pall Mall<br><br>Commenced | Demolition of existing buildings and structures and erection of part 10 and part 22 storey residential development comprising 336 apartments with associated communal facilities, commercial units and parking areas. |
| 14F/2543 – North Point<br><br>70-90 Pall Mall<br><br>Commenced | Demolition of industrial buildings with façade retention of 70-90 Pall Mall and erection of a 4 to 8 storey mixed use development comprising 426 residential units, a multi-storey car park, offices, retail units and leisure area. |

## 3.13 Assumptions and Limitations

A number of assumptions have been made during the preparation of the ES, and the assessments have been subject to certain limitations. The key assumptions that apply across the ES are summarised as follows but assumptions relevant to specific disciplines are discussed in the relevant technical chapters of this ES:

- that the principal land uses adjacent to the site remain as they are at the time of the ES submission (the cumulative impact assessment considers reasonably foreseeable changes, as do the future baseline conditions as defined within each technical chapter, to ensure the assessment is robust); and
- that information provided by third parties, including publicly available information and databases is correct at the time of ES publication;
- a Construction Environmental Management Plan (CEMP) will be produced as a pre-commencement condition after the planning application is determined.

Once discharged, the CEMP would be monitoring during the construction of the proposed scheme.

- baseline conditions have been assumed to be accurate at the time of the physical surveys but, due to the dynamic and changing nature of the environment, conditions may change during the construction phase and the operational phase. This is not considered to affect the robustness of the assessment reported within this ES; and
- the assessment of cumulative effects has been reliant on the availability of information on the identified committed developments. Assumptions have been made regarding those developments where information is not available, to ensure the assessment is as robust as possible.

## 3.14 Preparation of the Environmental Statement and Non-Technical Summary

The results of the EIA process are reported in this ES, which has been prepared in accordance with the requirements of Schedule 4 of the 2017 EIA Regulations. In line with these requirements, a non-technical summary (NTS) document has also been prepared which forms part of this ES and is bound separately as Volume III.

# 4 Alternatives and Design Evolution

## 4.1 Introduction

This chapter sets out the alternatives considered for the proposed scheme in relation to alternatives that have been considered for development options. It also includes an explanation of where changes have been made to the design through the process of evaluation and environmental assessment.

Schedule 4 of the 2017 EIA Regulations requires that the ES includes "*A description of the reasonable alternatives studied by the applicant which are relevant to the proposed project and its specific characteristics and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects*".

The 2017 EIA Regulations do not impose a specific requirement to consider and assess alternatives, however, the consideration of alternatives to a range of aspects of the location and design is best practice in design development and carrying out EIA. An outline of the main alternatives considered and the rationale for choosing the preferred option is set out in this chapter, further information can be found in the Design and Access Statement which supports this planning application.

Alternatives and amendments to proposed Scheme design have been developed in an iterative process, influenced by consultation with LCC's Planning Department and statutory consultees, with the aim of avoiding or minimising adverse environmental effects where possible.

## 4.2 Background to the Development

As set out in section 2.5, the vision for the proposed scheme has been established through the original vision of the outline planning consent for Liverpool Waters (10O/2424) secured on 19th June 2013. This is regarded as playing a significant part in contributing to the objectives of key regeneration strategies and initiatives operating at the local, sub regional and regional level.

The entire site represents a hugely important physical regeneration opportunity on a scale not witnessed in the City since the formation of the docks themselves over 200 years ago. Through their existing development plan (Liverpool UDP) and their emerging Local Plan, LCC have identified land located within Liverpool Waters as a "mixed use area" due to its strong links to the City Centre and its potential to generate transformational socio-economic benefits.

Although this development is not part of the Liverpool Waters Outline Consent, it does sit within the Liverpool Waters site and the proposed scheme sits in the entirety of plot C02 (where the proposed scheme is located) and also has connection to plot C01 as identified in the outline consent.

In November 2019, the Central Docks Masterplan was approved by LCC (19DIS/1315) which was a requirement of the conditions set within the decision notice of the outline consent. The approval of the Central Docks Masterplan details that plots C01 and C02 require the partial infill of West Waterloo Dock to ensure appropriate development is capable along the waterfront. Residential use is also set out as the appropriate use for plot C02.

The Liverpool Waters Conformity Statement which supports this application goes into further detail about the relationship between this standalone application and the outline consent

## 4.3 Alternatives

### 4.3.1 The 'Do Nothing' alternative

Best practice guidance in EIA suggests that the assessment should consider the evolution of the site in the absence of the proposed Scheme i.e. the 'do-nothing' or no development alternative.

If no development was to take place on this site, the area would stay derelict, providing a negative impact in terms of visual impact, aesthetic and amenity. The site would cause a lack of connectivity to the wider Central Dock area, creating poor placemaking between the proposed Isle of Man Ferry Terminal and the rest of the Liverpool Waters due to the large exposed area between the south of Central Docks and the north, caused due to the lack of development.

Because of the currently dereliction of the site, the area could also be an eyesore to visitors passing the site to and from the proposed Isle of Man Ferry Terminal and potential health and safety concerns due to the derelict nature of the current dock space and infrastructure around it.

The new northern link road currently being constructed by Liverpool City Council (17F/2628) is to service the proposed site and the Isle of Man Ferry Terminal. This would mean the 'do nothing' alternative would prevent the LCC from gaining complete investment in the infrastructure it had received funding for.

Development on this site would help connect Princes Dock with the wider Central Dock, providing public accessibility into a site which has been inaccessible for a large period of time. It would bring about better amenity space and access to the Liverpool Mercantile Maritime UNESCO World Heritage Site and prevent the complete deliverability of the Liverpool Waters Vision.

Therefore, the 'do nothing' alternative was not considered to be a viable option.

### 4.3.2 Alternative locations considered

The proposed scheme looks to provide high quality residential development along Liverpool's waterfront and regenerate previously developed land to bring an underused site back into use and to allow the general public to access waterfront which has been inaccessible for a number of years.

A unique aspect of the proposed scheme which has been in consideration from the beginning of the design has been the applicant's ambition to establish a pedestrian and cyclist route which connects people to the waterfront, providing them with a safe and secure route to other areas of the Liverpool Waters site. In addition to this, the scheme's design proposals allow for users of the Leeds/Liverpool Canal to moor up and enhance the activity of the waterspace through this recreational use. Something that has lacked along the Leeds/Liverpool Canal route for several years, preventing people from stopping along their route.

Therefore, when appraising sites for the proposed scheme, the Applicant required a site which offers the potential for waterside/riverfront regeneration and to meet the above ambitions. The main drivers for the selection of a suitable location for the proposed scheme were:

- Proximity to Liverpool City Centre to ensure the development is of a suitable location to encourage sustainable modes of transport;
- Proximity to the waterfront to allow the scheme to establish a pedestrian and cyclist route which connects people to the waterfront and allows boats to moor up;
- Proximity to roads and utilities to ensure the development is deliverable;
- Availability of land; and
- Land ownership.

Due to the specific requirement of the applicant the following alternatives have been considered and ruled out.

### Plot A01, Princes Dock.

Located in a sustainable location within Princes Dock and close to the three graces, the site is a prime site for redevelopment and is allocated within the Princes Dock Masterplan (as part of the Liverpool Waters Outline Consent) as a mixed-use development which would therefore promote residential as an appropriate use.

The site however would only provide a limited interaction with the existing dock space due to the need to retain the existing Leeds/Liverpool Canal route throughout the site. This and the fact that the site is currently being used as the Cruise Liner Terminal Facility and will be doing so for at least another 2 years means this site is not considered appropriate for the proposed scheme.

### Plot C03, Central Dock

Located just north to the proposed scheme, Plot C03 has been allocated within the Central Docks Masterplan as a cultural use and is of much smaller floorspace than the proposed scheme. The site is located within close proximity to the Kingsway Tunnels and therefore has a number of constraints in terms of maximum built height and mass which would not be suited to the quantum the applicant requires. The plot is situated close to the Leeds/Liverpool Canal but due to the narrow width of the canal in this location, the sense of waterfront activity the applicant seeks would not be seen acceptable here. Therefore, it is considered that this site is not appropriate for the proposed scheme.

### Plots C05 and C09, Central Dock

Located further north of C02 and C03 lies the proposed plots called C05 and C09 (as set out in the Liverpool Waters Outline Consent and Central Docks Masterplan). These plots are of considerable quantum and are located along the waterfront in close proximity to the River Mersey and the Leeds/Liverpool Canal.

Within the Central Docks Masterplan, these plots are allocated as predominately residential which allows them to be considered further for an alternative use to the proposed scheme.

However, there is currently no infrastructure (in terms of utilities and road networks) that reach to this part of the Liverpool Waters site and providing this would bring about additional time and cost to the applicant which may cause the proposed scheme to be unviable and at this time, is an unsuitable location to encourage sustainable modes of transport when there are other development plots located closer to the City Centre along the waterfront.

Although the locations of the site is in close proximity to water (both river and dock space), it is not of the same scale as the proposed scheme and would not benefit as much as the proposed site being regenerated.

Therefore although plots C05 and C09 could be considered in the future as potential sites, they are not as deliverable or suitable when being compared to the current site of the proposed scheme.

In addition to the assessment of these sites, it is important to state that the applicant currently has control over the land for the proposed site and therefore is seen to be more deliverable than other locations. That, along with the fact that the proposed site will be serviced by the Northern Link Road which is currently being constructed, in addition to the fact that there is outline consent for the partial infill of the dock to deliver a residential use scheme of similar scale clearly sets out how this location is suited to the proposed scheme.

In the context of the above need for development, the aspirations for the continued growth of Liverpool in this specific area and the availability of this significant brownfield site in a highly sustainable location.

For the reasons described above, the Applicant is progressing with the proposed site for this proposed scheme as it is considered that no other sites are suited as alternatives to deliver the outcomes and benefits that the applicant wishes to achieve.

### 4.3.3 Alternative uses considered

The applicant's aim is to develop a high quality residential use along the waterfront. Netherthless hotel, commercial and solely landscaping of the site have been considered as alternative uses. However, as set out in the supporting viability assessment that is part of the planning application, these uses were not considered viable at the time of this submission.

### 4.3.4 Alternative Designs and Evolution of Proposed Scheme

The design of the proposed scheme has been informed by detailed discussions that have taken place internally within the design team in addition to the extensive pre-application engagement and consultation with LCC and key stakeholders throughout the scheme's evolution.

The scheme has evolved from its initial design and arrangement and in response to relevant technical reports submitted in support of the application (for example Townscape and Visual Impact and Wind impacts)

The design evolution can be reviewed in more detail within the supporting Design and Access Statement but the following sets out the design process in relation to the proposed scheme.

#### Design Strategy

As a result of detailed team discussions and the surrounding context, the original concept evolved as follows (and as evident in Figure 4.1 below):

- The historic warehouse is re-imagined on the adjacent site - Historically the Waterloo Quay consisted of two identical warehouses. The development starts its design process by reimagining this warehouse on the C02 plot.
- The warehouse has 6 bays - The Waterloo Warehouse has a clear division across its principal facade. Making use of vertical piers and larger windows.
- Rotating the blocks ninety degrees and distributing them evenly across the site provides through views to and from the river - Using the ratio of Waterloo Warehouse, the development then rotates the units to maintain views to and from the Waterloo Warehouse.
- The historic volume is reorganised - The volumes of the re-imagined warehouse that sit outside of the site boundary and re-distributed within the site.
- The blocks are aligned to site constraints - The Kingsway Tunnel runs below the site and is expressed through the alignment of the end block.
- Taller elements are positioned at the edges of the site, mirroring the towers of Waterloo Warehouse - Picking up on the taller elements of the Waterloo Warehouse and the proposed C04 Development, as well as Alexandra Tower. The development seeks to reflect this by creating site edges and focal points.

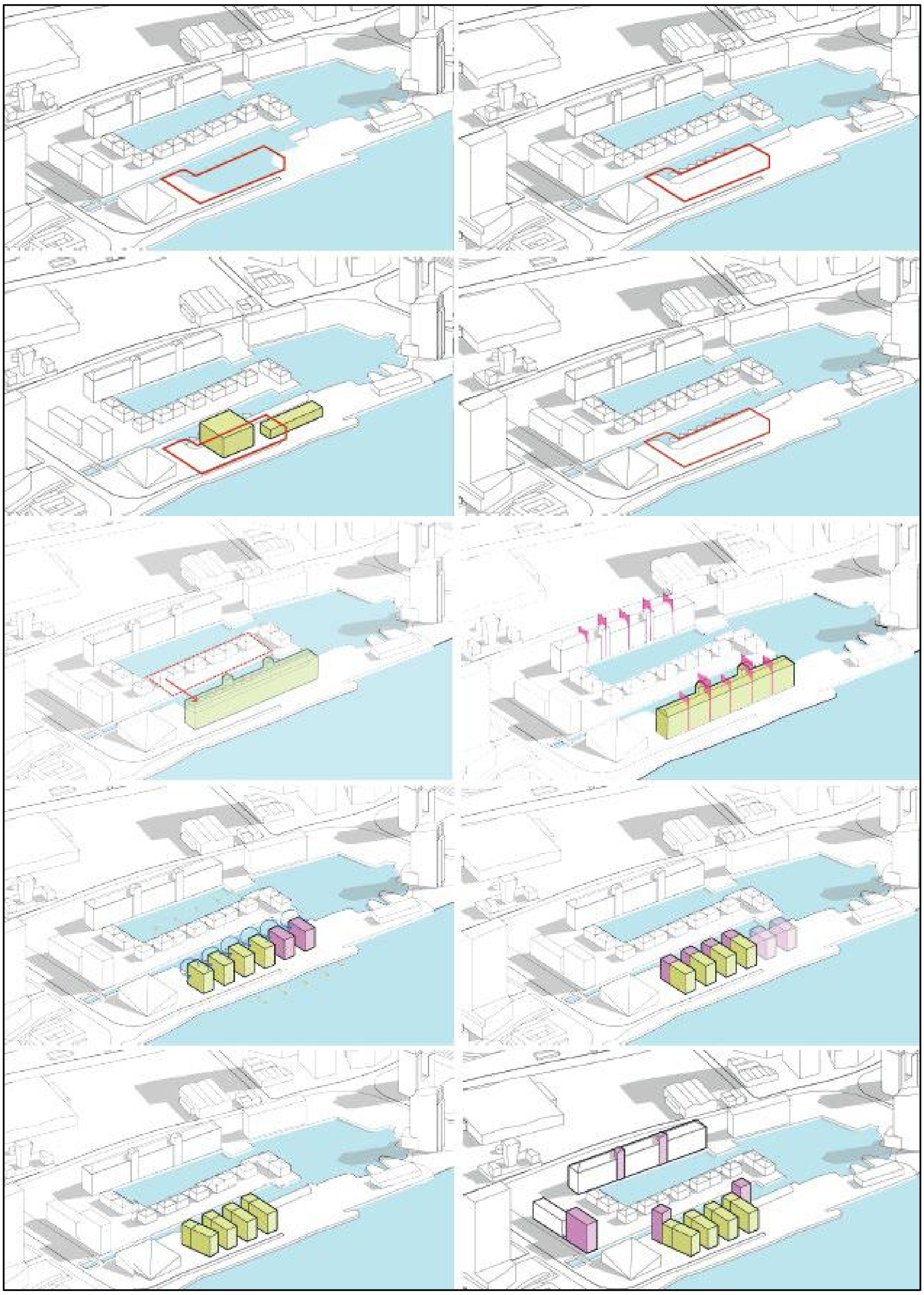

**Figure 4.1 – Original Design Concept**

The design further evolved through a number of pre-application meetings with Liverpool City Council. Comments raised about the initial design concerned the following:

- The extent of the infill exceeded the amount outlined in the Liverpool Waters Masterplan, thus raising concern; the development was advised to re-visit this solution;
- It was recommended to present proposals to Places Matter! Design Review at an early stage so any points raised can be duly considered;
- Rationale for the proposed form & massing needed further investigation and the contextual justification for the concept proposed needs to be explored further;
- Advised to ensure that all servicing is undertaken off-street, whilst not undermining landscaping at the front of development, which may require that the public footway is taken through part of the site;
- Provision of amenity space, contribution to public routes across the wider LW scheme and connections to neighbouring plots will need to be agreed in line with the proposals emerging within the Central Docks Masterplan;
- Highways & levels and nature of parking will also need to be agreed, as well as provision for sustainable means of travel, including a minimum of 50% secure, covered cycle storage.

Figures 4.2 and 4.3 below depict the design at this early stage.

**Figure 4.2 – Visualisation of initial scheme**

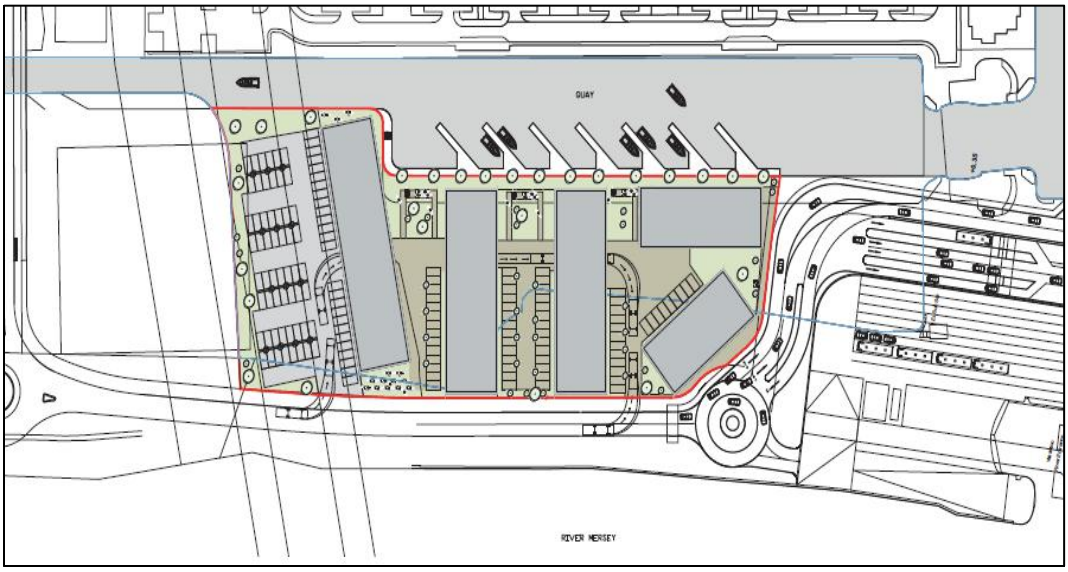


Figure 4.3 – Site Plan of initial scheme

The design team also met with Historic England (HE), who questioned the extent of the infill. Furthermore, HE noted that the proposal is unlikely to result in notable harm to the setting of the surrounding heritage assets, due to the proposed scale and massing being contextual with the existing dock landscape.

It was also discussed that the public benefits of the development would need to be clearly stated, since the original plot was allocated for commercial space and a Cruise Liner.

As a result of discussions, the design orientation was amended as seen in the below Figure 4.4.

Figure 4.4 – Site elevations of initial scheme

Further engagement with the Places Matter! Design Review, Merseyside Environmental Advisory Service (MEAS) and Natural England raised the following points:

- Overall, the Places Matter! panel accepted the approach to height and scale, and felt the materials and detailing would lead to a robust scheme
- The colonnade to the canal side was felt to be a useful space but activating the proposed boardwalk would provide the opportunity to introduce independent amenity retail along this frontage;
- Although considered inappropriate for existing water spaces in the WHS Buffer Zone to be infilled, an exception exists for where permission has previously been granted for partial infilling;
- The retention of open water is considered desirable in terms of retaining character and the value of these spaces in terms of historic and urban design terms.

Following meetings and various concerns about infill, the design team pulled back the extent of the infill to the original outline application. However, the development team recognised the importance of the connectivity of the site, linking the North and the South. Therefore, it endeavoured to permit overhang of buildings into the water, allowing a covered walkway for pedestrians and cyclists.

Public consultation took places on 7th November 2018, to share draft proposals with the public, including local residents and workers. Over 70 people attended the event with comments left for the design team through feedback forms. Overarching comments included the need for a quality development with materials that suited the waterfront and marine environment, the need for good connectivity to the site, and a suitable mix of apartments. (Further details regarding the consultation can be found in the supporting Consultation Statement.)

It was stated during the design evolution, the southern corner is the first impression of the city someone would have leaving the Isle of Man Terminal.

The design team submitted the application in December of 2018. Upon additional conversations, the team revisited the scheme and progressed the design further, resulting in the following design changes for this revised submission in 2019 (2018 and 2019 designs seen comparatively in below Figures 4.5).

Figure 4.5: Comparative context elevations

The proposed scheme's design's contextual response (evident in Figures 4.6 and 4.7 below) resulted from re-imagining the historic warehouse on the site, and then dividing it into bays and reinstating it horizontally. This approach is considered favourable as the buildings are orientated parallel to the East Waterloo Warehouse, providing a stronger roofscape typical of the Liverpool dock character. It has also enabled the scheme to be more favourably aligned with the canal and River Mersey and has resulted in less environmental effects, especially regarding heritage impact and amenity to existing neighbourhood.

Figure 4.6: Indicative visualisation of the proposed scheme


**Figure 4.7: Proposed site layout**

# 5 Transport and Access

## 5.1 Introduction

This chapter presents an assessment of potential impacts on Transport and Access associated with the proposals, described in Chapter 2: Scheme Description.

This chapter is supported by the following appendices:

- Appendix 5A: Transport Assessment (TA), SCP, November 2019
- Appendix 5B: Travel Plan, SCP, November 2019

## 5.2 Methodology, Scope and Significance Criteria

The Institute of Environmental Assessment, now the Institute of Environmental Management and Assessment (IEMA), Guidance lists seven transport related environmental effects which have been presented in Table 5.1 below.

**Table 5.1: IEMA Transport Related Environmental Impacts**

| IEMA Transport Related Environmental Impacts |
|---|
| Driver Delay |
| Impacts on Public Transport Users |
| Pedestrian Delay and Amenity |
| Impacts on Fear and Intimidation |
| Severance |
| Accidents and Safety |
| Hazardous Loads |

The seven categories in the above form the basis of this ES Chapter in order to assess the impact of the development, which is based on the findings of the supporting Transport Assessment as presented in Appendix 5A.

The broad principles of how the magnitude of effect for each category has been assessed is described below.

### 5.2.1 Driver Delay

IEMA guidelines note that driver delay can occur at several points on the network, although the effects are only likely to be significant when the traffic on the highway network is predicted to be at or close to the capacity of the system.

A high-level assessment of the impact of the development on the local highway network has been undertaken in the TA as a result of the increase in traffic. This has been based on professional judgement opposed to detailed junction modelling.

### 5.2.2 Impacts on Public Transport Users

There is no industry guidance on the assessment of public transport users and the assessments of the operation of the local highway network has been used to establish any increased delays to bus users by considering the bus routes and services within the Study Area.

### 5.2.3 Impacts on Pedestrian Delay and Amenity

IEMA guidelines state that the volume, composition or speed of traffic may affect the ability of people to cross roads". The guidance proposes that evaluators "… use their judgement to determine whether pedestrian delay is a significant impact".

Guidelines for the calculation of pedestrian delay are identified in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3. The determination of a material impact on pedestrian delay and amenity is not precisely defined, but should be made with "knowledge of local factors and conditions".

In relation to Pedestrian Amenity, this is broadly defined as the relative pleasantness of a journey which can be affected by traffic flow and traffic composition as well as pavement width and separation from traffic. The guidance suggests a tentative threshold for judging the significance of changes in pedestrian amenity of where traffic flow (or its HGV composition) is halved or doubled.

### 5.2.4 Impacts on Fear and Intimidation

The impact of this is dependent upon the amount of traffic, its HGV composition and its proximity to people or the lack of protection caused by narrow pavement widths, for example. The guidance states that there are no widely acceptable thresholds for estimating this from known traffic and physical conditions, however, it does suggest some thresholds which could be used based on previous research and these are presented in Table 5.2 below.

**Table 5.2: Degree of Hazard**

| Degree of Hazard | Average traffic flow over 18hr day – (vehicles/hour 2-way) | Total 18 hour HGV flow | Average Vehicle Speed over 18 hour day (mph) |
|---|---|---|---|
| Extreme | +1,800 | + 3,000 | + 20 |
| Great | 1,200 – 1,800 | 2,000 – 3,000 | 15 – 20 |
| Moderate | 600 – 1,200 | 1,000 – 2,000 | 10 – 15 |

The above table identifies how a potential change in the degree of hazard can be used to determine the scale of impact of the development proposals upon the levels of fear and intimidation on the surrounding network.

### 5.2.5 Severance

The guidance states that "severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery". Further, "Changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively".

The guidance acknowledges, however, that it is particularly difficult to predict and measure severance. Specific local conditions, in particular the location of pedestrian routes to key local facilities and whether or not crossing facilities are provided are key in the assessment of severance.

### 5.2.6 Impacts on Road Safety

A detailed appraisal of the potential effects of the Proposed scheme upon accidents and safety is presented in the TA. The guidance states that "Professional judgement will be needed to assess the implications of local circumstances, or factors, which may elevate or lessen risks of accidents, e.g. junction conflicts".

### 5.2.7 Hazardous Loads

IEMA guidelines suggests that the ES needs to clearly outline the estimated quantity and composition of such loads, but that the analysis should reflect the nature of the load in question. It is recognised within the IEMA guidelines that the majority of developments won't result in an intensification in the number of movements of hazardous/dangerous loads, as will be the case with this development.

## 5.3 Consultation

A full planning application (Application Reference: 18F/3247) was submitted to Liverpool City Council in December 2018 for 646 apartments on the application site. This application has now been revised, reducing the number of apartments to 538.

This application follows the first planning application within the Central Docks neighbourhood for Plot C04 and C06 (Application Reference: 17F/1628) which was granted planning approval in December 2017. The Transport Assessment for Plot C04 and C06 was also undertaken by SCP and has informed the scope of the Transport Assessment for this planning application. The two developments will sit alongside the new northern link road linking the Isle of Man Ferry Terminal with Waterloo Road and are a catalyst for Central Docks and the vision of Liverpool Waters.

This application has received a highway-related consultation response to the previously submitted design from both LCC and Merseytravel, summarised below and appended to the Transport Assessment presented at Appendix 5A.

LCC have raised concerns regarding the proposed parking provision, noting that it "*should not be less than those developments consented within the Central Dock*

*Neighbourhood Area*", as well as the cycle parking provision recommending 100% provision. In addition, LCC have requested a £100,000 contribution towards enhancing pedestrian/cycle connectivity and have noted that improvements will be required to the public transport services in the vicinity of the site.

In addition to the above comments from LCC, Merseytravel have requested LCC ensure:

- An assessment of the local highway network is undertaken;
- Demolition/construction works do not impact on Merseytravel Kingsway Tunnel;
- The proposal has adequate access to the public transport network and fund the provision of public transport infrastructure (i.e. bus stops and bus service);
- The developer creates appropriate access for Merseytravel Merseylink dial-a-ride vehicles and all other demand responsive bus services;
- The development provides good quality walking routes, including to the nearest bus stops; and,
- The developer implements a full travel plan for the site.

## 5.4 Limitations and Assumptions

As previously agreed with the highway officer at LCC as part of the C04 and C06 Central Docks application, no traffic modelling has been undertaken due to the comprehensive assessments undertaken as part of the Liverpool Waters Outline Consent and Northern Link Road application and the sustainable location of the site. As such, no detailed traffic data is included within this chapter.

## 5.5 Baseline Conditions

The site is within acceptable walking distance of Liverpool city centre and the vast array of amenities the city of Liverpool has on offer. The site is also within acceptable walking distance of numerous transport facilities. The closest bus stop is located on Waterloo Road approximately 100m north of the approved Waterloo Road / northern link road junction. Moorfields and James Street Merseyrail stations can both be accessed in under a 23-minute walk time (or <1.9km walk distance).

Waterloo Road is located approximately 200m to the east of the site and is a strategic link connecting the Central Docks to Liverpool city centre. Waterloo Road, which is subject to a 30mph speed limit, turns into Regents Road in the north, leading to Bootle, and to the south provides a link to Princes Dock and the A5052 New Quay via Bath Street. Within the vicinity of the approved Waterloo Road / northern link road signalised junction, Waterloo Road has a carriageway width of approximately 12.0m and benefits from regularly spaced street lighting columns and footways of over 2.0m in width on both sides of the carriageway. There is a signal-controlled pedestrian crossing, approximately 150m south of the approved Waterloo Road / Northern Link Road junction and a pedestrian refuge, less than 400m south of the approved junction on Waterloo Road.

The A5052 New Quay is located approximately 800m south-east of the development site and is subject to a 30mph speed limit. The A5052 New Quay is an urban A-road running on the western side of Liverpool city centre by the docks. In a southerly direction the A5052 New Quay turns into the A562 which links Liverpool to Widnes and to the north it links with Great Howard Street, leading to Bootle, and the A5053 which joins to the A59 linking Liverpool to Preston. The A5052 New Quay carriageway varies in width and benefits from footways of over 2.0m wide on both sides, dropped kerbs, signalised pedestrian crossings and street lighting.

### 5.5.1 Existing Driver Delay

Vehicular access to the development will be taken off the new spine road linking Waterloo Road to the planned Isle of Man Ferry Terminal (northern link road). The northern link road and associated junction have been designed to accommodate the level of traffic generated by the Liverpool Waters scheme and that associated with the Isle of Man Ferry Terminal so existing driver delay on the surrounding road network is considered to be minimal.

Whilst no traffic data has been collected as part of the assessment, the only locations in the locality of the site where driver delay may occur are Waterloo Road, the A5052 King Edward Street and the A565 Great Howard Street.

### 5.5.2 Existing Pedestrian Severance and Delay

A set of measures to identify severance within a community in terms of the 2-way AADT flow on a link is provided in DMRB Volume 11, Section 3, Part 8. Table 5.3 below summarises these thresholds.

**Table 5.3: Pedestrian Severance Thresholds**

| Pedestrian Severance Levels (DMRB) | |
|---|---|
| **Severance Level** | **Traffic Flow (AADT)** |
| Slight | <8,000 |
| Moderate | 8000 – 16,000 |
| Severe | >16,000 |

Although traffic data has not been collected as part of the assessment, the TA submitted as part of the approved planning application for the northern link road off Waterloo Road makes reference to the published AADT information and states that “Waterloo Road typically accommodates 11,445 vehicles” and therefore falls into the moderate severance level as defined above.

As part of the new Northern Link Raod linking Waterloo Road to the planned Isle of Man Ferry Terminal, the junction with Waterloo Road will be significantly upgraded with signal controlled pedestrian crossings provided on the northern and southern arms of the junction.

### 5.5.3 Existing Pedestrian Amenity

Pedestrian amenity is affected by traffic flows and composition, footway width and the degree of segregation.

As the development site is located within a close proximity to Liverpool city centre, walking infrastructure is generally well developed and of a good standard on route from the site to the city centre. Generally, the footways are wide and benefit from dropped kerbs, to help pedestrians with crossing roads, and regularly spaced lighting columns.

There are a number of pedestrian crossings provided at various points on the route to Liverpool city centre including two pedestrian refuge points along Waterloo Road and 4 signalised crossing points on the A5052 New Quay road, as shown on Figure 5.2 in the TA.

As mentioned earlier, as part of the Northern Link Road construction, Waterloo Road to the planned Isle of Man Ferry Terminal, the junction with Waterloo Road will be significantly upgraded with signal-controlled crossings provided on the northern and southern arms of the junction.

### 5.5.4 Existing Fear and Intimidation

Waterloo Road is likely to be categorised as Moderate and the A5052 King Edward Street and the A565 Great Howard Street are both likely to be categorised as Severe.

In the vicinity of the site, the widths of the footways are generous and the proposed spine road that will link the Isle of Man Ferry Terminal is proposed to have wide footways also.

### 5.5.5 Existing Accidents and Safety

Personal injury accident data has been obtained for the TA study area for the five-year period between 2014 and 2018.

Only two accidents have occurred on the local network in the vicinity of the site, one on Waterloo Road and one on Oil Street, during the five-year study period. The two accidents resulted in slight severity injuries.

Having regard to the low number of accidents that have occurred and as all were of slight severity, the existing accident record does not represent a material concern in the context of the proposed scheme.

### 5.5.6 Existing Hazardous Loads

No existing significant hazardous loads have been identified to be routing in the vicinity of the study area.

## 5.6 Environmental Impacts and Significance of Effects

### 5.6.1 Construction Phase

As the majority of the site is vacant, the construction phase is expected to involve the use of plant, machinery and HGVs required for site clearance and earthworks, followed by the construction of the development. Construction traffic is expected to access the site via a dedicated construction access from the Northern Link Road.

The level of construction traffic has been estimated during the infill period, which is considered to be the worst-case scenario in terms of material movement. The infill period is estimated to generate approximately 131 HGV movements (two-way) and 60 LGV movements (two-way) during the day. Compared to the existing traffic flows on the highway network, this increase in traffic is significantly less than 10%. As such a detailed assessment is not needed, in line with the IEA 'Guidelines for the Environmental Assessment of Road Traffic' and construction traffic is seen to be **negligible.**

A typical working day during the infill period has been assumed to start at 08:00 and finish at 18:00 during the weekday and 08:00 to 13:00 on a Saturday.

### 5.6.2 Operation Phase

The development will provide a total of 165 car parking spaces for residents which equates to a 31% provision. The vehicle trip generation undertaken within the TA suggests that there would be between 123 two-way trips generated within the AM peak hour and 134 two-way trips generated within the PM peak hour.

The pedestrian trip generation undertaken within the TA suggests that the development would result in approximately 84 pedestrian movements within the AM peak and 110 pedestrian movements within the PM peak. Movements would be seen to be **negligible.**

### 5.6.3 Driver Delay

It is anticipated that there would be no impact upon junction capacities or highway journey times since the impact of the proposed scheme on the operation of the local highway network was considered in detail as part of the wider Liverpool Waters TA and the recently approved Northern Link Road TA. Therefore, the significance of impact upon driver delay can be considered as **negligible.**

### 5.6.4 Pedestrian Severance

Although it is accepted that the development will increase the number of pedestrian movements to and from the site, the increase will not be significant and the impact upon pedestrian severance is considered to be **negligible.**

### 5.6.5 Pedestrian Delay

Again, whilst it is accepted that the development will increase the number of pedestrian movements to and from the site, the amount of delay is not adversely affected as the volume of traffic generated by the development is likely to be low given the reduced parking provision, traffic speeds within and surrounding the site are anticipated to be low and a number of pedestrian routes are provided on desire lines. Therefore, the significance of impact upon pedestrian delay can be considered as **negligible**.

### 5.6.6 Pedestrian Amenity

Where traffic flows (or the HGV component) double or more, negative changes in pedestrian amenity are assumed to be significant. Given the proposed uses are predominantly residential, the development will not result in a significant increase in HGV movements and overall it is concluded that the impact would be **negligibl**e.

### 5.6.7 Fear and Intimidation

The significance of impact upon fear and intimidation can be considered as **negligible** because the proposed scheme will not alter known traffic and physical transport conditions of the area.

### 5.6.8 Hazardous Loads

The significance of impact upon hazardous loads can also be considered as **negligible** as the proposed scheme does not have any specific need for, or result in generation of, hazardous loads.

### 5.6.9 Accidents and Highway Safety

The development is unlikely to have an impact upon road safety from a vehicular traffic generation perspective; traffic generated is likely to be reasonably low. The proposed accesses will conform to design standards and have adequate visibility splays. Therefore, the significance of impact upon accidents and highway safety can be considered as **negligible.**

# 5.7 Mitigation Measures

## 5.7.1 Construction Phase

During the demolition and construction phase a Construction Traffic Management Plan (CTMP) would be required by LCC as a condition of planning following any grant of approval. This could form part of the general CEMP.

The CTMP would provide a robust management strategy and a package of measures that would be adhered to by all operations both on and off-site during the construction phase. These measures would range from education and training of operatives to adhere to safe and courteous working practices (limiting noise and minimising vehicle movements) to on-site wheel washing facilities for Plant and HGVs to ensure material from the demolition and construction phase does not enter the public highway.

## 5.7.2 Operational Phase

Given that the significance of impact on all seven transport related environmental impacts (Pedestrian Severance, Pedestrian Delay, Pedestrian Amenity, Fear and Intimidation, Hazardous Loads, Accidents and Highway Safety and Driver Delay) has been found to be minimal, no mitigation measures for the operational phase of the development are required.

# 5.8 Residual Effects

Mitigation measures have been identified for the construction phase which involve the provision of a Construction Traffic Management Plan. With this mitigation in place the impact and effect of the proposed scheme during the construction phase is considered to be **negligible**.

# 5.9 Cumulative Impacts

As detailed earlier, no traffic modelling was undertaken as part of the assessment due to the comprehensive assessments undertaken as part of the Liverpool Waters Outline Consent and Northern Link Road application and the sustainable location of the site.

However, The Liverpool Waters TA provides detailed cumulative assessment of all developments within the Liverpool Waters development and other committed development in the vicinity of the site.

The following committed / consented developments have also been taken into account in the capacity assessments at the proposed Link Road / Waterloo Road signal junction submitted in the TA with the recently approved Northern Link Road application:

- Liverpool Waters (LW) outline permission reference - 10O/2424;

- Expansion of Cruise Liner Terminal (Capacity 3500 patrons) - application reference 17O/3230;
- Tobacco Warehouse, Stanley Dock - application reference 15F/2438;
- 70-90 Pall Mall, Liverpool - application reference 16F/3032;
- 30-36 Pall Mall, Liverpool - application reference 16F/2634;
- Ovatus Leeds Street, Liverpool - application reference 17F/0042; and,
- Infinity Leeds Street, Liverpool - application reference 17F/0340.

With the mitigation measures identified in the Liverpool Waters TA in place, the cumulative impact of the proposed scheme will not result in an unacceptable impact on the local highway network.

The consented Isle of Man Ferry Terminal - application reference 18F/3231, will also not result in an unacceptable impact.

Having regard to the analysis, there are no cumulative transport-related environmental impacts understood to arise from this development. The cumulative impact of these developments is therefore negligible.

## 5.10 Assessment Summary

A summary of the effects and additional mitigation is presented in the table below.

**Table 5.4: Summary of Effects**

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Construction Phase | Negligible | Controlled by a CTMP | Negligible |
| Pedestrian Severance | Negligible | None required | Negligible |
| Pedestrian Delay | Negligible | None required | Negligible |
| Pedestrian Amenity | Negligible | None required | Negligible |
| Fear & Intimidation | Negligible | None required | Negligible |
| Hazardous Loads | Negligible | None required | Negligible |
| Accidents and Highway Safety | Negligible | None required | Negligible |
| Driver Delay | Negligible | None required | Negligible |
| Operation Phase | Negligible | None required | Negligible |

# 6 Air Quality

## 6.1 Introduction

This chapter presents an assessment of potential impacts on Air Quality associated with the proposals, described in Chapter 2: Scheme Description.

The following impacts in relation to air quality have been considered.

Construction Phase Impacts: to evaluate the potential impacts from fugitive dust and exhaust emissions associated with construction activities and the recommendation for any necessary mitigation measures; and

Operational Phase impacts: to assess the significance of potential air quality impacts resulting from changes in traffic flow on the local road network and on site energy generation due to the operation of the proposed scheme. This will be assessed with due regard for any impacts on the human-health and ecological receptors, with subsequent recommendation for any necessary mitigation

The main pollutants of concern in this assessment are those associated with vehicle exhaust emissions, the energy centre and nuisance dust from construction works activity and vehicle movements.

This chapter is supported by the following figures and appendices:

- Figure 6.1: Site Location Plan
- Figure 6.2: Diffusion Tube Locations
- Figure 6.3: Earthworks and Construction Dust Buffer Zones
- Figure 6.4: Trackout Dust Buffer Zones
- Figure 6.5: Wind Rose Liverpool Meteorological Station
- Figure 6.6: ADMS Road Inputs
- Figure 6.7: Predicted Annual Mean NO2 Concentrations (µg/m3) 2022 DS
- Figure 6.8: Predicted Annual Mean PM10 Concentrations (µg/m3) 2022 DS
- Appendix 6A: ADMS Inputs

## 6.2 Methodology, Scope and Significance Criteria

### 6.2.1 European legislation

#### 6.2.1.1 Ambient Air Quality Directive

European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$).

The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for $NO_2$, oxides of nitrogen (NOx), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM10);
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

#### 6.2.1.2 Habitats Directive

The Council Directive 92/43/EEC was adopted in 1992 on the conservation of natural habitats and of wild fauna and flora aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements.

The Directive establishes the EU wide network of protected areas to be safeguarded against potentially damaging developments.

### 6.2.2 UK Legislation

#### 6.2.2.1 Air Quality Standards Regulations

The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007. The AQS sets out AQOs that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

Table 6.1 presents the AQOs for pollutants considered within this assessment.

**Table 6.1: Air Quality Objectives**

| Pollutant | Air Quality Objective | |
|---|---|---|
| | **Concentration ($\mu g/m^3$)** | **Averaging Period** |
| $NO_2$ | 40 | Annual mean |
| | 200 | 1-hour mean; not to be exceeded more than 18 times a year |
| $PM_{10}$ | 40 | Annual mean |
| | 50 | 24-hour mean; not to be exceeded more than 35 times a year |
| $PM_{2.5}$ | 25 | Annual mean |

Table 6.2 summarises the advice provided in DEFRA guidance LAQM (TG[16]) on where the AQOs for pollutants considered within this report apply.

**Table 6.2: Examples of Where the Air Quality Objectives Apply**

| Averaging Period | Objectives Should Apply At | Objectives Should Not Apply At |
|---|---|---|
| Annual mean | All locations where members of the public might be regularly exposed<br>Building façades of residential properties, schools, hospitals, care homes etc. | Building façades of offices or other places of work where members of the public do not have regular access<br>Hotels, unless people live there as their permanent residence<br>Gardens of residential properties<br>Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term |
| 24-hour mean | All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties | Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term |
| 1-hour mean | All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets)<br>Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more | Kerbside sites where the public would not be expected to have regular access |

| | | |
|---|---|---|
| | Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer | |

Table 6.3 presents the critical levels for the protection of vegetation for pollutants considered within this assessment.

**Table 6.3: Critical levels for the protection of Vegetation**

| Pollutant Critical Levels | Critical Level | |
|---|---|---|
| | Concentration ($\mu g/m^3$) | Averaging Period |
| $NO_2$ | 30 | Annual mean |
| | 75 | 24-hour mean |

### 6.2.2.2 The Conservation of Habitats and Species Regulations, 2018

The Conservation of Habitats and Species Regulations 2018 consolidate the Conservation of Habitats and Species Regulations 2010 with subsequent amendments. The Regulations transpose Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora (EU Habitats Directive), into UK law.

The Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites. Under the Regulations, competent authorities i.e. any Minister, government department, public body, or person holding public office, have a general duty, in the exercise of any of their functions, to have regard to the EC Habitats Directive.

### 6.2.2.3 Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV), Local Authorities (LAs) are required to periodically review and assess air quality within their area of administration under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves considering present and likely future air quality against the AQOs. If it is predicted that levels at sensitive locations where members of the public are regularly present for the relevant averaging period are likely to be exceeded, the LA is required to declare an AQMA. For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

### 6.2.2.4 Dust

The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2018) are those provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

*"any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance."*

Enforcement of the Act, in regard to nuisance, is currently under the administration of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no dust beyond the boundary of the works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practice measures.

#### 6.2.2.5 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was revised on in February 2019 and sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to this assessment:

*"Planning policies and decisions should contribute to and enhance the natural and local environment by:*

*[…]*

*Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality.*

*"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*

The implications of NPPF has been considered during the preparation of this Chapter.

#### 6.2.2.6 National Planning Practice Guidance

The National Planning Practice Guidance (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The relevant air quality sections are highlighted below:

Paragraph 001 states that*: "Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values" and "It is important that the potential impact of new development on air quality is taken into account, where the national assessment indicates that relevant limits have been exceeded or are near the limit". The role of Local Authorities under LAQM are stated and that Air Quality Action Plans should "identify measures that will be introduced in pursuit of the objectives"*

Paragraph 005 states that *"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation"*

Paragraph 007 states that *"Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality". In terms of mitigation, it states that "Mitigation options where necessary will be location specific, will depend on the proposed development and should be proportionate to the likely impact"*.

Paragraph 009 shows a flow chart highlighting how the assessment of air quality impacts should fit into the development management process. It makes it clear that air quality impact risks, AQLVs and AQOs should be considered in the decision-making process.

These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

#### 6.2.2.7 Local Planning Policy

Reference has been made to policies within the local development plan and emerging Local Plan by assessing impacts on existing sensitive receptors as a result of the proposals as well as assessing the suitability of the site for the proposed end use.

### 6.2.3 Methodology

The proposed scheme has the potential to cause air quality impacts during the construction and operational phases in addition to exposing future site users to elevated pollution levels. These issues have been assessed in accordance with the following methodology.

#### 6.2.3.1 Construction Phase Assessment

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction'.

Activities on the proposed construction site have been divided into three types to reflect their different potential impacts. These are:

- Earthworks
- Construction; and
- Trackout.

The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects.

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to $PM_{10}$.

The assessment steps are detailed below.

### Step 1

Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the site boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50m of the boundary site or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should also proceed to Step 2.

Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

### Step 2

Step 2 assesses the risk of potential dust impacts. A site is allocated to a risk category based on two factors

The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and

The sensitivity of the area to dust impacts, which can defined as low, medium or high sensitivity (Step 2B).

The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 6.4

**Table 6.4: Construction Dust – Magnitude of Emissions**

| Magnitude | Activity | Criteria |
|---|---|---|
| Large | Earthworks | Total site area greater than 10,000m2<br>Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) |

| Magnitude | Activity | Criteria |
|---|---|---|
| | | More than 10 heavy earth moving vehicles active at any one time<br>Formation of bunds greater than 8m in height<br>More than 100,000 tonnes of material moved |
| | Construction | Total building volume greater than 100,000m3<br>On site concrete batching<br>Sandblasting |
| | Trackout | More than 50 Heavy Duty Vehicle (HDV) trips per day<br>Potentially dusty surface material (e.g. high clay content)<br>Unpaved road length greater than 100m |
| Medium | Earthworks | Total site area 2,500m2 to 10,000m2<br>Moderately dusty soil type (e.g. silt)<br>5 to 10 heavy earth moving vehicles active at any one time<br>Formation of bunds 4m to 8m in height<br>Total material moved 20,000 tonnes to 100,000 tonnes |
| | Construction | Total building volume 25,000m3 to 100,000m3<br>Potentially dusty construction material (e.g. concrete)<br>On site concrete batching |
| | Trackout | 10 to 50 HDV trips per day<br>Moderately dusty surface material (e.g. high clay content)<br>Unpaved road length 50m to 100m |
| Small | Earthworks | Total site area less than 2,500m2<br>Soil type with large grain size (e.g. sand)<br>Less than 5 heavy earth moving vehicles active at any one time<br>Formation of bundsless than 4m in height<br>Total material moved less than 20,000 tonnes<br>Earthworks during wetter months |
| | Construction | Total building volume less than 25,000m3<br>Construction material with low potential for dust release (e.g. metal cladding or timber) |
| | Trackout | Less than 10 HDV trips per day<br>Surface material with low potential for dust release<br>Unpaved road length less than 50m |

Step 2B defines the sensitivity of the area around the development site for construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table 6.5.

**Table 6.5: Examples of Factors Defining Sensitivity of the Area**

| Sensitivity | Examples | |
|---|---|---|
| | **Human Receptors** | **Ecological Receptors** |
| High | Users expect of high levels of amenity<br>High aesthetic or value property<br>People expected to be present continuously for extended periods of time<br>Locations where members of the public are exposed over a time period relevant to the AQO for $PM_{10}$ e.g. residential properties, hospitals, schools and residential care homes | Internationally or nationally designated site e.g. Special Area of Conservation |
| Medium | Users would expect to enjoy a reasonable level of amenity<br>Aesthetics or value of their property could be diminished by soiling<br>People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work | Nationally designated site e.g. Sites of Special Scientific Interest |
| Low | Enjoyment of amenity would not reasonably be expected<br>Property would not be expected to be diminished in appearance<br>Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads | Locally designated site e.g. Local Nature Reserve |

The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts during the construction phase:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and
- Any known specific receptor sensitivities which go beyond the classifications given in the document

These factors were considered in the undertaking of this assessment.

The sensitivity of the area to dust soiling effects on people and property is shown in Table 6.6.

**Table 6.6: Sensitivity of the Area to Dust Soiling Effects on People and Property**

| Receptor Sensitivity | Number of Receptors | Distance from the Source (m) | | | |
|---|---|---|---|---|---|
| | | Less than 20 | Less than 50 | Less than 100 | Less than 350 |
| High | More than 100 | High | High | Medium | Low |
| | 10 - 100 | High | Medium | Low | Low |
| | 1 - 10 | Medium | Low | Low | Low |
| Medium | More than 1 | Medium | Low | Low | Low |
| Low | More than 1 | Low | Low | Low | Low |

Table 6.7 outlines the sensitivity of the area to human health impacts.

**Table 6.7: Sensitivity of the Area to Human Health Impacts**

| Receptor Sensitivity | Annual Mean $PM_{10}$ Concentration | Number of Receptors | Distance from the Source (m) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Less than 20 | Less than 50 | Less than 100 | Less than 200 | Less than 350 |
| High | Greater than 32µg/m3 | More than 100 | High | High | High | Medium | Low |
| | | 10 - 100 | High | High | Medium | Low | Low |
| | | 1 - 10 | High | Medium | Low | Low | Low |
| | 28 - 32µg/m3 | More than 100 | High | High | Medium | Low | Low |
| | | 10 - 100 | High | Medium | Low | Low | Low |
| | | 1 - 10 | High | Medium | Low | Low | Low |
| | 24 - 28µg/m3 | More than 100 | High | Medium | Low | Low | Low |
| | | 10 - 100 | High | Medium | Low | Low | Low |
| | | 1 - 10 | Medium | Low | Low | Low | Low |
| | Less than 24µg/m3 | More than 100 | Medium | Low | Low | Low | Low |
| | | 10 - 100 | Low | Low | Low | Low | Low |
| | | 1 - 10 | Low | Low | Low | Low | Low |
| Medium | Greater than 32µg/m3 | More than 10 | High | Medium | Low | Low | Low |
| | | 1 - 10 | Medium | Low | Low | Low | Low |

| Receptor Sensitivity | Annual Mean $PM_{10}$ Concentration | Number of Receptors | Distance from the Source (m) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Less than 20 | Less than 50 | Less than 100 | Less than 200 | Less than 350 |
| | 28 - 32µg/m3 | More than 10 | Medium | Low | Low | Low | Low |
| | | 1 - 10 | Low | Low | Low | Low | Low |
| | 24 - 28µg/m3 | More than 10 | Low | Low | Low | Low | Low |
| | | 1 - 10 | Low | Low | Low | Low | Low |
| | Less than 24µg/m3 | More than 10 | Low | Low | Low | Low | Low |
| | | 1 - 10 | Low | Low | Low | Low | Low |
| Low | - | More than 1 | Low | Low | Low | Low | Low |

Table 6.8 outlines the sensitivity of the area to ecological impacts.

**Table 6.8: Sensitivity of the Area to Ecological Impacts**

| Receptor Sensitivity | Distance from the Source (m) | |
|---|---|---|
| | Less than 20 | Less than 50 |
| High | High | Medium |
| Medium | Medium | Low |
| Low | Low | Low |

Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

Table 6.9 outlines the risk category from earthworks and construction activities.

**Table 6.9: Dust Risk Category from Earthworks and Construction**

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | Large | Medium | Small |
| High | High | Medium | Low |
| Medium | Medium | Medium | Low |
| Low | Low | Low | Negligible |

Table 6.10 outlines the risk category from trackout.

**Table 6.10: Dust Risk Category from Trackout**

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | Large | Medium | Small |
| High | High | Medium | Low |
| Medium | Medium | Low | Negligible |
| Low | Low | Low | Negligible |

### Step 3

Step 3 requires the identification of site specific mitigation measures within the IAQM guidance to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with negligible risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

### Step 4

Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'. This has been described as negligible within this report to provide continuity between assessment terminologies.

The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The IAQM guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 6A.

### 6.2.3.2 Operation Phase Assessment

The development has the potential to expose future users to elevated pollutant levels, as well as impact on existing air quality as a result of road traffic exhaust emissions, such as $NO_2$, $PM_{10}$ and $PM_{2.5}$, associated with vehicles travelling to and from the site. Detailed dispersion modelling was therefore undertaken to quantify pollutant concentrations across the site and determine suitability for the proposed use, using the following scenarios:

- 2018 Verification;
- Future year do-minimum (DM1) (predicted traffic flows in 2020 should the proposals not proceed);
- Future year do-something (DS1) (predicted traffic flows in 2020 should the proposals proceed with the link road and including construction vehicles);
- Opening year do-minimum (DM2) (predicted traffic flows in 2022 should the proposals not proceed with addition of committed developments); and
- Opening year do-something (DS2) (predicted traffic flows in 2022 should the proposals be completed with the addition of committed developments and additional traffic flows generated by the development).

Committed schemes are outlined in Chapter 3 of the ES, Table 3.3 were included within the assessed 2022 DM and DS traffic data.

As outlined in Chapter 5: Transport and Access, 2020 represents the year of construction for the dock infill. Under this assessment year, all the construction traffic will access the site via the link road. 2022 represents the fully operational development with traffic associated with the proposed scheme distributed along both the link road and Waterloo road.

Reference should be made to Appendix 6A for assessment input data.

Receptors potentially sensitive to changes in $NO_2$, $PM_{10}$ and $PM_{2.5}$ concentrations were identified within 200m of the affected highway network in accordance with the guidance provided within the Design Manual for Roads and Bridges (DMRB) on the likely limits of pollutant dispersion from road sources. LAQM (TG16) provides the following examples of where annual mean AQOs should apply.

- Residential properties;
- Schools;
- Hospitals; and
- Care homes.

### 6.2.4 Significance Criteria

The impact at each receptor was defined in accordance with the criteria shown in Table 6.11 These are based upon the guidance provided within the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance 'Land-Use Planning and Development Control: Planning for Air Quality.

**Table 6.11: Operational Traffic Exhaust Emissions - Significance of Impact**

| Long Term Average Concentration | % Change in Concentration Relative to AQO | | | |
|---|---|---|---|---|
| | **1** | **2-5** | **6-10** | **>10** |
| 75% or less of AQO | Negligible | Negligible | Minor | Moderate |
| 76 - 94% of AQO | Negligible | Minor | Moderate | Moderate |
| 95 - 102% of AQO | Minor | Moderate | Moderate | Substantial |
| 103 - 109% of AQO | Moderate | Moderate | Substantial | Substantial |
| 110% or more of AQO | Moderate | Substantial | Substantial | Substantial |

The criteria shown in Table 6.11 is adapted from the EPUK and IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality' viii with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance.

Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 6.11 the EPUK and IAQM document states that this framework is to be used as a starting point to make a judgement on significance of effect but other influences might need to be accounted for. Whilst impacts might be determined as **minor, 'moderate'** or **'substantial'** at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
- The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and
- The extent to which an objective is exceeded e.g. an annual mean $NO_2$ concentration of 41µg/$m^3$ should attract less significance than an annual mean of 51µg/$m^3$.

These factors were considered, and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

### 6.2.5 Impact Assessment and Significance Criteria

The assessment of potential effects as a result of the proposed scheme has taken into account both the construction phase and the operational phase. The significance level attributed to each effect has been assessed based on the magnitude of change due to the proposed scheme and the sensitivity of the affected receptor/receiving environment to change.

Criteria specific to air quality assessments are provided by EPUK and the IAQM where appropriate they have been used in this assessment. However, the criteria terminology has been changed to be consistent with the terminology used in this ES, this is discussed further in the following section.

### 6.2.6 Impact Significance

The following terms have been used to define the significance of the effects identified:

**Substantial effect:** where the proposed development could be expected to have a considerable effect (either beneficial or adverse) on local air quality;

**Moderate effect**: where the proposed development could be expected to have a limited effect (either beneficial or adverse) on local air quality;

**Minor effect**: where the proposed development could be expected to result in a slight, very short term or highly localised effect (either beneficial or adverse) on local air quality; and

**Negligible:** where no discernible effect is expected as a result of the proposed development on local air quality.

### 6.2.7 Ecological Significance

No official guidelines have been promulgated for determining the significance of air quality effects at sites designated for ecological importance.

For SPAs, SACs, Ramsar sites and Sites of Special Scientific Interest (SSSIs), EA Guidance states that the impacts, can be considered insignificant if both the following criteria are met:

- the short-term process contribution (PC) is less than 10% of the short-term environmental standard for protected conservation areas; and
- the long-term PC is less than 1% of the long-term environmental standard for protected conservation areas.

Should these criteria be exceeded then the PEC should be checked against the standard for protected conservation areas. PEC is not required for short-term targets. Should the short-term PC exceed the screening criteria, further consideration is required.

If the predicted long-term PC is greater than 1% and the predicted environmental concentration (PEC) is less than 70% of the long-term environmental standard, the emissions can be considered insignificant. Should the predicted PEC be greater than 70% of the long-term environmental standard, detailed dispersion modelling is required. However this assessment has used detailed modelling at the initial stage to predict impacts at sensitive receptors and whether impacts can be considered as insignificant.

When considering impacts at local nature sites and the emissions meet both of the following criteria, impacts can be considered insignificant and no further assessment is required:

- The short-term PC is less than 100% of the short-term environmental standard; and
- The long-term PC is less than 100% of the long-term environmental standard.

Should the PC exceed the screening criteria, the EA states that detailed dispersion modelling is required. However this assessment has used detailed modelling at the initial stage to predict impacts at sensitive receptors and whether impacts can be considered as insignificant.

IAQM guidance provides further suggestions on circumstances where there is definitely an insignificant effect on a site in relation to the Habitats Directive. This guidance endorses the EA criteria above, noting that:

"The EA, in consultation with the conservation agencies, is the only organisation with any statutory responsibility that has set out principles and guidance for the assessment of air quality impacts on nature conservation sites. As a consequence, its thinking has been applied to other developments where such assessments are required, involving sources that are not industrial and not regulated by the EA. There is nothing inherently wrong with such an approach, provided that the underlying principles are followed."

The IAQM guidance goes on to emphasise that these criteria are for screening out effects from further assessment, not an indication that there is an adverse impact:

*"As the only available source of guidance that is relevant to this topic, the EA's approach to assessment has been widely adopted. Unfortunately, this has also led to many instances where the criterion for determining when a new source has an inconsequential effect has been wrongly used as a threshold for the onset of damage to a habitat. It is quite clear from studying the EA's original guidance and its more recent statements that this is a false interpretation it is the position of the IAQM that the use of a criterion of 1% of an assessment level in the context of habitats should be used only to screen out impacts that will have an insignificant effect. It should not be used as a threshold above which damage is implied and is therefore used to conclude that a significant effect is likely. It is instead an indication that there may be potential for a significant effect, but this requires evaluation by a qualified ecologist and with full consideration of the habitat's circumstances."*

## 6.3 Consultation

A summary of consultation carried out for this EIA is provided in Table 6.12.

**Table 6.12: Consultation Summary**

| Consultee and date | Issue raised | Summary of response |
|---|---|---|
| Paul Farrell, Environmental Health Officer | Methodology Approval | Acceptance of Methodology |

## 6.4 Limitations and Assumptions

For the operational phase assessment, there is current uncertainty over $NO_2$ concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. It has been assumed that this will be the case when the proposed scheme is operational and therefore 2018 emission factors have been utilised for the prediction of pollution levels for all scenarios in preference to the proposed scheme opening year (2022) in order to provide a robust assessment.

Similarly, it has been assumed that background concentrations will not improve and therefore 2018 background concentrations have been utilised for the assessment of the opening year of the proposed scheme. This provides a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the Proposed scheme.

# 6.5 Baseline Conditions

### 6.5.1.1 Existing Conditions

Existing air quality conditions in the vicinity of the proposed development site were identified in order to provide a baseline for assessment. These are detailed in the following sections.

### 6.5.1.2 Local Air Quality Management

As required by the Environment Act (1995), LCC has undertaken Review and Assessment of air quality within their area of administration. This process has indicated that annual mean concentrations of $NO_2$ are above the AQO within the City. As such, an AQMA has been declared, described as:

*""Liverpool City AQMA – An area encompassing the whole of the City of Liverpool."*

The proposed development site is located within the Liverpool City AQMA. As such, there is potential for the development to cause adverse impacts on air quality within this area, as well as to introduce future site users to elevated pollutant concentrations. This has been considered within this report. Reference should be made to Figure 6.1 for the location of the AQMA.

LCC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs and as such no further AQMAs have been designated.

### 6.5.1.3 Air Quality Management

Monitoring of pollutant concentrations is undertaken by LCC using continuous and periodic methods throughout their area of administration. A review of LCC’s most recent Air Quality Annual Status Report indicated that there is one automatic analyser operated by LCC, located approximately 12.9km southeast of the site at NGR: 343884, 383601. Due to the distance between the development site and automatic analyser, similar pollutant concentrations would not be expected and as such, this monitoring station has not been considered further within this assessment.

LCC also utilises passive diffusion tubes to monitor $NO_2$ concentrations. A review of LCC's most recent monitoring data available indicated that there are seven diffusion tubes in the vicinity of the site, as indicated in Table 6.13. Exceedances of the annual mean AQO are highlighted in **bold**.

**Table 6.13: NO2 Monitoring Results**

| Site Name | Type | NGR(m) | | Annual Mean $NO_2$ Concentrations ($\mu g/m^3$) | | |
|---|---|---|---|---|---|---|
| | | **X** | **Y** | **2016** | **2017** | **2018** |
| T2 | Urban Roadside | 334109 | 391076 | 39 | 30 | 32 |
| T3 | Urban Roadside | 334579 | 390676 | **63** | **47** | **44** |
| T5 | Kerbside | 334073 | 390442 | 44 | 36 | 31 |
| T6 | Urban Roadside | 334006 | 390359 | **67** | **50** | **45** |

As indicated in Table 6.13, the annual mean AQO for $NO_2$ was exceeded at three diffusion tubes sites in recent years. This is due to their roadside location. Reference should be made to Figure 6.2 for geographical representation of the diffusion tube monitoring.

### 6.5.1.4 Background Pollutant Concentration

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in one grid square with NGR: 333500, 391500. Data for this location was downloaded from the DEFRA website for the purpose of this assessment for the verification year (2018) and (2022). The concentrations are summarised in Table 6.14.

**Table 6.14: Predicted Background Pollutant Concentrations**

| Pollutant | Predicted Background Concentration (µg/m3) | |
|---|---|---|
| | **2018** | **2022** |
| NOx | 29.58 | 20.97 |
| $NO_2$ | 19.87 | 15.17 |
| $PM_{10}$ | 10.97 | 11.92 |
| $PM_{2.5}$ | 7.43 | 7.49 |

As shown in Table 6.14, background concentrations of $NO_2$ did not exceed the relevant AQOs. Comparison with the monitoring results indicates the impact that vehicle exhaust emissions from the highway network have on pollutant concentrations at roadside locations.

### 6.5.1.5 Sensitive Receptors

A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for dust and road vehicle exhaust emission impacts in the following Sections.

#### 6.5.1.6 Construction Sensitive Receptors

Receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 350m from the development boundary. These are summarised in Table 6.15.

**Table 6.15: Earthworks and Construction Dust Sensitive Receptors**

| Distance from Site Boundary (m) | Approximate Number of Human Receptors | Approximate Number of Ecological Receptors |
|---|---|---|
| Less than 20 | 0 | 0 |
| 20 - 50 | 10 – 100 | 1 |
| 50 - 100 | More than 100 | - |
| 100 - 350 | More than 100 | - |

Reference should be made to Figure 6.3 for a graphical representation of earthworks and construction dust buffer zones.

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access route. These are summarised in Table 6.16. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. However, it was assumed construction traffic would access the site from Waterloo Road to ensure the maximum potential trackout distance was considered.

**Table 6.16: Trackout Dust Sensitive Receptors**

| Distance from Site Boundary (m) | Approximate Number of Human Receptors | Approximate Number of Ecological Receptors |
|---|---|---|
| Less than 20 | More than 100 | 1 |
| 20 - 50 | More than 100 | 1 |

Reference should be made to Figure 6.4 for a graphical representation of trackout dust buffer zones.

A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 6.17.

### Table 6.17: Additional Area Sensitivity Factors

| Guidance | Comment |
|---|---|
| Whether there is any history of dust generating activities in the area | The site is located within a predominantly industrial and residential area. There is likely to have been a history of dust generating activities due to industrial processes and regeneration activities within the area |
| The likelihood of concurrent dust generating activity on nearby sites | A review of the LCC Planning Portal indicated that the several large-scale development schemes in the locality of the site.<br>As such, there is a likelihood for concurrent dust generation if the construction phases overlap |
| Pre-existing screening between the source and the receptors | There is no vegetation present across the site. |
| Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place | The wind direction is predominantly from the west and south-south east of the development, as shown in Figure 6.5. As such, properties to the east and north east would be most affected by dust emissions |
| Conclusions drawn from local topography | The topography of the area appears to be predominantly flat. As such, there are no constraints to dust dispersion |
| Duration of the potential impact, as a receptor may become more sensitive over time | The construction phase is set to begin in 2020 and be undertaken for a duration of 2 years. |
| Any known specific receptor sensitivities which go beyond the classifications given in the document. | No specific receptor sensitivities identified during the baseline |

Based on the criteria shown in Table 6.17, the sensitivity of the receiving environment to potential dust impacts was considered to be high. This was because users would expect to enjoy a reasonable level of amenity, aesthetics or value of their property could be diminished by soiling and people would be expected to be present for extended periods of time e.g. residential properties.

The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 6.1.2, is shown in Table 6.18.

### Table 6.18: Sensitivity of the Surrounding Area

| Potential Impact | Sensitivity of the Surrounding Area | | |
|---|---|---|---|
| | Earthworks | Construction | Trackout |
| Dust Soiling | Medium | Medium | High |
| Human Health | Low | Low | Medium |
| Ecological | Medium | Medium | High |

#### 6.5.1.7 Ecological sensitive Receptors

The development may have the potential to impact on existing Special Protection Areas (SPAs) as a result of construction HGV traffic exhaust emissions associated with construction phase of the proposed scheme.

The IAQM guidance document "A Guide to the Assessment of Air Quality impacts on Designated Nature Conservation Sites, IAQM, 2019" states the following methodology to help establish when an air quality is likely to be considered necessary. The methodology is split into the following three sections:

- Scoping;
- Quantification; and
- Screening.

**Scoping**

A desktop study is conducted to identify sensitive ecological receptors which fall within 200m of the road network which is likely to be used by traffic associated with the Proposed scheme. If all ecological sites fall outside of the 200m buffer then no further action is required and the site should not be assessed further.

The desk top survey indicated the following designations within 200m of the affected road network:

- Liverpool Bay SPA.

**Screening**

Given that potential impacts have been scoped in, the next stage of assessment is to considered screening based on AADT or air quality impacts. It is considered that traffic impacts can be screened out if predicted AADT traffic flows from cumulate developments are predicted to cause increases of less than 1000 AADT or 200 HDV's within 200m of ecological sites.

Given the associated traffic data there is potential for air quality changes to affect the aforementioned SPAs. Therefore, as the number of additional HDV's falls below 200 there is no necessary requirement further mitigation.

### 6.5.2 Operational Sensitive Receptors

#### 6.5.2.1 Human Sensitive Receptors

A desk-top study was undertaken in order to identify any sensitive receptor locations in the vicinity of the site that require specific consideration during the assessment. These were modelled at a height of 1.5m in order to represent ground floor level and are summarised in Table 6.19.

**Table 6.19: Human Sensitive Receptors**

| Receptor | NGR (m) | |
|---|---|---|
| | X | Y |
| R1 | 333538 | 391312 |
| R2 | 333569 | 391374 |
| R3 | 333629 | 391387 |
| R4 | 333653 | 391286 |
| R5 | 333696.5 | 391116.7 |

The sensitive receptors identified in Table 6.19 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of the proposed scheme that have not been individually identified above. Reference should be made to Figure 6.6 for a graphical representation of operational phase emission sensitive human receptor locations.

#### 6.5.2.2 Ecological Sensitive Receptors

Increased atmospheric emissions from the proposed scheme have the potential to impact on ecological receptors within the vicinity of the site. A desk-top study was therefore undertaken to identify any statutory designated sites of ecological or nature conservation importance within the distances stated by the EA. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service which provides information on key environmental schemes and designations.

Table 6.20 provides detail of the ecological receptors considered within this assessment.

**Table 6.20: Ecological Sensitive Receptors**

| Ecological Receptor | | Designation | NGR (m) | |
|---|---|---|---|---|
| | | | X | Y |
| E1 | Liverpool Bay | SPA | 333328.6 | 392127.0 |
| E2 | Liverpool Bay | SPA | 333317.3 | 392043.3 |
| E3 | Liverpool Bay | SPA | 333288.1 | 391936.1 |
| E4 | Liverpool Bay | SPA | 333299.1 | 391862.3 |
| E5 | Liverpool Bay | SPA | 333294.0 | 391896.5 |
| E6 | Liverpool Bay | SPA | 333306.1 | 391815.9 |
| E7 | Liverpool Bay | SPA | 333314.2 | 391749.4 |
| E8 | Liverpool Bay | SPA | 333328.3 | 391667.8 |
| E9 | Liverpool Bay | SPA | 333340.4 | 391594.2 |
| E10 | Liverpool Bay | SPA | 333345.0 | 391550.6 |

| Ecological Receptor | | Designation | NGR (m) | |
|---|---|---|---|---|
| | | | X | Y |
| E11 | Liverpool Bay | SPA | 333352.3 | 391525.0 |
| E12 | Liverpool Bay | SPA | 333355.0 | 391491.1 |
| E13 | Liverpool Bay | SPA | 333364.2 | 391461.8 |
| E14 | Liverpool Bay | SPA | 333370.6 | 391437.0 |
| E15 | Liverpool Bay | SPA | 333371.5 | 391401.3 |
| E16 | Liverpool Bay | SPA | 333387.1 | 391364.6 |
| E17 | Liverpool Bay | SPA | 333392.6 | 391341.7 |
| E18 | Liverpool Bay | SPA | 333393.8 | 391316.4 |
| E19 | Liverpool Bay | SPA | 333398.6 | 391298.1 |
| E20 | Liverpool Bay | SPA | 333405.3 | 391271.3 |
| E21 | Liverpool Bay | SPA | 333409.6 | 391247.7 |
| E22 | Liverpool Bay | SPA | 333408.7 | 391224.2 |
| E23 | Liverpool Bay | SPA | 333414.4 | 391199.2 |
| E24 | Liverpool Bay | SPA | 333417.8 | 391166.1 |
| E25 | Liverpool Bay | SPA | 333420.7 | 391108.4 |
| E26 | Liverpool Bay | SPA | 333451.9 | 391120.9 |
| E27 | Liverpool Bay | SPA | 333457.7 | 391070.5 |
| E28 | Liverpool Bay | SPA | 333460.5 | 391023.9 |
| E29 | Liverpool Bay | SPA | 333523.9 | 390979.7 |
| E30 | Liverpool Bay | SPA | 333557.0 | 390772.4 |

Critical loads have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS website was undertaken in order to identify the relevant nitrogen critical load class and associated critical load for the designations considered within the model. The critical loads for nitrogen deposition are detailed in Table 6.21.

**Table 6.21: Nitrogen Critical Load**

| Ecological Receptor | Habitat | APIS Relevant Nitrogen Critical Load Class | Nitrogen Critical Load (kgN/ha/yr) | |
|---|---|---|---|---|
| | | | Min | Max |
| Liverpool Bay SPA | Supralittoral sediment | Coastal stable dune grasslands | 8 | 10 |

As Table 6.21 indicates, sensitive species would not be adversely affected from any additional nitrogen deposition caused by the proposed scheme and therefore nitrogen deposition has not been considered further in this assessment.

Table 6.22 shows the relevant critical loads for acid deposition.

**Table 6.22: Acid Critical Load**

| Ecological Receptor | Habitat | APIS Relevant Acid Critical Load Class | Acid Critical Load (kgN/ha/yr) | | |
|---|---|---|---|---|---|
| | | | CLmaxS | CLmaxN | CLminN |
| Liverpool Bay SPA | Supralittoral sediment | Coastal stable dune grasslands | 0.212 | 0.321 | 0.533 |

Similar to nitrogen deposition Table 6.22 indicates that sensitive species would not be adversely affected from any additional acid deposition caused by the proposed scheme and therefore acid deposition has not been considered further in this assessment.

Background deposition rates at the ecological receptor locations were downloaded from the APIS website and are summarise in Table 6.23.

**Table 6.23: Background Deposition Rates**

| Ecological Designation | Background Deposition Rate | | |
|---|---|---|---|
| | Nitrogen (kgN/ha/yr) | Acid (keq/ha/yr) | |
| | | Nitrogen | Sulphur |
| Liverpool Bay SPA | 16.1 | 1.15 | 0.35 |

## 6.6 Environmental Impacts and Significance of Effects

### 6.6.1 Construction Phase Effects

There is the potential for air quality impacts as a result of the construction and operation of the proposed scheme. These are assessed in the following sections

#### Step 1

The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.

The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.

The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of the site boundary. As such, a detailed assessment of potential dust impacts was required.

# Step 2

## Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. Information on soil type was not available for the purpose of this assessment. As such, the soil type was considered to be potentially dusty in order to provide a worst-case scenario.

The proposed development site is estimated to cover an area of between 2,500m$^2$ and 10,000m$^2$. In accordance with the criteria outlined in Table 6.4, the magnitude of potential dust emissions from earthworks is therefore medium.

Table 6.17 indicates the sensitivity of the area to dust soiling effects on people and property is medium. In accordance to with the criteria outlined in Table 6.9, the development is considered to be medium.

Table 6.17 indicates the sensitivity of the area to human health is low. In accordance with the criteria outlined in Table 6.9 the development is considered to be a low risk site for human health as a result of earthwork activities.

Table 6.17 indicates the sensitivity of the area to ecological impacts is medium. In accordance with the criteria outlined in Table 6.8 the development is considered to be a medium risk site for ecological receptors as a result of earthwork activities.

## Construction

Due to the size of the development the total building volume is likely to be between 25,000m$^3$ and 100,000m$^3$. In accordance with the criteria outlined in Table 6.4, the magnitude of potential dust emissions from construction is therefore medium.

Table 6.17 indicates the sensitivity the sensitivity of the area to dust soiling effects on people and property is medium. In accordance to with the criteria outlined in Table 6.9, the development is considered to be medium.

Table 6.17 indicates the sensitivity of the area to human health is low. In accordance with the criteria outlined in Table 6.9 the development is considered to be a low risk site for human health as a result of construction activities.

Table 6.17 indicates the sensitivity of the area to ecological impacts is medium. In accordance with the criteria outlined in Table 6.9 the development is considered to be a medium risk site for ecological receptors as a result of earthwork activities.

## Trackout

The number of HGV trips to be generated during the construction phase of the development was predicted to be 131 daily trips as a result of the dock infill. However, surface material and unpaved road length was not known at this stage of the project.

Based on the site area, it is anticipated that the unpaved road length is likely to be greater than 100m. In accordance with the criteria outlined in Table 6.4, the magnitude of potential dust emissions from trackout is therefore large.

Table 6.17 indicates the sensitivity of the area to dust soiling effects on people and property is high. In accordance with the criteria outlined in Table 6.10 the development is considered to be a high risk site for dust soiling as a result of trackout activities.

Table 6.17 indicates the sensitivity of the area to human health is medium. In accordance with the criteria outlined in Table 6.10, the development is considered to be a medium risk site for human health as a result of trackout activities.

Table 6.17 indicates the sensitivity of the area to ecological impacts is high. In accordance with the criteria outlined in Table 6.10 the development is considered to be a high risk site for ecological receptors as a result of earthwork activities.

## 6.6.2 Summary of the Risk of Dust Effects

A summary of the risk from each dust generating activity is provided in Table 6.24.

**Table 6.24: Summary of Potential Dust Risk to Define Specific Mitigation**

| Potential Impact | Risk | | |
|---|---|---|---|
| | Earthworks | Construction | Trackout |
| Dust Soiling | Medium | Medium | High |
| Human Health | Low | Low | Medium |
| Ecological | Medium | Medium | High |

As indicated in Table 6.24, the potential risk of dust soiling and ecological impacts is **medium** from all earthworks and construction phase processes and **high** for trackout activities. The potential risk to human health impacts is **low** from earthworks and construction activities and **medium** from trackout activities. The potential risk to ecological impacts is **medium** from earthworks and construction activities and **high** from trackout activities.

It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

## 6.6.3 Operational Phase Effects – Human Receptors

Additional vehicle movements associated with the operation of the proposed scheme will generate exhaust emissions on the local road network. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations.

Additional vehicle movements associated with the operation of the proposed scheme will generate exhaust emissions on the local road network. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations.

The assessment considered the following scenarios:

- 2018 - Verification;
- 2020 – Future Year DM;
- 2020 – Future Year DS;
- 2022 – Opening Year DM; and
- 2022 –Opening Year DS.

The verification scenario was representative of baseline traffic data for 2018. The "DM" (i.e. without development) scenario was representative of anticipated traffic data for the opening year including committed developments in the area. The "DS" (i.e. with development) scenario was representative of anticipated traffic data for the opening year including committed development in the area in addition to vehicle trips associated with the proposal.

For the purpose of this assessment traffic data was supplied for 2020 (construction phase) and 2022 as the development opening year. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2018 were utilised within the dispersion model. The use of 2020, and 2022 traffic data with 2018 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

Reference should be made to Appendix 6A for full assessment input details.

#### 6.6.3.1 Nitrogen Dioxide

##### Predicted concentrations Across the site

Annual mean $NO_2$ concentrations were predicted across the development site for the DS scenario, as shown in Figure 6.7. Predicted annual mean $NO_2$ concentrations across the development site during the DS scenario are summarised in Table 6.25.

**Table 6.25: Predicted Annual Mean NO2 Concentrations at the Development Site**

| Elevation (m) | Predicted 2022 Annual Mean $NO_2$ Concentration Range ($\mu g/m^3$) |
|---|---|
| Ground (1.5m) | 20.45 – 25.11 |

The predicted concentrations shown in Table 6.25 indicate there were no exceedances of the annual mean AQO across the entirety of the proposed development site.

It is considered that $NO_2$ concentrations are likely to be lower at elevated heights due to increased distance from emission sources, such as the local road network. Therefore, predicted concentrations at elevations above the ground floor level have not been included within this assessment.

Predictions of 1-hour $NO_2$ concentrations were not produced as part of the dispersion modelling assessment. However, as stated in LAQM (TG16), if annual mean $NO_2$ concentrations are below 60µg/m3 then it is unlikely that the 1-hour AQO will be exceeded. As such based on the results in Table 6.23 it is not predicted that concentration will exceed the 1 hour mean AQO for $NO_2$ across the development site.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future site users from elevated $NO_2$ concentrations.

### Predicted Concentrations at Sensitive Receptors

Annual mean $NO_2$ concentrations were predicted at the receptor locations for both DM and DS scenarios and are summarised in Table 6.26. Reference should be made to Figure 6.6 for a graphical representation of operational phase emission sensitive human receptor locations.

**Table 6.26: Predicted Annual Mean NO2 Concentrations at the Sensitive Locations**

| Sensitive Receptor 2020 Construction Year | Predicted Annual Mean NO2 Concentration (µg/m3) | | |
|---|---|---|---|
| | **DM** | **DS** | **Change** |
| R1 | 20.59 | 20.64 | 0.05 |
| R2 | 20.80 | 20.85 | 0.05 |
| R3 | 21.72 | 21.78 | 0.06 |
| R4 | 22.28 | 22.33 | 0.05 |
| R5 | 27.57 | 27.70 | 0.13 |
| **Sensitive Receptor 2022 Opening Year** | **Predicted Annual Mean NO2 Concentration (µg/m3)** | | |
| | **DM** | **DS** | **Change** |
| R1 | 20.59 | 20.64 | 0.05 |
| R2 | 20.80 | 20.86 | 0.06 |
| R3 | 21.73 | 21.82 | 0.09 |
| R4 | 22.29 | 22.37 | 0.08 |
| R5 | 27.57 | 27.84 | 0.27 |

As indicated in Table 6.26 predicted concentrations **did not exceed** the relevant AQO at any sensitive receptor location.

Predicted impacts on annual mean $NO_2$ concentrations at the sensitive receptor locations are summarised Table 6.27.

### Table 6.27: Predicted NO2 Impacts

| **Sensitive Receptor 2020 Construction Year** | **% Change in Concentration Relative to AQO** | **Long Term Average Concentration** | **Impact** |
|---|---|---|---|
| R1 | 0.13 | 75% or Less of the AQO | Negligible |
| R2 | 0.13 | 75% or Less of the AQO | Negligible |
| R3 | 0.15 | 75% or Less of the AQO | Negligible |
| R4 | 0.12 | 75% or Less of the AQO | Negligible |
| R5 | 0.32 | 75% or Less of the AQO | Negligible |
| **Sensitive Receptor 2022 Opening Year** | **% Change in Concentration Relative to AQO** | **Long Term Average Concentration** | **Impact** |
| R1 | 0.13 | 75% or Less of the AQO | Negligible |
| R2 | 0.15 | 75% or Less of the AQO | Negligible |
| R3 | 0.23 | 75% or Less of the AQO | Negligible |
| R4 | 0.20 | 75% or Less of the AQO | Negligible |
| R5 | 0.67 | 75% or Less of the AQO | Negligible |

As indicated in Table 6.27 the impacts on annual mean $NO_2$ concentrations as a result of the development was predicted to be **negligible** at all 5 sensitive receptor locations considered.

### 6.6.3.2 Particulate Matter $PM_{10}$

### Predicted Concentrations Across the Site

Annual mean $PM_{10}$ concentrations were predicted across the development site for the DS scenario, as shown in Figure 6.8. Predicted annual mean $PM_{10}$ concentrations across the development site during the DS scenario are summarised in Table 6.28.

**Table 6.28: Predicted Annual Mean PM10 Concentrations at the Development Site**

| Elevation (m) | Predicted 2022 Annual Mean PM10 Concentration Range (µg/m3) |
|---|---|
| Ground (1.5m) | 11.06 – 11.78 |

The predicted concentrations shown in Table 6.28 indicate there were no exceedances of the annual mean AQO across the entirety of the proposed development site.

Similar to $NO_2$, it is considered that $PM_{10}$ concentrations are likely to be lower at elevated heights due to increased distance from emission sources, such as road. Therefore, predicted concentrations at elevations above the ground floor level have not been included within this assessment.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future site users from elevated $PM_{10}$ concentrations.

## Predicted Concentrations at Sensitive Receptors

Annual mean $PM_{10}$ concentrations were predicted at the receptor locations for each scenario and are summarised Table 6.29.

**Table 6.29: Predicted Annual Mean PM10 Concentrations at the Sensitive Locations**

| Sensitive Receptor 2020 Construction Year | Predicted Annual Mean $PM_{10}$ Concentration (µg/m3) | | |
|---|---|---|---|
| | DM | DS | Change |
| R1 | 11.09 | 11.10 | 0.01 |
| R2 | 11.13 | 11.14 | 0.01 |
| R3 | 11.31 | 11.32 | 0.01 |
| R4 | 11.41 | 11.42 | 0.01 |
| R5 | 12.36 | 12.38 | 0.02 |
| **Sensitive Receptor 2022 Opening Year** | **Predicted Annual Mean $PM_{10}$ Concentration (µg/m3)** | | |
| | **DM** | **DS** | **Change** |
| R1 | 11.09 | 11.10 | 0.01 |
| R2 | 11.13 | 11.14 | 0.01 |
| R3 | 11.31 | 11.33 | 0.02 |
| R4 | 11.42 | 1.43 | 0.01 |
| R5 | 12.37 | 12.42 | 0.25 |

As indicated in Table 6.29 predicted concentrations were below the relevant AQO at all sensitive receptors for both scenarios considered.

Predicted impacts on annual mean $PM_{10}$ concentrations at the sensitive receptor locations are summarised in Table 6.30.

**Table 6.30: Predicted PM10 Impacts**

| **Sensitive Receptor 2020 Construction Year** | **% Change in Concentration Relative to AQO** | **Long Term Average Concentration** | **Impact** |
|---|---|---|---|
| R1 | 0.02 | 75% or Less of the AQO | Negligible |
| R2 | 0.02 | 75% or Less of the AQO | Negligible |
| R3 | 0.02 | 75% or Less of the AQO | Negligible |
| R4 | 0.02 | 75% or Less of the AQO | Negligible |
| R5 | 0.05 | 75% or Less of the AQO | Negligible |
| Sensitive Receptor 2022 Opening Year | % Change in Concentration Relative to AQO | Long Term Average Concentration | Impact |
| R1 | 0.02 | 75% or Less of AQO | Negligible |
| R2 | 0.02 | 75% or Less of AQO | Negligible |
| R3 | 0.05 | 75% or Less of AQO | Negligible |
| R4 | 0.02 | 75% or Less of AQO | Negligible |
| R5 | 0.13 | 75% or Less of AQO | Negligible |

As indicated Table 6.30 the impacts on annual mean $PM_{10}$ concentrations as a result of the development was predicted to be **negligible** at all 5 sensitive receptor locations considered.

### 6.6.3.3 Particulate Matter $PM_{2.5}$

$PM_{2.5}$ has not been modelled within the assessment as the predicted concentrations relating to annual mean $PM_{10}$ remain below the AQO for $PM_{2.5}$ (25 µg/m$^3$).

Since $PM_{10}$ contains all particulate matter with an aerodynamic diameter of less than 10µm, $PM_{2.5}$ is effectively accounted for within these predictions; and at worst could be considered that $PM_{2.5}$ concentrations would be equal to the predicted $PM_{10}$ concentrations.

The overall significance of operational phase road traffic emission impacts was determined as **not significant**. This was based on the most significant impacts at discrete receptor locations and the considerations outlined in the operational phase methodology. Further justification is provided in Table 6.31.

**Table 6.31: Overall Impact Significance**

| Guidance | Comment |
|---|---|
| Number of properties affected by minor, moderate or substantial air quality impacts and a judgement on the overall balance | Impacts on $NO_2$, and $PM_{10}$ concentrations were predicted to be negligible at all sensitive receptors considered.<br>Given the use of 2022 traffic data and 2018 emission factors, the assessment is considered to provide a significant overestimation and therefore a sufficient level of confidence can be placed within the predicted non-significant impacts. |
| Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant | There were no predicted exceedances of the relevant annual mean AQOs at sensitive locations across the proposed scheme, and as such no new exposure has been introduced |
| The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors | The change in concentration relative to the AQO for the opening year scenario was predicted to range from:<br>0.125% to 0.675% for $NO_2$; - and<br>0.02% to 0.13% for $PM_{10}$,<br>As such, resultant impacts on annual mean $NO_2$, and $PM_{10}$ concentrations were predicted to be negligible at all sensitive receptor locations. |
| Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease | There were no exceedances of the annual mean AQO for $NO_2$ or $PM_{10}$ at sensitive locations throughout the modelling extents. |
| The extent to which an objective is exceeded e.g. an annual mean $NO_2$ concentration of 41µg/m3 should attract less significance than an annual mean of 51µg/m3 | There were exceedances of the annual mean AQO for $NO_2$ at non-sensitive locations within the modelling and site extents. Critically, there were no exceedances of the annual mean AQO at any sensitive locations within the modelling extents |

### 6.6.4 Operational Phase Effects – Ecological Receptors

The proposed development site is located in the vicinity of the Liverpool Bay Special Protection Area (SPA) and therefore there is the potential for impacts to arise at the designation as a result of additional road vehicle emissions associated with the operational phase.

Predicted concentrations and deposition rates of each pollutant at the ecological receptor locations identified in Table 6.19 are summarised in the following section.

### Annual Mean Oxides of Nitrogen

Predicted Annual Mean NOx concentrations at the SPA for both the 2020 and 2022 development scenarios are summarised in Table 6.32 and Table 6.33 below.

## Table 6.32: Predicted Annual Mean NOx Impacts for 2020 Construction Year

| Receptor | Predicted Annual Mean NOx Concentration (µg/m³) | Proportion of EQS (%) | Predicted Annual Mean NOx Concentration (µg/m³) | Proportion of EQS (%) |
|---|---|---|---|---|
| | PC | PC | PEC | PEC |
| E1 | 0.01 | 0.05 | - | - |
| E2 | 0.02 | 0.05 | - | - |
| E3 | 0.02 | 0.06 | - | - |
| E4 | 0.02 | 0.07 | - | - |
| E5 | 0.02 | 0.07 | - | - |
| E6 | 0.02 | 0.08 | - | - |
| E7 | 0.03 | 0.10 | - | - |
| E8 | 0.04 | 0.14 | - | - |
| E9 | 0.06 | 0.20 | - | - |
| E10 | 0.08 | 0.28 | - | - |
| E11 | 0.11 | 0.36 | - | - |
| E12 | 0.16 | 0.54 | - | - |
| E13 | 0.28 | 0.93 | - | - |
| E14 | 0.47 | 1.55 | 30.04 | 100.15 |
| E15 | 0.49 | 1.64 | 30.07 | 100.24 |
| E16 | 0.97 | 3.24 | 30.55 | 101.84 |
| E17 | 1.14 | 3.81 | 30.72 | 102.40 |
| E18 | 0.90 | 3.01 | 30.48 | 101.60 |
| E19 | 0.99 | 3.29 | 30.57 | 101.89 |
| E20 | 1.02 | 3.38 | 30.59 | 101.98 |
| E21 | 0.65 | 2.16 | 30.23 | 100.76 |
| E22 | 0.15 | 0.51 | - | - |
| E23 | 0.08 | 0.26 | - | - |
| E24 | 0.05 | 0.16 | - | - |
| E25 | 0.03 | 0.10 | - | - |
| E26 | 0.04 | 0.12 | - | - |
| E27 | 0.03 | 0.09 | - | - |
| E28 | 0.02 | 0.08 | - | - |
| E29 | 0.03 | 0.09 | - | - |
| E30 | 0.02 | 0.05 | - | - |

As indicated in Table 6.32, the PC proportion of the EQS is below the screening threshold (1% of the EQS) at 24 sensitive ecological receptor locations and as such can be deemed insignificant.

The PC proportion of the EQS is greater than 1% at 8 receptor locations (E14 – E21) and as such, impacts on annual mean $NO_x$ concentrations cannot be screened as insignificant according to first stage EA screening criteria.

Following the second stage of screening the PEC proportion of the EQS at the 8 locations (E14 – E21) are also to be greater than 70%, It should be noted that such exceedance of the PEC are largely related to an elevated background concentration of 28.2µg/m$^3$ which is marginal below the relevant EQS of 30.0µg/m$^3$

**Table 6.33: Predicted Annual Mean NOx Impacts for 2022 Opening Year**

| Receptor | Predicted Annual Mean NOx Concentration (µg/m$^3$) | Proportion of EQS (%) | Predicted Annual Mean NOx Concentration (µg/m$^3$) | Proportion of EQS (%) |
|---|---|---|---|---|
| | PC | PC | PEC | PEC |
| E1 | 0.02 | 0.05 | - | - |
| E2 | 0.02 | 0.05 | - | - |
| E3 | 0.02 | 0.06 | - | - |
| E4 | 0.02 | 0.08 | - | - |
| E5 | 0.02 | 0.07 | - | - |
| E6 | 0.02 | 0.08 | - | - |
| E7 | 0.03 | 0.10 | - | - |
| E8 | 0.04 | 0.14 | - | - |
| E9 | 0.06 | 0.20 | - | - |
| E10 | 0.08 | 0.27 | - | - |
| E11 | 0.10 | 0.35 | - | - |
| E12 | 0.15 | 0.50 | - | - |
| E13 | 0.26 | 0.85 | - | - |
| E14 | 0.44 | 1.46 | - | - |
| E15 | 0.44 | 1.46 | - | - |
| E16 | 0.82 | **2.73** | 30.55 | **101.84** |
| E17 | 0.96 | **3.20** | 30.72 | **102.40** |
| E18 | 0.75 | **2.49** | 30.48 | **101.60** |
| E19 | 0.80 | **2.68** | 30.57 | **101.89** |
| E20 | 0.85 | **2.82** | 30.59 | **101.98** |
| E21 | 0.54 | **1.79** | 30.23 | **100.76** |
| E22 | 0.13 | 0.45 | - | - |

| Receptor | Predicted Annual Mean NOx Concentration ($\mu g/m^3$) | Proportion of EQS (%) | Predicted Annual Mean NOx Concentration ($\mu g/m^3$) | Proportion of EQS (%) |
|---|---|---|---|---|
| | PC | PC | PEC | PEC |
| E23 | 0.07 | 0.24 | - | - |
| E24 | 0.05 | 0.16 | - | - |
| E25 | 0.03 | 0.11 | - | - |
| E26 | 0.04 | 0.13 | - | - |
| E27 | 0.03 | 0.10 | - | - |
| E28 | 0.03 | 0.09 | - | - |
| E29 | 0.03 | 0.11 | - | - |
| E30 | 0.02 | 0.07 | - | - |

As indicated in Table 6.33, the PC proportion of the EQS is below the screening threshold (1% of the EQS) at 24 sensitive ecological receptor locations and as such can be deemed insignificant.

The PC proportion of the EQS is greater than 1% at 6 receptor locations (E16 – E21) and as such, impacts on annual mean $NO_x$ concentrations cannot be screened as insignificant according to first stage EA screening criteria.

Following the second stage of screening the PEC proportion of the EQS at the 6 locations (E16 – E21) are also to be greater than 70%, It should be noted that such exceedance of the PEC are largely related to an elevated background concentration of 28.2$\mu g/m^3$ which is marginal below the relevant EQS of 30.0$\mu g/m^3$

As such, impacts on annual mean $NO_x$ concentrations at 6 receptor location cannot be screened out as insignificant according to the EA guidance. It should be noted that the remaining 24 receptors are deemed insignificant, and potential impacts are therefore isolated to a small area directly adjacent to the proposed link road.

### 24-hour Mean Oxides of Nitrogen

Predicted 24-Hour Mean NOx concentrations at the SPA for both the 2020 and 2022 development scenarios are summarised in Table 6.34.

**Table 6.34: Predicted 24-Hour Mean NOx Impacts for 2020 Construction Year**

| Receptor | Predicted 24-Hour Mean NOx Concentration (µg/m3) | Proportion of EQS (%) |
|---|---|---|
| | PC | PC |
| E1 | 0.01 | 0.01 |
| E2 | 0.01 | 0.02 |
| E3 | 0.01 | 0.02 |

| Receptor | Predicted 24-Hour Mean NOx Concentration (µg/m3) | Proportion of EQS (%) |
|---|---|---|
| | PC | PC |
| E4 | 0.02 | 0.02 |
| E5 | 0.01 | 0.02 |
| E6 | 0.02 | 0.02 |
| E7 | 0.02 | 0.03 |
| E8 | 0.03 | 0.04 |
| E9 | 0.04 | 0.06 |
| E10 | 0.06 | 0.08 |
| E11 | 0.07 | 0.10 |
| E12 | 0.11 | 0.14 |
| E13 | 0.19 | 0.25 |
| E14 | 0.31 | 0.41 |
| E15 | 0.31 | 0.41 |
| E16 | 0.58 | 0.77 |
| E17 | 0.69 | 0.92 |
| E18 | 0.54 | 0.72 |
| E19 | 0.58 | 0.77 |
| E20 | 0.61 | 0.81 |
| E21 | 0.39 | 0.52 |
| E22 | 0.10 | 0.13 |
| E23 | 0.05 | 0.07 |
| E24 | 0.03 | 0.04 |
| E25 | 0.02 | 0.03 |
| E26 | 0.03 | 0.04 |
| E27 | 0.02 | 0.03 |
| E28 | 0.02 | 0.03 |
| E29 | 0.02 | 0.03 |
| E30 | 0.01 | 0.02 |

As indicated in Table 6.34, the PC proportion of the EQS is below the screening threshold (10% of the EQS) at all sensitive ecological receptor locations. As such, impacts on 24-Hour mean NOx concentrations are considered to be insignificant in accordance with the first stage EA screening criteria.

**Table 6.35: Predicted 24-Hour Mean NOx Impacts for 2022 Opening Year**

| Receptor | Predicted 24-Hour Mean NOx Concentration (µg/m3) | Proportion of EQS (%) |
|---|---|---|
| | PC | PC |
| E1 | 0.01 | 0.01 |
| E2 | 0.01 | 0.01 |
| E3 | 0.01 | 0.02 |
| E4 | 0.02 | 0.02 |
| E5 | 0.01 | 0.02 |
| E6 | 0.02 | 0.02 |
| E7 | 0.02 | 0.03 |
| E8 | 0.03 | 0.04 |
| E9 | 0.04 | 0.06 |
| E10 | 0.06 | 0.08 |
| E11 | 0.08 | 0.10 |
| E12 | 0.12 | 0.15 |
| E13 | 0.20 | 0.27 |
| E14 | 0.33 | 0.44 |
| E15 | 0.35 | 0.47 |
| E16 | 0.70 | 0.93 |
| E17 | 0.83 | 1.11 |
| E18 | 0.64 | 0.85 |
| E19 | 0.71 | 0.95 |
| E20 | 0.73 | 0.97 |
| E21 | 0.47 | 0.63 |
| E22 | 0.11 | 0.15 |
| E23 | 0.06 | 0.07 |
| E24 | 0.03 | 0.04 |
| E25 | 0.02 | 0.03 |
| E26 | 0.03 | 0.03 |
| E27 | 0.02 | 0.03 |
| E28 | 0.02 | 0.02 |
| E29 | 0.02 | 0.02 |
| E30 | 0.01 | 0.01 |

As indicated in Table 6.35, the PC proportion of the EQS is below the screening threshold (10% of the EQS) at all sensitive ecological receptor locations. As such, impacts on 24-Hour mean NOx concentrations are considered to be insignificant in accordance with the first stage EA screening criteria.

# 6.7 Mitigation Measures

## 6.7.1 Construction Phase

The IAQM guidance provides a number of potential mitigation measures to reduce potential impacts from the construction phase. As a high risk of dust impacts as a result of earthworks, construction and trackout activities was identified, mitigation measures are required. These have been adapted for the development site as summarised in Table 6.36. These may be reviewed prior to the commencement of construction works and incorporated into any existing plans if required by the Local Planning Authority.

**Table 6.36: Fugitive Dust Mitigation Measures**

| Issue | Control Measure |
|---|---|
| Communications | Develop and implement a Stakeholder Communications Plan that includes community engagement<br>Display the head or regional office contact information<br>Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary<br>Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LA |
| Site Management | Record all dust and air quality complaints<br>Make the complaints log available to the local authority when asked<br>Record any exceptional incidents that cause dust/or air emissions, and the action taken to resolve the situation<br>Hold regular consortium meetings with other high-risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised |
| Monitoring | Undertake daily on-site and off-site inspections to monitor dust.<br>Carry out regular site inspections to monitor compliance with the DMP<br>Increase frequency of site inspections when activities with a high potential to produce dust are being carried out |
| Preparing and Maintaining the Site | Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible<br>Fully enclose site or specific operations where there is a high potential for dust production<br>Avoid site runoff of water or mud<br>Keep site fencing, barriers and scaffolding clean using wet methods<br>Remove materials that have a potential to produce dust from site as soon as possible<br>Cover, seed or fence stockpiles to prevent wind whipping |

| Issue | Control Measure |
|---|---|
| Operating Vehicle/ Machinery and Sustainable Travel | All vehicles to switch of engines - no idling vehicles<br>Avoid the use of diesel or petrol-powered generators where practicable<br>Impose a maximum-speed-limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas<br>Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials<br>Implement a Travel Plan that supports and encourages sustainable travel |
| Operations | Cutting equipment to use water as dust suppressant or suitable local extract ventilation<br>Ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation<br>Use enclosed chutes and covered skips<br>Minimise drop heights<br>Ensure equipment is readily available on site to clean any spillages |
| Waste Management | No bonfires |
| Earthworks and Construction | Re-vegetate earthworks and exposed areas<br>Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil<br>Only remover the cover in small areas during work and not all at once<br>Avoid scabbling<br>Ensure sand and other aggregates are stored and not able to dry out<br>Ensure bulk cement and other fine power materials are delivered and stored to prevent escape |
| Trackout | Use water-assisted dust sweeper on the access and local roads<br>Avoid dry sweeping of large areas<br>Ensure vehicles entering and leaving sites are covered to prevent escape of materials<br>Inspect on-site routes for integrity, instigate necessary repairs and record in site log book<br>Install hard surfaced haul routes which are regularly damped down<br>Pressure washer on site for wheel washing with adequate area of hard surfaced road between the washer and site exit, wherever site size and layout permits<br>Access gates 10m from receptors where possible |

### 6.7.2 During Operation

The overall impact significance was determined as **not significant** and therefore no mitigation measures are required.

## 6.8 Climate Change

Comments from MEAS on the originally submitted application stated that all developments will have an impact on climate change. The development will generate greenhouse gas emissions associated with transport and traffic in the construction and operational phase as well as emissions from heating.

Development pollutants including those of NOx and $PM_{10}$, do have the potential to cause implications upon climate change. Whilst these pollutants are not directly classified as greenhouse gases, they do interact with ozone pollutants which in turn influence greenhouse gases.

It should also be noted that due to the deficiency of legislation and relevant technical guidance, it is challenging to assess the significance between local air quality and global climate change. Moreover, the timescales of each matter are not related, as local Air Quality modelling focuses on short term predictions, whereas the effect of climate is based on long-term predictions.

There is no government guidance published for assessing the significance of the effects of developments on regional or greenhouse gas emissions. Greenhouse gas emissions are addressed at a national, rather than development level. Despite this, in order to provide some context, the annual increase in emissions as a result of the proposed scheme have been compared with the 2014 NAEI national carbon contribution for road transport (a total of 26,901 kilotonnes per year). The database does not project forward to future years, therefore 2014 has been used as the latest dataset.

The proposed scheme during both construction and operational phases is expected to lead to an annual increase in the carbon emissions in comparison to the national emissions figures of 0.001% in 2020 and 2022 respectively. Therefore, the air quality impact of the scheme on carbon emissions are negligible**.**

Additionally, recent advancement in fuel technologies associated with road vehicle emissions, particularly those related to diesel emissions, have increased the potential for reductions in surface temperatures and subsequently the overall effects of climate change. Importantly, emissions in the UK associated with road vehicles, especially those associated with diesel fuel, are predicted to decrease significantly in the forthcoming decades and therefore the impact on climate change from these sources will dissipate.

## 6.9 Residual Effects

### 6.9.1 Construction Phase

Assuming the relevant mitigation measures outlined in Table 6.34 are implemented, the residual effect from all dust generating activities is predicted to be not significant.

### 6.9.2 Operational Phase

The overall significance of impacts was considered to be not significant without the requirement for mitigation measures. Consequently, the residual effects from road vehicle exhaust emissions associated with traffic generated by the proposal are predicted to be **not significant.**

**Table 6.37: Summary of Effects**

| Receptor | Effects | Mitigation | Residual Effects |
|---|---|---|---|
| During Construction | | | |
| Dust Soiling, Human Health and Ecology | Negligibl e | Measures Outlined in the IAQM guidance as stated in Table 6.8.1 | Negligible dust impacts to property and people |
| During Operation | | | |
| Human Health and Ecology | Negligibl e | Best Practice Measures | Negligible |

### 6.9.3 Climate Change

Based on the additional construction and operational traffic predicted for the proposed scheme, the annual increase in carbon emissions was calculated at 0.001% of the 2014 NAEI national carbon contribution for road transport. The overall significance of impact was considered to be not significant without the requirement for mitigation measures.

Importantly, emissions in the UK associated with road vehicles are predicted to decrease significantly in the forthcoming decades and therefore the impact on climate change from these sources will dissipate.

## 6.10 Cumulative Impacts

There is the potential for cumulative effects on construction dust impacts from other major developments in the vicinity of the development site should the phases overlap and from agricultural dust generating activity in the area.

Generally, cumulative effects are considered in two ways as follows:

- The combined effects of individual residual impacts (intra), for example, noise and dust, from one development on a particular sensitive receptor; and,
- The combined effects from several developments in the area (inter), which individually might be insignificant, but when considered together, could result in a significant cumulative effect.

### 6.10.1 Intra Cumulative Effects

#### Construction Phase

There is the potential for cumulative impacts on existing sensitive receptors close to the development site from fugitive dust emissions throughout the construction phase, particularly given the likely length of this phase.

However it is considered that due to the low number of sensitive receptors in the vicinity of the site and that the effective implementation of dust control mitigation measures stated previously it is likely to be sufficient as to effectively control dust impacts and render these other potential cumulative impacts as not significant.

#### Operational Phase

There is the potential for air pollution associated with additional road traffic to cause cumulative impact upon human health and ecological sites. However, given the predicted negligible air quality impacts at all sensitive receptors it is considered unlikely that air quality impacts would not contribute to cumulative health impacts in these locations.

### 6.10.2 Inter Cumulative Effects

#### Construction Phase

As discussed previously, there is the potential for cumulative effects from construction dust impacts from other major developments in the vicinity of the development site should the phases overlap.

The proposed scheme sits within the Liverpool Waters site which has the benefit of outline consent (10O/2424) and it is understood that there are several applications within the vicinity of the proposed scheme that have received planning consent. These developments have the potential to create cumulative construction impacts if construction phases were to overlap. A full list of the committed developments are outlined within Table 3.3 of Chapter 3 of this ES.

Dust generating activities from agricultural sources in the area are likely to be transient and therefore not cause significant cumulative impacts.

The Isle of Man development is now a committed scheme, situated within 500m and overlaps with the Liverpool Waters development boundary and therefore cumulative impacts have been considered. It is proposed that a Construction Environmental Management Plan (CEMP) is to be implemented for the proposed ferry terminal development.

Similar to this development residual impacts of dust and other potential adverse impacts on amenity should be assumed to be controlled to acceptable levels through appropriate mitigation from the proposed scheme and others.

Given these considerations and the mitigation measures proposed, the assessment of cumulative construction dust impacts is therefore considered to be not significant.

### Operational Phase

The cumulative traffic impacts from other potential committed developments in the area have been included in the future year's traffic flow DM and DS scenarios and therefore the cumulative air quality impacts have been considered within this assessment.

Given the predicted negligible air quality impacts at all sensitive receptors it is considered unlikely that air quality impacts would contribute to cumulative health impacts in these locations.

However, in principal, there is potential for exhaust emissions from the combined Isle of Man Development and the Liverpool Waters development to give rise to cumulative residual dust impacts on the local area. Similarly, the predicted impacts at sensitive receptors from the Isle of Man scheme was negligible and the cumulative impacts would also be considered as not significant.

## 6.11 Assessment Summary

**Table 6.38: Summary of Effects**

| Potential Impact | Environmental significance effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Construction Dust | High | Dust Control Measures through CEMP | Negligible |
| Construction Dust | Medium | Dust Control Measures through CEMP | Negligible |
| Operational Impacts | Negligible | - | Negligible |

The proposed scheme has the potential to cause air quality impacts at sensitive locations. As such, this chapter was required to quantify pollutant levels across the site, consider its suitability for the proposed end-use and assess potential impacts as a result of the development.

During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be **negligible**.

Dispersion modelling was undertaken in order to quantify pollutant concentrations at the site and to predict air quality impacts as a result of road vehicle exhaust emissions associated with traffic generated by the development. Results were subsequently verified using monitoring results obtained from LCC.

The dispersion modelling results indicated that pollutant levels at sensitive locations across the site were below all relevant AQOs. The location is therefore considered suitable for the proposed end-use without the inclusion of mitigation methods to protect future users from poor air quality. Predicted impacts on human and ecological sensitive receptors as a result of operational exhaust emissions were predicted to be **negligible**. The overall significance of potential impacts was determined to be **not significant**, in accordance with the EA and EPUK and IAQM guidance.

## 6.12 Abbreviations

| | |
|---|---|
| AADT | Annual Average Daily Traffic |
| ADM | Atmospheric Dispersion Modelling |
| AQAP | Air Quality Action Plan |
| AQLV | Air Quality Limit Value |
| AQMA | Air Quality Management Area |
| AQO | Air Quality Objectives |
| AQS | Air Quality Strategy |
| CERC | Cambridge Environmental Research Consultants |
| DEFRA | Department for Environment, Food and Rural Affairs |
| DfT | Department for Transport |
| DMP | Dust Management Plan |
| DMRB | Design Manual for Roads and Bridges |
| EPUK | Environmental Protection UK |
| EU | European Union |
| HDV | Heavy Duty Vehicle |
| IAQM | Institute of Air Quality Management |
| LA | Local Authority |
| LAQM | Local Air Quality Management |
| LCC | Liverpool City Council |
| NGR | National Grid Reference |
| $NO_2$ | Nitrogen dioxide |

| | |
|---|---|
| NOx | Oxides of nitrogen |
| NPPF | National Planning Policy Framework |
| NPPG | National Planning Practice Guidance |
| $PM_{2.5}$ | Particulate matter with an aerodynamic diameter of less than 2.5µm |
| $PM_{10}$ | Particulate matter with an aerodynamic diameter of less than 10µm |
| REC | Resource and Environmental Consultants |
| TEMPRO | Trip End Model Presentation Program |
| z0 | Roughness Length |

# 7 Noise and Vibration

## 7.1 Introduction

This chapter presents an assessment of potential impacts on Noise and Vibration associated with the proposals, described in Chapter 2: Scheme Description.

The potential permanent sources of noise and vibration are likely to be restricted to mechanical equipment (nearly all standby and/or emergency) located in the ground floor areas and roofs, as well as some ground floor commercial units (most likely to be retail and coffee shops, potentially with some mechanical equipment). There should be negligible impact from the development's traffic, and this is briefly discussed.

Construction noise and vibration is not modelled in detail as it was agreed with LCC's Environment Protection that potentially sensitive locations are not particularly close, and that impact is typically controlled using suitable planning conditions requiring that a noise management plan is adhered to.

This chapter is supported by the following figures and appendices:

- Appendix 7A: Definitions of Acoustic Terms

## 7.2 Methodology, Scope and Significance Criteria

In general terms, The National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE) and the National Planning Practice Guidance (NPPG) are referred to.

More specifically, there is no useful legislation and guidance designed for standby and/or emergency equipment as the usual guidance implicitly assumes that the normal state of the equipment in question is running. However, in order to provide a complete picture, it has been assessed in the light of *BS 4142:2014 Methods for rating and assessing industrial and commercial sound* which allows us to consider context in the assessment. Commercial noise is assessed with the same standard. We have also made brief reference to *BS 8233:2014 Guidance on sound insulation and noise reduction for buildings*.

The main standards are briefly discussed as follows:-

### 7.2.1 NPPF, NPSE and NPPG

The National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE) and the National Planning Practice Guidance (NPPG) provide nothing in the way of quantitative criteria but instead provide general policy aims and statements and some guidance on how certain situation can be interpreted.

The NPPF's main statement on noise is to be found in paragraph 180:-

*180 Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including* *cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development*. In doing so they should:

*a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life(footnote here refers to NPSE – see below);*

*b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*

*c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation*

Paragraph 182 is also relevant:-

*182 Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*

The NPPF refers to the NPSE which sets out the following aims:-:-

1. *avoid significant adverse impacts on health and quality of life;*
2. *mitigate and minimise adverse impacts on health and quality of life; and*
3. *where possible, contribute to the improvement of health and quality of life.*

It also introduces the concepts of:

- *NOEL – No Observed Effect Level. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
- *LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.*
- *SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.*

SOAEL is clearly something the policy seeks to avoid in aim 1. Aim 2 represents situations between SOAEL and LOAEL, and seeks to minimise and mitigate the effects.

The NPPG section on noise adds some further detail, much of it reproducing the NPPF and NPSE, but some useful qualitative guidance is provided in Table 7.1 as reproduced below.

**Table 7.1: NPPG Section on Noise**

| Perception | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| Not noticeable | No Effect | No Observed Effect | No specific measures required |
| Noticeable and not intrusive | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life. | No Observed Adverse Effect | No specific measures required |
| | | Lowest Observed Adverse Effect Level | |
| Noticeable and intrusive | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life. | Observed Adverse Effect | Mitigate and reduce to a minimum |
| | | Significant Observed Adverse Effect Level | |
| Noticeable and disruptive | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant Observed Adverse Effect | Avoid |
| Noticeable and very disruptive | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory | Unacceptable Adverse Effect | Prevent |

It also makes the point that the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation, including the level of the noise in absolute terms and how it might compare with the underlying background noise, the impulsiveness or intermittence pattern of the noise, its spectral content, and the time of day. It discusses in very general terms the issues to consider when introducing noise sources to existing noise sensitive area, new residential development in areas affected by existing noise sources (most of which have their own specific guidance, such as BS4142, BS8233, etc.) and the potential impact on wildlife.

### 7.2.2 BS 4142:2014

BS 4142 was updated in November 2014. The standard is very complicated but, basically, it describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a) sound from industrial and manufacturing processes

b) sound from fixed installations which comprise mechanical and electrical plant and equipment

c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises

d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

### 7.2.3 Characteristics and Context

Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, we need to add a character correction to the specific sound level to obtain the rating level.

These features can include tonality, impulsivity and intermittency with corrections typically ranging potentially from 0dB to 9 dB. Corrections at the higher end would represent characteristics which are highly perceptible in the context of the ambient noise as a whole. Corrections at the lower end would represent characteristics which are just perceptible in the presence of the ambient noise as a whole,

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.

### 7.2.4 Assessment

We obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and considering the following.

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Where the initial estimate of the impact needs to be modified due to the context, pertinent factors need to be taken into consideration, including the following.

1) The absolute level of sound.

   For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

   Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

   Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) The character and level of the residual sound compared to the character and level of the specific sound.

   We need to consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

### 7.2.5 BS 8233:2014

BS 8233 was updated in March 2014. Quantitatively, however, the design criteria are little changed – just expressed differently to reduce ambiguity in certain situations. The criteria are very similar to those of the WHO Guide to Community Noise

Table 4 of BS8233 gives the desirable criteria for indoor ambient noise levels for dwellings as follows:-

**Table 7.2: Extracts from Table 4 of BS 8233**

| Activity | Location | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,16hour}$ | - |
| Dining | Dining room/area | 40 dB $L_{Aeq,16hour}$ | - |
| Sleeping (daytime resting) | Bedroom | 35 dB $L_{Aeq,16hour}$ | 30 dB $L_{Aeq,16hour}$ |

Note that the standard accepts the widely used rule of thumb that, for a partly open window, the levels just outside will be 15dB higher than those just inside. This brings us to an external equivalent of the above table, as follows:-

**Table 7.3: External Equivalents of Table 4 of BS 8233**

| Activity | Location | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|---|
| Resting | Living room | 50 dB $L_{Aeq,16hour}$ | - |
| Dining | Dining room/area | 55 dB $L_{Aeq,16hour}$ | - |
| Sleeping (daytime resting) | Bedroom | 50 dB $L_{Aeq,16hour}$ | 45 dB $L_{Aeq,16hour}$ |

It goes on to state that, where necessary, the criteria can be relaxed by up to 5 dB and still achieve reasonable conditions. Note that the new version does not explicitly state criteria for bedroom noise in terms of dB LAmax.

Garden area criteria are unchanged with 50 dB LAeq and 55 dB LAeq being considered desirable and reasonable respectively.

Note that the new version of BS8233 more explicitly specifies the assessment periods as 16 hour and 8 hour for daytime and night time respectively.

### 7.2.6 Survey Details

The measurements were carried out on 18$^{th}$/19$^{th}$ November 2018 by Mark Pickering of ADC Acoustics.

We were restricted for daytime measurements due to construction noise on the adjacent site and so daytime measurements were carried out between 16:00 hours and 18:00 hours. Evening and night time measurements were between 22:00 and 00:00 and between 01:00 and 03:00.

Instrumentation used was a Rion NL-52. This is a precision grade sound level meter which holds a current calibration certificate and which was field-calibrated as necessary. The meter was set up to measure 15 minute samples in terms of dB $L_{eq}$, dB $L_{max}$ and dB $L_{90}$ in overall A-weighted terms, and in octave bands across the frequency range.

The main measurement position was as shown by the yellow star below. Access to the site-side nearest residential locations was not possible and so the site itself was used. We are confident that it is representative.

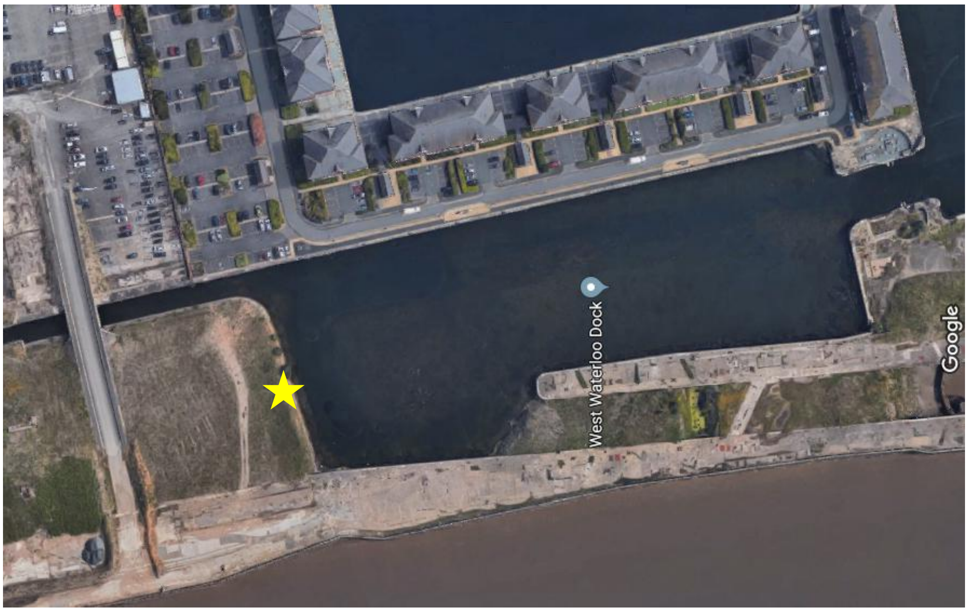


**Figure 7.1: Main Measurement Position**

The microphone was 1.5 m above ground and well away from other reflecting surfaces.

Weather conditions were as follows :-

| | | |
|---|---|---|
| Rain | : | none, dry roads |
| Cloud | : | 0 to 20% |
| Temperature | : | 8to 12 Celsius |
| Wind | : | less than 5m/s, from the East. |

Results are used to set the criteria for comparative assessments such as BS 4142, and for guidance as to the overall levels for discussions in the light of BS 8233.

## 7.3 Consultation

Consultations were mainly with the Local Authority Environmental Protection noise specialist. Brief consultations were also made with the project's Ecology

Consultants, Transport Consultants and the general (building, civil, structural) Consulting Engineers.

### 7.3.1 Environmental Protection

Discussions were undertaken with the Senior Enforcement Officer in Liverpool City Council's Environmental Protection Unit.

The original discussions took place in November 2018 and updated in October 2019.

It was generally agreed that the site sources were unlikely to be a high risk for noise impact on existing noise/vibration sensitive locations. The officer was advised that the permanent sources were likely to be restricted to mechanical equipment (nearly all standby and/or emergency) located in the ground floor areas and roofs, plus some commercial units on the ground floor (such as retail or coffee shops). These are assessed but should be straight forward to control by conditions. It was agreed that traffic generated by the development should be minimal and that a short discussion should be adequate rather than detailed assessment. Similarly, it was agreed that construction noise and vibration does not require detailed assessment as sensitive locations are not particularly close and it is typical for city locations be controlled using suitable planning conditions requiring that a noise management plan is adhered to. This is essentially identical to the approach taken at the nearby C04 and C06 sites.

In the light of the low risk of noise and vibration impact, it was agreed that basic survey work to assess existing noise levels during the daytime and night time would be adequate.

It was agreed that BS 4142:2014 would be the most useful guidance for assessing the mechanical equipment, including equipment associated with commercial units. However, it was pointed out that exact equipment would not be known for some time and the assessment would be done in outline form, so that conditions can be realistically proposed.

It was agreed that BS 8233:2104 would be referred to briefly with regards to general noise.

### 7.3.2 Ecology

Discussions were undertaken in October 2019 with Middlemarch Environmental, the project ecology consultants. We advised that we had been asked by MEAS to "reference ecological receptors" in our assessment. It was agreed that, while we can discuss noise levels, we have no expertise to comment on the effect on wildlife and that Middlemarch Environmental were to include a section discussing noise impacts and present it in chapter 15 (Terrestrial Ecology) of this ES.

It was agreed that the finished site in operation is likely to have negligible impact. We were also advised that Middlemarch felt that the construction of the site is also likely to have minimal impact. However, they felt that it is possible that there could be some cumulative impact issues in combination with construction on other sites where there is potential for displacement of a small number of cormorant foraging and roosting sites.  We comment on cumulative levels of construction noise below.

But we emphasise again that the main assessment of ecological impact from noise has been covered within chapter 15 of this ES.

### 7.3.3 Transport Consultants

SCP Transport Consultants were briefly consulted in October 2019 with regards to increases in traffic noise. There provided simple figures of construction and operation traffic increases for us to interpret as noise increases.

### 7.3.4 Consulting Engineers

Clancy Consulting Engineers were briefly consulted in October 2019 with regards to potentially noise-producing construction activities.  They advised that detailed plans are not available, and will be provided by the appointed contract or in due course.  They did, however, provide a list of potential activities.

A summary of consultation carried out for this EIA is provided in Table 7.4.

**Table 7.4: Consultation Summary**

| Consultee and date | Issue raised | Summary of response |
|---|---|---|
| Senior Enforcement Officer in Liverpool City Council's Environmental Protection Unit.  November 2018 and October 2019. | General requirements of assessment | Unlikely to be any significant impact. potential sources can be controlled by conditions if necessary. |
| Middlemarch Environmental.  October 2019.  October 2019. | Impact on ecological receptors | Some possibility of impact on cormorants from cumulative construction noise.  They will assess in detail |
| SCP Transport Consultants | Increases in traffic | Simple figures provided for traffic increases in the immediate area. |
| Clancy Consulting. October 2019. | Sources of construction noise | General list provided |

## 7.4 Limitations and Assumptions

Certain limitations with access to noise sensitive receptors and noise from the adjacent construction site are discussed elsewhere.  However, we are confident that the results obtained are representative.

At this stage of the project the exact nature of mechanical equipment and commercial usage has not been confirmed and so detailed modelling and assessment is not possible.  Instead noise limits are provided, based on existing conditions along with comments on the feasibility of achieving them. They can be used to establish planning conditions as necessary.

Details of construction activities, phasing, etc. are unavailable and will not become available until the appointment of a main contractor. It is therefore impossible to deal with the potential impact of construction noise in anything other than a qualitative way. However, this has been discussed with the Environmental Protection Unit and the Ecology Consultants.

## 7.5 Baseline Conditions

The proposed site is part of the Central Dock area with residential development to the east, beyond which are busy roads and the city centre. To the west is the River Mersey, including some minor and occasional noise from shipping. There was also significant construction noise up until around 17:00 and some industrial noise from other areas.

### 7.5.1 Noise Survey Results

Basic results are best presented graphically as follows:

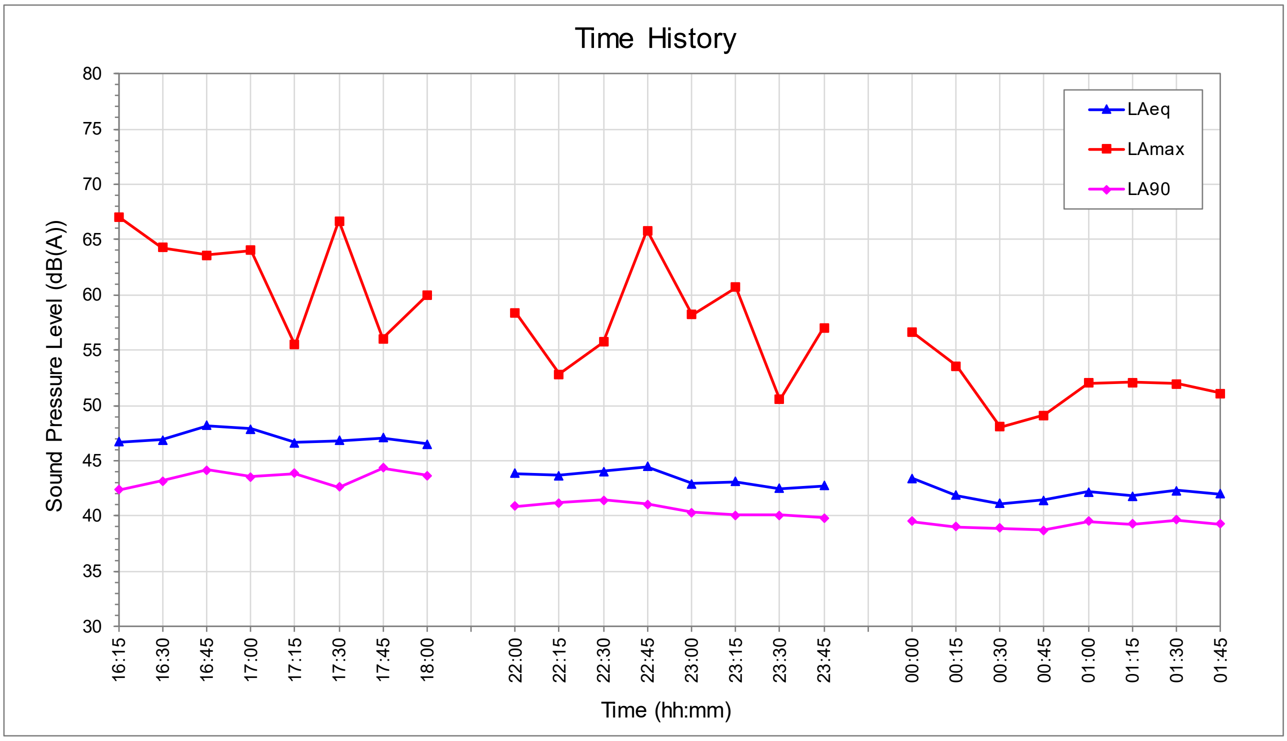


**Figure 7.2: Measurement Time History**

A summary is shown below in Table 7.5:-

**Table 7.5: Measurement Summary**

| *Time Period* | *Index* | ***dB(A)*** |
|---|---|---|
| Overall Late Afternoon | Leq | **47** |
| | Lmax | **64** |
| | L90 | **43** |
| Overall Evening/Early Night | Leq | **43** |
| | Lmax | **60** |
| | L90 | **41** |
| Overall Middle of Night | Leq | **42** |
| | Lmax | **53** |
| | L90 | **39** |

Noise was generally dominated by traffic, although influenced during the daytime period by construction noise and some industrial noise. Occasional noise from shipping was also audible

In general terms, the noise is suitable for residential development in terms of BS 8233. Even with nearby the construction noise, overall levels should be acceptable to future residential occupants of the site.

## 7.6 Environmental Impacts and Significance of Effects

This section considers key aspects of the proposed scheme which may be the source of effects as well as measures which have been embedded into the design, operation or construction impacts.

### 7.6.1 Construction Phase

The draft construction programme will be:-

- February – August 2020 Enabling Works
- August 2020 – August 2022 Construction of Buildings
- September 2022 – Occupation of buildings

The exact nature of sources and when/how they will operate is not known and will not be available until main contractor is appointed. A recent response from MEAS queried the qualitative nature of the draft assessment but it is simply impossible to assess it quantitatively without such information. This was discussed and agreed with Environmental Protection. It was agreed that such an assessment was unnecessary due distances and the commonplace nature of construction in the city centre. This is essentially the same as the consultation on the approved C04 and C06.

However, unmanaged construction noise does have the potential to be noisy and so Best Practice and a Construction Environmental Management Plan (CEMP) will be necessary and is the most practical means of control. Where necessary and practicable, it may include measures such as:

- Ensuring vehicles and machinery are regularly services and in good condition
- Installing silencers or attenuators were practicable
- Replacing older equipment with quieter alternatives
- Using broadband reversing alarms on site
- Not leaving engines idling when not in use
- Siting any generators away from the nearby residential properties
- Erecting a close boarded timber fence around the development site

It is not anticipated that construction will create a significant adverse impact on sensitive locations, the nearest being about 50m away. By its nature construction noise is always temporary (it will come to an overall end), nearly always transient (it comes and goes from day to day and within parts for the day), and usually intermittent/impulsive (shorter duration events). The chances of such effects combining are low. See cumulative impacts in section 7.9 below.

Construction traffic has been discussed with the Transport Consultants. They advise that the construction phase of the site will increase traffic by 131 HGV movements (two-way) and 60 LGV movements (two-way) during the working day. This is estimated to be an increase of the order of 0.5% distributed across the immediate area (i.e. Waterloo Road) during the working day. This would equate to an increase in noise of less than 0.1 dB which would be completely imperceptible.

In terms of vibration, apart from obvious potential sources such a piling or very heavy ground breaking, any perceptible vibration impact would appear to be very unlikely.

Consultation with the Ecology Consultants was undertaken. See section 7.3 above. They felt that the construction of the site was likely to have minimal impact. However, they felt that it was possible that there could be some cumulative impact issues in combination with construction on other sites where there is potential for displacement of a small number of cormorant foraging and roosting sites. We comment on residual impact in 7.8 and cumulative levels of construction noise in 7.9.

### 7.6.2 Operation Phase

Noise from mechanical equipment will need to be limited to Rating Levels (as defined by BS 4142:2014) at the nearest residential locations to the following.

Daytime (07:00 – 19:00) : 43 dB $L_{Ar}$

Evening (19:00 – 23:00) : 41 dB $L_{Ar}$

Night Time (23:00 – 07:00): 39 dB $L_{Ar}$

Note that these figures are fractionally lower than those suggested for the C04 and C06 consent.

The nearest residential noise sensitive developments are around 50m to the east. So, to put the above limits into perspective, a single source with a noise level of around 73 dB LAeq at 1m would meet the night time criterion, even if it were in direct line of site to the residential properties. Typical commercial a/c units typically generate 50 to 60 dB LAeq at 1m. This would theoretically allow 20 to 200 such units to operate through the night in full view of the residential locations. This shows the clear feasibility of any planning conditions being met.

The standby/emergency equipment proposed in the ground floor and roof areas is clearly not going to operate on a regular basis and of course the intention will be that it will never run at all. For that reason, it should not be necessary for it to meet the above criteria but a condition requiring details to be submitted and approved is recommended.

Other commercial noise such as music breakout from within or customers voices is extremely unlikely with the proposed uses. However, the exact uses have not been defined and so a condition requiring details to be submitted and approved may be required.

Traffic generated by the development is likely to be minimal and nowhere near the levels already found in the area. The traffic consultants advise that the site operations will increase traffic by 124 vehicle movements (two-way) in the Weekday AM peak period (07:45-08:45) and 135 vehicle movements (two-way) in the Weekday PM peak period (16:30-17:30). This is estimated to be an increase of the order of 9% distributed across the immediate area (i.e. Waterloo Road) for both the Weekday AM and PM peaks. This would equate to an increase in noise of around 0.4dB which would be completely imperceptible.

In terms of vibration, any perceptible vibration impact is more or less inconceivable.

It was agreed with the Ecology Consultants that the finished site in operation is likely to have a general human impact, but noise should be negligible. We comment on residual impact in 7.8 and cumulative levels of operation noise in 7.9.

## 7.7 Mitigation Measures

A general discussion of a CEMP and best practice is given above. Beyond that there are no specific mitigation measures to recommend at this stage.

It is unlikely that any mitigation will be required for the operation of the site. However, it can be adequately controlled by conditions as discussed elsewhere.

## 7.8 Residual Effects

Details of construction methods will not be available until a main contractor is appointed. However, the assessment of noise from the construction phase concluded that human impact is unlikely to be significant, based on the use of best practice and adherence to an agreed CEMP. Beyond that no particular mitigation is recommended and so the residual noise effects from construction activities has been assessed as not significant. Construction noise will of course be audible at times, and could potentially cause disturbance for relatively short periods. But, as discussed above, construction noise is temporary and transient.

Regarding construction noise impact on ecology, we quote from the chapter 15 as follows:-

*<u>European Statutory Sites</u>*

*Noise and visual disturbance during the construction period are anticipated to result in unavoidable localised small shifts in the distribution of cormorant, an* ***adverse residual effect, significant at the Local (Site) scale****, which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a* ***residual minor adverse effect****. However, the provision of four permanent floating pontoons within Princes Half Tide Dock (located to the south of West Waterloo Dock) in accordance with the Liverpool Waters: Strategic Ecological Mitigation Plan…will ensure that suitable supporting habitat for cormorant is maintained within the wider Liverpool Waters area and that adverse effects on the population at a wider scale are avoided.*

*Birds (non-qualifying species)*

*The ECMP and CEMP will include information regarding the most appropriate timings and working methods to minimise potential disturbance to birds using off-site habitat, and the LEMP will include enhancements proposals for urban bird species including black redstart. Provided that both documents are implemented, the predicted residual effect for remaining bird species will reduce to an effect of* ***negligible significance.***

Regarding Operations, mechanical equipment is unlikely to be significant as long as it meets the criteria suggested above. It has been illustrated that these criteria should be entirely feasible to meet. No mitigation is likely to be necessary and so the residual effect from this source has been assessed as not significant. Regarding Ecology, there will be general human impact but noise should be negligible.

## 7.9 Cumulative Impacts

Committed development in the vicinity have been assessed as having no significant impact on residential locations nearest to them. This includes recent applications as listed in Section 3 where straight forward noise related planning conditions have been set which should ensure low impact in their direct vicinities and negligible impact at this site. C04 and C06 sites, are closer and are discussed in a little more depth. Also, the Isle Man Ferry Terminal is close enough for some potential for cumulative impact and is discussed.

Application Reference application 19F/1290 which we understand is to be considered in October 2019, where relevant consultees (Environmental Protection, etc) have no concerns over noise. This is over 200m away and unlikely to have any significant affect here.

C04 and C06 sites (planning reference 17F/1628|) are closer but predominantly residential with straightforward conditions attached. Conditions 3 and 4 refer to CEMP, condition 38 requires plant noise to be below background noise level at residential properties, and condition 40 requires no amplified music in outdoor café areas. Assuming similar conditions with this site, the cumulative impacts are expected to be low.

The Isle of Man Ferry Terminal site (planning reference 18F/3231|) is the adjacent site to the South. It is accompanied by quite a detailed Noise and Vibration section, all of which are predicted to be within the overall Liverpool Waters conditions (planning ref 10O/2424). Conditions 3 and 4 refer to CEMP, condition 20vi required details of externally audible Pas to be submitted, and condition 29 requires plant noise to be below background noise level at residential properties.

Within the chapter 15 (Terrestrial Ecology), there have been conclusions made that there is unlikely to be a significant impact from the site construction on its own but that there is some potential for disturbance to cormorant roosting and foraging sites with the cumulative effects of construction site in the vicinity. It is also our understanding that wildlife in general can be startled by noise, but soon acclimatise to it and recover quickly once it has come to an end. But we emphasise again that the main assessment of ecological impact from noise is cover within chapter 15 of the ES.

Generally, as stated previously, details of construction methods, etc. will not be available until after a main contractor is appointed. However, again as stated previously, construction noise is always temporary (it will come to an overall end), nearly always transient (it comes and goes from day to day and within parts for the day), and usually intermittent/impulsive (shorter duration events). The chances of such effects combining are clearly lower than they would be for steady noise. And where operational noise is rates as low (negligible in this case) cumulative impact is likely to be dominated by other sources.

## 7.10 Assessment Summary and Conclusion

The impact of noise and vibration from the construction stage of the proposed scheme is unlikely to be significant at the nearest noise sensitive receptors. There may some potential impact on cormorants with cumulative construction but this will be temporary.

With the implementation of best practice/CEMP, and suitable planning conditions, the residual effects are expected to be not significant.

Noise impact of operations is expected to be negligible and easily controllable where necessary by planning conditions.

## Table 7.6: Summary of Effects

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Operations | Negligible | None. Possibly planning conditions for mechanical equipment | Negligible |
| Operations Cumulative | Negligible | As above, otherwise n/a | Negligible |
| Construction | Potential for some adverse impact, temporary/transient | Best practice/CEMP | Minor adverse<br>Generally low impact, some temporary/transient potential |
| Construction Cumulative | Potential for some adverse impact, temporary/transient | Best practice/CEMP | Minor adverse<br>Generally low impact, some temporary/transient potential |

# 8 Townscape and Visual Impact

## 8.1 Introduction

This chapter assesses the impact of the proposed scheme on Townscape and Visual Amenity for this proposed scheme, which is identified as plot C02 in the Liverpool Waters Parameters Plan. It considers the potential effects on townscape character, for both the site and the surrounding area, and the potential visual effects on a number of selected viewpoints that are considered to represent the principal view of the proposed scheme. This chapter describes the methods used to assess the effects; the baseline conditions currently existing at the site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted. It also considers the cumulative effects of other relevant consented schemes.

The cumulative impact assessment includes proposed structures given permission as part of the Liverpool Waters Parameters Plan, although this is subject to further detailed, neighbourhood masterplans, and other than the schemes at CO4, CO6 and the Isle of Man Ferry Terminal, no further details for the Central Docks are yet available. Those structures that have been subject to detailed design work, and which have been given full planning permission are assessed as part of the cumulative impacts.

The site occupies an area of land that was formerly part of the West Waterloo Dock, and its western quayside, within the central docks system of Liverpool's northern operational waterfront. The dock was partially infilled in 1988, although it was partially excavated to facilitate the construction of the extended Leeds-Liverpool canal link opened in 2007. There are no major routes that border the site, although the existing access road to the north is intended to form part of the public realm works for the Liverpool Waters regeneration scheme, and it is envisaged that this will contain major landscaping proposals. The access road will also provide the link to the Isle of Man Ferry Terminal, located to the south of the site.

The site is currently partly water based, with an area of infilling, and also part of the remodelled western quayside of the West Waterloo Dock, including part of the 1949 river entrance lock. There are no structures within the site, although it has been occupied in the past by a series of altered transit sheds, and mooring infrastructure associated with its earlier port related activities from different periods. To the east of the site, the Leeds-Liverpool canal link and the east retaining wall of the former dock form a boundary, to the north is the local access road, including a bridge over the canal, to the south is Princes Half Tide Dock and the remains of the 1949 river lock. There is no direct access to the main arterial route of Regent Road to the east of the site, and it is currently closed to public access.

The site forms part of a large area of redundant historic docks that were located on the northern waterfront, but are now unused, with a number infilled in whole or in part. Once dominated by the three towers of the power station constructed in the

1930's on the partially in-filled Clarence Dock, the area now comprises a series of spaces with hard-standing used for storing vehicles, and low- quality and functional units. The overall character of the site and the area is of a fractured and disaggregated place, with no integration that would lead to a coherent and legible urban form that may be expected so close to the city centre.

This chapter is supported by the following figures and appendices:

- Appendix 8A: Baseline, CO2 Development and Cumulative Viewpoints

## 8.1.1 Legislation

The European Landscape Convention (ELC, 2000) (Ref. 11.1) provides a foundation for closer co-operation on landscape issues across Europe and was ratified in the UK on the 21 November 2006, and became binding on 1 March 2007. The convention identifies the need to recognise landscape in law, to develop and promote landscape policies dedicated to the protection, management and creation of landscapes, and to establish procedures for the participation of the general public and other stakeholders in the evolution and implementation of landscape policies. It also encourages the integration of landscape into all relevant areas of policy, including cultural, economic and social policies.

The ELC defines landscape as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'. It recognises that landscape has important cultural, ecological, environmental and social dimensions and is a key element of achieving sustainable development. In this context the use of the word 'landscape' is more appropriately termed 'townscape' though the constituent factors remain consistent.

### 8.1.1.1 National Planning Policy Framework (2019)

The National Planning Policy Framework (NPPF) was amended in 2019 and consolidates the previously adopted Planning Policy Statements and Planning Policy Guidance Notes for use in England. It contains a number of criteria relating to the importance of good design and sustaining and enhancing the significance of heritage assets.

Section 12 of the NPPF deals with the requirements of good design. The overarching statement can be found at paragraph124, which states: 'The creation of high quality buildings and places is fundamental to what the planning and development process should achieve."

Key aspects of the NPPF which apply to the Townscape and Heritage Assessment are the paragraphs below, which are provided to ensure that developments:

- **Paragraph 127c:** are sympathetic to local character and history, including the surrounding built environment and landscape setting, whilst not preventing or discouraging appropriate innovation or change (such as increased densities);
- **Paragraph127d:** establish or maintain a strong sense of place, using the arrangements of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit.

#### 8.1.1.2 Liverpool Unitary Development Plan (Liverpool City Council, 2002)

A Local Plan is currently being prepared by Liverpool City Council, until that has been adopted the Unitary Development Plan (UDP) forms the statutory development plan for the city. A number of policies contained within the UDP relate to the conservation of the existing landscape, character, and views within the UDP area. In summary, these policies are:

- HD5 Development Affecting the Setting of a Listed Building
- HD12 Development Adjacent to Conservation Areas
- HD22 Existing Trees and Landscaping
- HD23 New Trees and Landscaping
- OE4 The Mersey Coastal Zone
- OE16 The Leeds and Liverpool Canal

#### 8.1.1.3 Submitted Local Plan (January 2018)

Policy UD1 on Local Character and Distinctiveness anticipates that the following aspects should be taken into account with new development proposals:

a. Local grain and pattern of development, and where this has been fragmented, the opportunity to re-stitch damaged historic townscape;

b. Means and pattern of enclosure, and any intrinsic rhythms and patterns established by streets, spaces and built form;

c. Patterns of movement and street character;

d. The form, scale, proportion, building line, frontages, plot sizes, storey and absolute heights, rooflines, skyline, roofscape and ratios of solid to void within buildings;

e. Materials, colours, tones and textures, which should be appropriate to the characteristics of the local area;

f. Relationship and response to topography, and natural and built landscapes, including the underlying morphology of the area;

g. The need to preserve, improve and create views into and out of development and also across it;

h. Focal buildings, landmarks, compositions and building ensembles, nodes and gateways; and

i. Designated and non-designated historic assets.

#### 8.1.1.4 Liverpool Urban Design Guide, Liverpool City Council 2003

The Liverpool Urban Design Guide has two overriding objectives in guiding development within Liverpool. These objectives are used as a planning tool to guide general development within the city.

- To guide the physical development of the city; and,
- To assist in the implementation of statutory planning control.

This document is used as general planning guidance within the planning system and it therefore can be used to refine the baseline townscape character.

This chapter presents an assessment of potential impacts on Townscape and Visual Impact associated with the proposals, described in Chapter 2: Scheme Description.

This chapter is supported by the following appendices:

- Appendix 8A: Baseline, Proposal and Cumulative Views. 21 locations.

This assessment has been carried out with reference to the Guidelines for Landscape & Visual Impact Assessment, 3rd Edition, 2013 (referred to hereafter as “the Guidelines”).

An assessment of townscape value and susceptibility of townscape to change enables the overall sensitivity of townscape receptors to be determined. This forms the baseline from which the impact of the proposed scheme can be assessed.

## 8.2 Methodology, Scope and Significance Criteria

### 8.2.1 Townscape Assessment Methodology

#### 8.2.1.1 Baseline Townscape Value

Townscapes may be valued at community, local, national level or above. Existing Townscape designations have been taken as the starting point for this assessment, as shown in Table 8.1 below. However, the value attached to undesignated townscapes also needs to be assessed and this is considered in Table 8.2.

Table 8.1 sets out the relative importance of generic townscape designations and descriptions, identifying those designations applicable to the study area in the third column.

**Table 8.1: Value of Designated Townscapes**

| Type | Description | Actual Designation of site | Importance (Value) where present |
|---|---|---|---|
| World Heritage Site | Unique sites, features or areas of international importance with settings of very high quality. | Within the buffer zone of the Liverpool Maritime Mercantile City World Heritage Site | High |
| National Park, AONBs, curtilage of Grade I, II and II* Listed Buildings, Registered Parks and Gardens of Special Historic Interest, Scheduled Monuments, Ancient Woodland | Sites, features or areas of national importance with settings of high quality. | Within the zone of visual influence of listed buildings | Medium |
| Special Landscape Areas, Areas of Great Landscape Value, long distance footpaths | Sites, features or areas of regional importance with intact character. | The Mersey special Protection Area is located on the Wirral shoreline opposite the site. | Medium |
| Areas of Local Landscape Importance, Tree Preservation Orders (TPO) | Sites, features or areas of district importance. | N/A | N/A |

Whilst the assessment of value is partly based on the Planning Policy importance of the townscape, other criteria used to assess townscape value in more detail, including that of undesignated townscape, are set out in Table 8.2 below. The criteria are taken from the Planning Practice Guidance which supports the National Planning Policy Framework.

### Table 8.2: Criteria for Assessing the Value of non-designated Townscapes

| Attribute | Criteria |
|---|---|
| Functional | A building or place should be fit for purpose, designed and delivered in a way that delivers the intended function and achieves value for money in terms of lifetime costs |
| Mix of uses | Mix of uses to ensure easy access to facilities and encourage a healthier environment, reducing the need to travel. |
| Well designed public space | Functional and attractive hard and soft landscape elements, well orientated and designed routes, inclusion of facilities such as seats and play equipment and public art. |
| Buildings designed to be adaptable | Flexibility to be able to respond to a range of future needs – how easily buildings change be adapted for change of use, places that are easy and practical to manage with good access, natural surveillance and hard wearing materials that are easy to repair. |
| Distinctive character | Consideration of: the local pattern of street blocks and plots; building forms; details and materials; style and vernacular;<br><br>landform and gardens, parks, trees and plants; and wildlife habitats and micro-climates. |
| Attractive spaces | Consideration of streetscapes, landscapes, buildings and elements within them all, microclimates and views should all be considered. |
| Promotes ease of movement | All users should be able to move safely, conveniently and efficiently to and within a place, appropriate number of legible routes to and through it, good connections with each other and other destinations. |

An overall assessment of value has been made for each townscape receptor, based on an overview of the assessments made using each of the above criteria, in terms of high, medium and low value.

#### 8.2.1.2 Baseline Susceptibility of Townscape Receptors to Change

Susceptibility of townscape receptors to change has been assessed using the criteria identified in Table 8.3, with reference to the baseline conditions.

**Table 8.3: Townscape Receptor Susceptibility to Change**

| Susceptibility | Criteria |
|---|---|
| High | Little ability to accommodate the proposed development without undue harm. |
| Medium | Some ability to accommodate the proposed development without undue harm. |
| Low | Substantial ability to accommodate the proposed development without undue harm. |

#### 8.2.1.3 Overall Sensitivity of Receptor

The assessment of receptor sensitivity combines judgements on the susceptibility of the receptor to the specific type of development proposed and the value attributed to that receptor.

#### 8.2.1.4 Magnitude of Townscape Effects

The magnitude of a townscape or visual effect is assessed in terms of its size or scale, the geographical extent of the area influenced by that effect, and its duration and degree of reversibility.

The size and/or scale of change in the townscape takes into consideration the following factors:

- the extent/proportion of townscape elements lost or added;
- the contribution of that element to townscape character and the degree to which aesthetic/perceptual aspects are altered; and whether the effect is likely to change the key characteristics of the townscape, which are critical to its distinctive character.

**Table 8.4: Townscape Effects: Magnitude**

| Category | Criteria |
|---|---|
| Substantial adverse townscape effect | The proposals will result in a total change in the key characteristics of townscape character; will introduce elements totally uncharacteristic to the attributes of the receiving townscape; and/or will result in a substantial or |

| | |
|---|---|
| | total loss, alteration or addition of key elements/features/characteristics. |
| Moderate adverse townscape effect | The proposals will result in a partial change in the key characteristics of townscape character; will introduce elements partially uncharacteristic to the attributes of the receiving townscape; and/or will result in partial loss, alteration or addition of key elements/features/characteristics. |
| Minor adverse townscape effect | The proposals will result in a small change in the key characteristics of townscape character; will introduce elements that are not uncharacteristic to the attributes of the receiving townscape; and/or will result in a minor loss, alteration or addition of elements/features/characteristics. |
| Negligible adverse townscape effect | The proposals will result in a just discernible change to townscape character/elements/features/characteristics. |
| Neutral | The proposals will not cause any change to the townscape character/elements/features/characteristics. |
| Negligible townscape benefit | The proposals will result in a just discernible improvement to the townscape character/elements/features/characteristics. |
| Minor townscape benefit | The proposals will achieve a degree of fit with the townscape character/elements/features/characteristics and go some way towards improving the condition or character of the townscape. |
| Moderate townscape benefit | The proposals will achieve a good fit with the townscape character/elements/features/characteristics, or would noticeably improve the condition or character of the townscape. |
| Substantial townscape benefit | The proposals will totally accord with the townscape character/elements/features/characteristics, or would restore, recreate or permanently benefit the condition or character of the townscape. |

The criteria used to assess the size and scale of townscape effects are based upon the amount of change that will occur as a result of the proposals, as described in Table 8.4, above.

## 8.2.2 Visual Assessment Methodology

### 8.2.2.1 Visual Sensitivity of Views

In terms of assessing the baseline visual sensitivity, key factors to consider are the type of view and the likely numbers of viewers (the visual receptors). The type of view and the number of viewers are described in the following terms:

i) Glimpsed (i.e. in passing)/Filtered/Oblique/Framed/Open Views; and

ii) Few/Moderate/Many Viewers

### 8.2.2.2 Value of Views

The value attached to views has regard to a number of factors, including:

- Recognition through planning designations or heritage assets; and
- The popularity of the viewpoint, its appearance in guidebooks, literature or art, on tourist maps and the facilities provided for its enjoyment. The assessment of the value of views is summarised in Table 8.5 below, in terms of High, Medium and Low value. These criteria are provided for guidance only and are not intended to be absolute.

**Table 8.5: Value Attached to Views**

| Value | Criteria |
|---|---|
| High | Views from townscapes/viewpoints of national importance, or highly popular visitor attractions where the view forms an important part of the experience, or with important cultural associations. |
| Medium | Views from townscapes/viewpoints of regional/district importance or moderately popular visitor attractions where the view forms part of the experience, or with local cultural associations. |
| Low | Views from townscapes/viewpoints with no designations, not particularly popular as a viewpoint and with minimal or no cultural associations. |

### 8.2.2.3 Susceptibility of Visual Receptors to Change

The susceptibility of different types of visual receptor to changes in views is mainly a result of:

i) The occupation or activity of the viewer at a given location; and

ii) The extent to which a person's attention or interest may therefore be focussed on a view and the visual amenity experienced at a given view.

The assessment of a visual receptor to change is specific to the proposed scheme. However, the Guidelines for Landscape and Visual Impact Assessment offers the generic guidance identified in Table 8.6 as a starting point for the assessment.

**Table 8.6: Visual Receptor Susceptibility to Change**

| Susceptibility | Type of Receptor |
|---|---|
| High | People engaged in outdoor recreation, including users of public rights of way, whose attention is likely to be focussed on the townscape and on particular views; Visitors to heritage assets or other attractions where views of the surroundings are an important part of the experience;<br>Communities where views contribute to the townscape setting enjoyed by residents; and Travellers on scenic routes. |
| Medium | Travellers on road, rail or other transport routes, where the view is moderately important to the quality of the journey. |
| Low | People at their place of work, where the setting is not important to the quality of working life; and Travellers on road, rail or other transport routes, where the view is fleeting and incidental to the journey.<br>People engaged in outdoor sport or recreation, which does not involve appreciation of views. |

The Guidelines for Landscape and Visual Impact Assessment qualifies the above examples as follows:

'*This division is not black and white and in reality there will be a gradation in susceptibility to change. Each project needs to consider the nature of the groups of people who will be affected and the extent to which their attention is likely to be focused on views and visual amenity.*' (page 114, paragraph 6.35).

#### 8.2.2.4 Overall Sensitivity of Visual Receptors

The assessment of receptor sensitivity combines judgements on the susceptibility of the receptor to the specific type of development proposed, and the value attributed to that receptor.

#### 8.2.2.5 Predicted Townscape and Visual Impacts

The assessment of receptor sensitivity combines judgements on the susceptibility of the receptor to the specific type of development proposed and the value attributed to that receptor.

### 8.2.2.6 Magnitude of Visual Effects

The magnitude of a visual effect is assessed in terms of its size or scale, the geographical extent of the area influenced and its duration and degree of reversibility. The size or scale of change in the view relates to the degree of contrast or integration likely to result from the proposed scheme and is influenced by the relative time over which a view is experience and whether it is a full, partial or glimpsed view.

**Table 8.7: Visual Effects: Magnitude**

| Category | Criteria |
|---|---|
| Major adverse or beneficial visual effect | The proposals will cause a dominant or complete change or contrast to the view, resulting from the loss or addition of substantial features in the view and will substantially alter the appreciation of the view. |
| Moderate adverse or beneficial visual effect | The proposals will cause a clearly noticeable change or contrast to the view, which would have some effect on the composition, resulting from the loss or addition of features in the view and will noticeably alter the appreciation of the view. |
| Slight adverse or beneficial visual effect | The proposals will cause a perceptible change or contrast to the view, but which would not materially affect the composition or the appreciation of the view. |
| Negligible adverse or beneficial visual effect | The proposals will cause a barely perceptible change or contrast to the view, which would not affect the composition or the appreciation of the view. |
| No Change | The proposals will cause no change to the view. |
| Neutral | There will be a change to the composition of the view, but the change will be in keeping with the existing elements of the view. |

The criteria identified in Table 8.7 are used to assess the size and scale of visual effects, based on the degree of change to the view or composition.

## 8.2.3 Nature of Townscape and Visual Effects

### 8.2.3.1 Size and Scale of Effects

The size and/or scale of effects relates to the scale of changes in the townscape, such as the loss or addition of features and the scale of the change in views.

#### 8.2.3.2 Geographical Extent of Effects

The geographical extent of effects relates to:

- The area over which townscape effects are likely to be experienced, i.e. this could be at the site level, the immediate setting of the site, or townscape character type or area;
- The area over which visual effects are likely to be visible; and duration. Effects may be temporary, permanent or reversible over time. For example, visual effects arising from construction activities may be limited solely to the construction period and therefore only temporary or they may be permanent, for example, where construction necessitates some clearance of existing vegetation.

#### 8.2.3.3 Reversibility

Effects may be reversible, for example, restoration of a quarry following mineral extraction. The assessment therefore considers the practicality of effects being reversed with an approximate timeframe for reversibility.

#### 8.2.3.4 Nature of Effects

The nature of effects may be positive or negative (beneficial or adverse), direct or indirect. Direct effects are those which result directly from a development itself, whereas indirect or secondary effects may arise as a consequential change resulting from development, for example, changes to downstream vegetation as a result of alterations to a drainage regime.

**Table 8.8: Assessment of Townscape or Visual Significance**

| Sensitivity of Receptor | Major Effect | Moderate Effect | Minor Effect | Negligible Effect | Neutral Effect |
|---|---|---|---|---|---|
| High | Significant | Significant/Moderately Significant | Moderately Significant | Not Significant | Not Significant |
| Medium | Moderately Significant | Moderately Significant | Not Significant | Not Significant | Not Significant |
| Low | Moderately Significant | Not Significant | Not Significant | Not Significant | Not Significant |

### 8.2.4 Significance of Effects

The scale shown in Table 8.8 is used to guide the assessment of the significance of both townscape and visual effects, from a combination of the assessment of receptor sensitivity and the magnitude of effects:

The table has regard to guidance in the Guidelines for Landscape and Visual Impact Assessment, Third Edition, 2013, at paragraph 5.56, page 92 (significance of landscape effects) and paragraph 6.44, page 116 (significance of visual effects). This matrix is used as a guide to determine significance, along with professional judgement.

For the purposes of this Townscape and Visual Impact Assessment, Moderately Significant effects are not considered to be Significant in the meaning of the Town and Country Planning (EIA) Regulations 2011. Only effects deemed Significant are considered significant in EIA terms.

### 8.2.5 Confidence

The predicted impact is assessed against the criteria set out below in order to attribute a level of confidence to the visual assessment.

- Low: 0-50% probability, where there have been many assumptions within the assessment;
- High: 51-100% probability, where assessments have been based on satisfactory surveys and baseline information.

## 8.3 Consultation

The principle viewpoints were identified through a process of desktop study and on-site survey. The 21 viewpoints selected for reassessment were those which were considered to be most sensitive, or most likely to result in change as a result of the proposed scheme. Consultations have been undertaken with a range of stakeholders, including Liverpool City Council, Historic England, Merseyside Environmental Advisory Service, and the local residents.

## 8.4 Limitations and Assumptions

The proposal is shown in the 21 viewpoints in simple white-card form, so that it can be easily identifiable in distant viewpoints. The detailed design shows that the buildings will be finished in red brick, and with architectural details which break up the mass of the elevations.

In the cumulative views, the plots contained in the consented Liverpool Waters Parameter Report are shown in outline, accompanying other developments in the city centre, which have acquired planning permission, and where there is a likelihood that they will be implemented. The Liverpool Waters Parameters Plan represent maximum heights, and as yet there are no other plots within the Central Docks Neighbourhood which have come forward with definite proposals, apart from plots CO4, CO6 and the Isle of Man ferry Terminal. As such the projected scale for the plots within the Liverpool Waters site, may well change, and reduce in mass and scale from the outlines consented in 2013. Nevertheless, it is felt that at this stage it would be helpful to illustrate the potential scale of development if the outline is implemented as consented, subject to detailed planning permission.

Other projects shown on the cumulative views have been included because they have detailed planning permission, and there is evidence that they will be implemented.

# 8.5 Baseline Conditions

## 8.5.1 Policy Context

### 8.5.1.1 Liverpool World Heritage Site (WHS)

In July 2004, Liverpool was inscribed onto UNESCO's World Heritage List by the World Heritage Committee. As part of the inscription process, the World Heritage Committee stated that planning procedures should be applied to ensure that the height, character and location of any new construction in the World Heritage Site and its Buffer Zone respects the area's special architectural, historic, townscape and visual interests. This is captured in the World Heritage Site Management Plan and the Supplementary Planning Document (2009).

The buffer zone extends beyond the World Heritage Site boundaries, primarily to protect the Site's visual setting and to ensure that future development in the setting of the Heritage Site respects the values of the Site. The proposed development site is included within the World Heritage Site Buffer Zone.

The World Heritage Site boundary encompasses the area within the City which contributes to its outstanding universal value and retains a high degree of integrity and authenticity, relating strongly to its historic role as a commercial port. It stretches from Bramley Moore Dock to Wapping Dock and includes the historic business and cultural quarters as well as earlier warehousing areas within the Ropewalks quarter. The Site is divided into 6 distinctive areas:

1. The Pier Head
2. Albert Dock Area
3. Stanley Dock Area
4. Castle Street Commercial Area
5. William Brown Street Area
6. Lower Duke Street Area

The proposed development site lies outside the World Heritage Site, but within the buffer zone, and is within a short distance from Character Area 3 (Stanley Dock) of the World Heritage Site.

The management plan for the World Heritage Site sets out the current physical state of the environment within the Site and outlines steps for the restoration, regeneration, management and conservation of the historic character of the waterfront. The Management Plan accepts that new development is compatible with the conservation of the WHS, provided that it does not involve the loss of heritage assets or damage their setting. Location, appropriate scale and high quality design are key to conserving the fabric and setting of the WHS.

#### 8.5.1.2 Conservation Areas

Conservation Areas are defined in the Planning Act 1990 (Listed Buildings and Conservation Areas) as areas of "special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance ".

There are a total of 35 designated Conservation Areas within Liverpool, and a large amount of the City Centre is protected by this policy designation. The proposed development site lies within reasonably close proximity to several conservation areas many of which are contained partly or wholly within the World Heritage Site boundary. The conservation area that lie closest to the site is Stanley Dock to the north of the site.

#### 8.5.1.3 Historic Parks

Liverpool, and its immediate vicinity, has a number of important designated historic parks that form part of a network of green spaces throughout the city. These include:

1 Stanley Park - Grade II listed

2 Anfield Cemetery - Grade I listed

3 Newsham Park

4 Toxteth Park Cemetery

5 Princes Park - Grade II listed

6 Sefton Park - Grade II* listed

7 St James's Cemetery

8 Birkenhead Park - Grade I listed

No significant views from the city's historic parks and landscapes were identified. Many of the city's Victorian parks are bounded by large villas and have extensive tree cover that tends to contain the views. As a result, views of the wider city skyline are significantly restricted. In contrast to this, the modern Everton Park provides elevated panoramic views over the city and a view from this location is included within the principal viewpoints.

#### 8.5.1.4 Listed Buildings

Section 1 of the Planning (Listed Buildings and Conservation Areas) Act 1990 (the Act) imposes a duty on the Secretary of State to compile or approve a list or lists of buildings of special architectural or historic interest as a guide to the planning authorities when carrying out their planning functions. The statutory criteria for listing are the special architectural or historic interest of a building.

Many buildings are interesting architecturally or historically, but, in order to be listed, a building must have "special" interest.

The development site does not contain any listed buildings within its curtilage, and the nearest listed structure visible from the site is Princes Half-Tide Dock to the south, whilst the Waterloo Dock and the grade II Waterloo warehouse lay to the east of the site.

#### 8.5.1.5 World Heritage Site Supplementary Guidance (2009)

The SPD contains guidelines relating to development proposals within the WHS and the Buffer Zone. Paras 4.2.8/4.2.9 of the document sets out that all developments in the Buffer Zone, whether in an area of surviving historic character or not, will, in accordance with HD18, need to respond to and reflect the characteristics of the area around them. The design and scale of developments will need to respond to, and respect, their context proportionately to their potential impact on the setting of a conservation area and the WHS. Major schemes adjacent to conservation areas and the WHS will be considered more carefully for their impact on OUV of the WHS and character of conservation areas than minor developments further away from the WHS and conservation areas.

Where a proposal in the Buffer Zone is for 1) a tall building, 2) a building with a mass that significantly exceeds that of surrounding buildings, 3) a development that is immediately adjacent to the WHS, 4) a building which has a significant impact upon key views or key landmark buildings, 5) a building of architectural or historic interest (whether listed or not), or 6) a development that affects a site of archaeological interest: special consideration should be given to the relationship between the development and the WHS and the impact of development on the historic character of its locality and any buildings that contribute to that character.

Para 4.2.12 states that:

*"The architectural quality of a proposal within the WHS and Buffer Zone must be of the highest quality of contemporary design but respect, respond to and enhance its highly sensitive and important historic context.....In all cases, the emphasis should be on quality architecture which is grounded in understanding and design concepts, informed by the context."*

Section 4.4 of the SPD relates to the importance of views. In particular, the document outlines the importance of key visual landmarks within the WHS and Buffer Zone:

*"There are significant landmark buildings and building complexes that form a fundamental part of the WHS's OUV and wider city's visual structure. They make a positive contribution to the skyline and distinctiveness of the city because of their size, architectural quality, location and / or their inter-relationships. They provide visual reference points across the cityscape and form major components of key views to, from and within the WHS. Not all the landmarks are listed buildings but many are. Views to and from these listed buildings form part of their setting and consequently are a material consideration in planning applications and directly addressed by UDP policy HD5. The key landmark buildings are: Stanley Dock Complex, Pier Head Complex, Albert Dock Complex, Town Hall, St*

*George's Hall, Liverpool Museum, Lime Street Station, Municipal Buildings, Anglican Cathedral, Metropolitan Cathedral, St Luke's Church, Beacon, Beetham Tower West, Unity Building, St Nicolas Church, Victoria Clock Tower, Waterloo Warehouse and Wapping Warehouse"*

#### 8.5.1.6 North Liverpool and South Sefton Strategic Regeneration framework (2010)

The adopted SRF identifies Liverpool waters as a key transformational project, concluding that:-

*"Peel has indicated that Liverpool Waters will be developed in phases, over a 40 year timescale. This timescale is a realistic estimate in view of the scale of the project, current economic conditions and likely demand for the uses/floor space being proposed. There is also no doubt that during this period elements of the development will change to reflect developing market and other relevant conditions. Accordingly, there is no guarantee that what is currently being put forward now in terms of proposed uses and amounts of floor space will be the final version of Liverpool Waters and our instincts are that it will evolve into a less dense version of what is currently being proposed. What is clear though, is that a development of this scale will have a massive impact on the city and indeed the sub-region. A key challenge for the developer, the City Council and other partners is to ensure that the development complements investment in the city centre and anchors the regeneration of North Liverpool. This in turn will have a positive impact on the wider economy of the sub- region. Liverpool Waters presents an important opportunity to allow the city to expand and attract new investment which is critical for economic growth. The scale of opportunity is transformational particularly in view of the Peel proposals for Wirral Waters which was recently granted planning permission."*

#### 8.5.1.7 Liverpool Strategic Investment Framework (2013)

The SIF document identifies the Liverpool Waters development proposals as a key strategic action.

### 8.5.2 The Site

The site occupies part of the former Victoria Dock in the northern dockland area of Liverpool's waterfront. It is essentially 'land-locked', with no access to public roads. To the south the grade II Waterloo Warehouse is all that remains of a series of three warehouses. The dock boundary wall is located to the east, whilst to the west is the canal link of the Leeds-Liverpool canal. To the north is the remainder of the in-filled Victoria and Clarence docks.

Like the majority of Liverpool's historic docks, the area was reclaimed from the river Mersey as trade, and its infrastructure, expanded rapidly in the 19th century. Following the success of the first dock (Steers Dock) in 1715, the next decades saw the planning and completion of significant new facilities. The Dock engineer, Jesse Hartley, was responsible for the phase of construction from 1824 to 1860, and he more than doubled the dock accommodation in the city. Clarence Dock and Clarence Graving Dock opened in 1830, with Waterloo Dock completed in 1834. By 1836, Victoria and Trafalgar Docks were open, and along with Waterloo Dock they formed a uniform trio of inter-connecting water spaces, with river access gained through the Victoria Dock lock gate. However, this access was closed after just 10 years, meaning that access could only be gained through the dock network. This made these docks the first real examples of spine and branch dock, with the docks aligned on an east-west axis, and transit sheds surrounding them on each side.

All of these docks were built into the river, and archaeological excavations in advance of the Leeds-Liverpool canal link demonstrated that the majority of reclaimed land around the Trafalgar and Victoria Docks comprised quarry waste and beach sand mixed with waste brought from the city. Parts of the Victoria and early original Trafalgar Dock walls were demolished to accommodate the canal link, and a 15m section of each was demolished. The remainder of the dock walls survive beneath a layer of nineteenth and twentieth century backfill. As part of the construction of these docks, the Dock wall was extended.

Waterloo Dock was re-developed in 1868 following the repeal of the Corn Laws, and this allowed the Dock to become the world's first specialist grain dock. From its original 5 acre space, the new dock was completely re-orientated, and two basins were constructed, on a north-south axis, and named Waterloo Docks East and West.

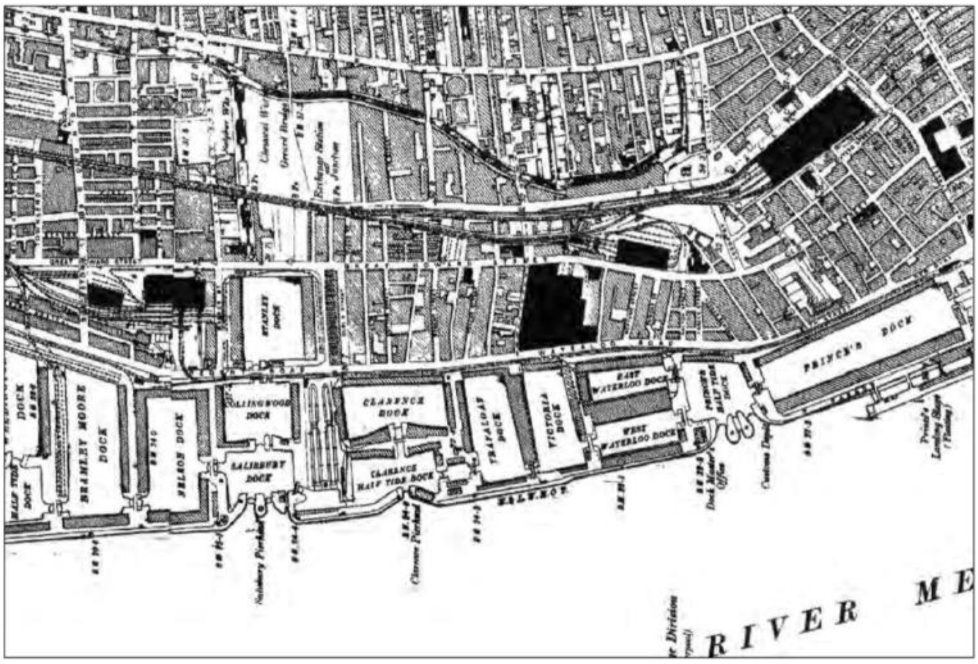


**Figure 8.1: OS plan 1894**

East Waterloo Dock became the specialist grain dock, with huge brick warehouses with colonnades. The three buildings were located on all three sides of the dock, with that on the northern quay being shorter than those to east and west. The long warehouses had granite bases with limestone floors, of 5 working storeys, plus basement and mezzanine. These levels housed machinery and conveyor belts, operated hydraulically, which in turn worked three bridges, ten ship capstans, and

24 gate engines. West Waterloo Dock provided a passage between Victoria Dock and Princes Half-Tide Dock, as well as berths for ocean going vessels. It had long transit sheds on its east and west quays, with a smaller one to the south. The northern warehouse was destroyed in the air-raids of 1941, whilst the western warehouse was demolished in 1969, along with the smaller transit buildings. The eastern warehouse remains, although it was converted into residential accommodation in the 1980's, and is now a grade II listed building. The site of the northern warehouse is now partially a car-park for the residents of the former eastern warehouse.

In 1929, a modernization programme was undertaken that saw the in-filling of Clarence Dock, Clarence Half-Tide Dock and part of Victoria Dock, whilst Trafalgar Dock was substantially re-ordered, and a power station was constructed within the in-filled Clarence Dock. Figures 8.2 shows the Waterloo warehouse complex in 1920. Figure 8.3 shows the docks from the south in 1949, following the substantial re-modelling and the construction of the power-station.

**Figure 8.2: Waterloo warehouses and docks, 1920. Also notable is the scale of Bibbys Warehouse to the east, beyond the warehouses, and the location of transit sheds on the east and west quays. (Historic England)**

**Figure 8.3: Aerial Photo 1949. Northern Warehouse at Waterloo Dock has been demolished, although the western Warehouse is still in situ, as is Bibbys warehouse on Waterloo Road.**

With the provision of lock gates as part of the re-modelled West Waterloo Dock in 1949, which allowed direct access to the Mersey, it was merged with Victoria Dock and used as a small container port in the 1970's. However, this proved short-lived, and the Dock closed in 1988. Following its in-filling, it was partially re-excavated with the construction of the Leeds-Liverpool canal link in 2007.

#### 8.5.2.1 Topography

The city centre occupies an historic site at the centre of a natural shallow amphitheatre formed by the surrounding higher land, with the open side facing the estuary. The landform allows for some important views into the city from the river frontage, river approaches and the Wirral river frontage. Inland, a steep sandstone escarpment curves away from Breeze Hill, through Everton, St. James Mount, behind the City Centre and reaches the river again at Dingle. The river frontage follows a shallow curve opposite to the curve at the north end of this escarpment, so that the centre of the city is projected slightly towards the river. The site occupies a low-lying area to the north of the city centre core and lies adjacent to the river Mersey directly to the west.

### 8.5.3 Landscape/Townscape Character

#### 8.5.3.1 Regional Character

The Countryside Character Map of England, places the site within Character Area 58, "Merseyside Conurbation," an area incorporating the conurbation of Liverpool and the urban/industrial areas of Birkenhead in the north-eastern part of the Wirral peninsula. The area expanded rapidly during the 18th century in response to global trade and continued through the Victorian age. The ring road around Liverpool marks the general extent of Victorian Liverpool. Outside the ring road, most of the development is post- war housing with some areas of farmland, golf courses and parkland.

The amount of open countryside within the urban fabric of the conurbation is extremely limited, the Leeds & Liverpool Canal and the railway network form important landscape corridors and the area includes several Victorian public parks.

Since the end of the Second World War, large parts of the docks, upon which the city was based, become redundant, leaving large areas of derelict land. However, major regeneration and infrastructure projects commencing in the late 1980's with the restoration of the Albert Dock, have transformed the city centre.

This includes:

- The provision of a new Arena and Conference Centre at Kings Dock in 2008, and its extended Exhibition Halls. This also includes hotel and restaurant facilities, as well as residential accommodation and a multi storey car park.
- The development of the Paradise Street and adjoining areas as part of the £1 billion Liverpool 1 retail and mixed use area that has helped to stitch together the fractured townscape of the city centre, and has led to the promotion of Liverpool into the top 5 retail destinations in the UK.
- The opening of the new canal link across Pier Head in 2008 that connects the Albert Dock with the Leeds-Liverpool canal at Stanley Dock.
- The opening of the Museum of Liverpool on the waterfront in 2011 as a unique city-based museum of international importance.
- The commencement of the Liverpool Waters regeneration scheme for Princes Dock and the northern docks. This 30-year programme of development is intended to provide a city centre extension over 60ha of redundant dockland.
- The provision of new cruise liner facilities, allowing for the visit of over 60 cruise ships in 2015/16.
- The on-going regeneration of the Ropewalks and Baltic Triangle areas.
- The provision of over 7500 new hotel rooms since 2008, in acknowledgment of Liverpool's position as the 5$^{th}$ most popular UK destination for overseas visitors.
- The on-going multi-million pound investment in public realm and highway improvements throughout the city centre.
- Several tall building schemes, including the twin towers of the Unity building on Chapel Street, Beetham Towers 1 and 2 on Old Hall Street, St Pauls Square and Alexander and City Lofts tall buildings at Princes Dock.

- The provision of a family of three buildings at Mann Island, including office, restaurant and residential uses.
- The re-design of Pier Head, including a new link to the Leeds-Liverpool canal, new public realm and a replacement for the Ferry terminal.
- The Liverpool Museum at Pier Head.
- In addition, a number of tall building schemes have been given permission but not yet completed, including the 34 storey Moda Living scheme at Princes Dock, and two more tall building proposals adjacent to that scheme- the Hive and Plaza 1821. The three towers located at Lanyork Road, off Leeds Street, to the east of the application site, and the tower known as Ovatum also fronting Leeds Street, are also recently approved developments.

### 8.5.3.2 City Urban Character

The World Heritage Site SPD and the SIF, in addition to area specific studies such as the Baltic Planning Framework, provide a general categorisation of urban design and neighbourhood characterisation issues within the city centre. A number of zones within the city centre have been identified however, where particular land uses or townscape character gives rise to areas with a particular identity.

A brief description of the characteristics of those areas are outlined below.

### 8.5.3.3 Waterfront - Princes Dock through to Stanley Dock

The Liverpool waterfront provides one of the most instantly recognisable skylines in the world, centred on Pier Head. The area includes the major historic dock basins, including Albert Dock, which has been regenerated to become a major regional tourist destination. To the north, Princes Dock is currently being developed for office, hotel and residential uses and Kings Dock to the south has also seen major developments undertaken. The waterfront area is characterised by large scale development that reflects the scale of its setting adjacent to the River Mersey and plays a significant role in defining the skyline of the city.

### 8.5.3.4 Ropewalks

The Ropewalks is a unique area of the city, recognised for its concentration of historic warehouse buildings and increasingly becoming known for its night-time economy and creative industries located within this quarter. The area around Duke Street is included within the boundary of the World Heritage Site. The area is characterised by its narrow network of streets and sense of enclosure. Small intimate public spaces have been created as part of a significant programme of regeneration and contemporary architecture now sits successfully alongside refurbished historic buildings to create a unique and vibrant feel to the area.

#### 8.5.3.5 Baltic Triangle (Residential/Commercial Area)

The Baltic Triangle area lies to the south of Ropewalks and adjoins the waterfront around Kings Dock. The eastern half of this zone is dominated by low-rise residential development, which allows views of the city centre skyline from Park Lane. The area to the south and west has seen large levels of investment in recent years, with many new and refurbished buildings, and opportunities exist for further significant development through refurbishment of historic warehouses or new contemporary architecture.

#### 8.5.3.6 Hope St. Quarter (Mixed-use Area)

The Hope Street Quarter is characterised by its strong links to the arts, education and the city's two cathedrals. The area is home to the cultural institutions of the Philharmonic Hall, The Everyman and Unity theatres and the Liverpool Institute of Performing Arts. The elevated position of the cathedrals enhances their landmark status and allows significant views over the surrounding city. The area has a stable residential community and a flourishing office district, particularly along Rodney Street. The area is noted for its high quality architecture, particularly along Mount Pleasant and Hardman Street and this has been enhanced by new development such as the Hope Street hotel, the refurbishment of key buildings such as the Philharmonic Hall and the Stirling Prize winning Everyman redevelopment, in addition to a successful public realm scheme.

#### 8.5.3.7 Stanley Dock and the Ten Streets

Stanley Dock is one of the character areas within the World Heritage Site, and also a conservation area. In addition to a series of historic, but largely redundant, docks, the area contains two Jesse Hartley warehouse (grade II*), and the Tobacco Warehouse that dominates this part of the waterfront, and at the time of its construction in 1901 was reputedly the largest brick building in the world. The northern Hartley Warehouse has been successfully converted into the Titanic Hotel, and work has commenced on the restoration and re-use of both the Tobacco warehouse (residential) and the southern warehouse (mixed-use).

The area of mostly redundant and derelict warehousing that stretches south from Stanley Dock between Great Howard Street and Regent Road/Waterloo Road, does not have a designated heritage status, but is an important contributor to the character of the Stanley Dock and this part of the city. Known as the Ten Streets, a framework has been adopted which is based on the cultural industries.

#### 8.5.3.8 Birkenhead and Wallasey Riverside

A combination of settlements and industry dominate the riverside along the Wirral Peninsula. Large-scale docks characterise the riverfront opposite Pier Head and include the two ferry terminals at Woodside and Seacombe providing classic views across the river. Further south, the riverside is dominated by large-scale industry with limited public access to the river's edge. In contrast, to the north, residential properties front onto the riverside promenade as far as New Brighton at the mouth of the estuary. Views across the river take in the operational docks to the north of Pier Head, which appear relatively featureless and uninspiring in comparison to the dramatic skyline of the Three Graces and the cluster of tall buildings around the commercial quarter.

## 8.5.4 Local Urban Context

### 8.5.4.1 Scale and Massing

The existing site contains no buildings, and is located partially within East Waterloo Dock, and on its western quayside. The site is west of Waterloo Road, with no direct access, and the interface with Waterloo Road comprises low level industrial units and a former vehicle hire use, with associated hard-standing. To the north is the infilled Victoria and Clarence Docks, and the area is largely disused, but does contain some vehicle storage areas. The Leeds-Liverpool canal link adjoins the site to the east, whilst to the west, the sea wall marks the boundary with the river Mersey, separated from the site by what will become the northern link road.

The site lies within an area defined as the northern docks, within the Liverpool Waters development area. These proposals were given outline planning permission in 2013, complemented with a parameters plan. There are no designations on the site, although the Waterloo Warehouse to the east is grade II listed, and Princes Half Tide Dock to the south is also grade II, with its separately listed lock gates. The site is within the Buffer Zone of the World Heritage Site.

The Wallasey Tunnel ventilation shaft is located to the east of the site on Waterloo Road, and at 50m high is the highest building in the immediate vicinity. To the east, the Waterloo Warehouse is a substantial, seven-storey building with a series of smaller apartment buildings of 4 storeys in height, constructed in the late twentieth century. However, when viewed from the west and north especially, the existing tall buildings cluster centred on Old Hall Street forms a significant and substantial backdrop to the site, and this will be added to with the recent permissions for further tall buildings

To the north of the site, are the remains of Clarence Dock, which was largely infilled to accommodate the Clarence Dock Power Station in the 1930's. The three chimneys of this facility were a major landmark on the waterfront until the plant was demolished in 1994. Apart from the canal link that was constructed in 2007, the remainder of the dock is redundant and remains infilled.

### 8.5.4.2 Urban Grain

Historic maps indicate that the urban grain of this part of the city developed as the waterfront dock facilities were extended from the 1800's onwards. The grain is entirely connected with port related activities, as no public access was allowed, and was prevented through the construction of the Dock Boundary wall, to the east of the site, that controlled access along the whole of the dock system. West Waterloo Dock was designed as a trio of docks, with Victoria and Trafalgar to the north, and with the existing Princes Half Tide dock re-modelled. All three interconnected as part of the first spine and branch system. Following major reworking, the southern wall of Victoria Dock was breached to join up with West Waterloo Dock, forming an L-shaped water body, until it was infilled in the late twentieth century.

The current townscape is of a denuded former industrial area, with the site surfaced in hard standing, and no direct access to Waterloo Road to the east. Immediately to the north of the site, the access road to the remainder of the Central Docks site bridges the link of the Leeds-Liverpool canal, which is a relatively recent addition to the area. There are no formal footpaths or publicly accessible highways within the area. The main north-south route is located to the east of the site, and connects north Liverpool with the city centre. The area beyond this to the east is has been provided with a regeneration strategy, and identified as the Ten Streets. Whilst this is an area of former warehouses and dock related uses, it does have a series of east-west routes that divide the area into streets, with buildings at back of pavement, and of mixed height and scale. A clear hierarchy is identifiable, with smaller warehouses occupying the narrower east-west routes, and larger buildings associated with the two major north-south routes of Waterloo Road/Regent Road and Great Howard Street to the east. These are both arterial roads, and offer little attraction to either pedestrian or cyclist movement, with minimal activity at ground floors, and bordered by inward looking commercial/industrial uses.

To the east of the site, the Waterloo Warehouse, the single remaining building of an original trio of such warehouses, provides a suitably monumental scale to the former activities of the dockland area. Set in its own grounds, and with direct access to East Waterloo Dock, it remains protected by the remnants of the Dock boundary wall to the east. Also providing a landmark in the area is the 1970’s Kingsway Ventilation Shaft, a brutalist construction standing at some 50m. This is located to the east of the site, across Waterloo Road. The combination of the Ventilation Shaft, and the original Warehouse provide a positive addition to the townscape, aiding legibility and hierarchy within the area. This will be aided when the development at Plots CO4 and CO6 to the north of the site have been completed, and they are currently under construction.

To the north -east of the site, the townscape of the Ten Streets, provides a tonal quality through the iterative use of brick for construction, although there are height variations, and these provide an interesting and attractive roofline. The most dominant building in the area is the Stanley Dock Tobacco Warehouse to the north, and this monumental construction, considered to be the largest brick-building in the world at the time of its construction, effectively provides a northern termination of the defined Ten Streets area. To the south, the area is bookended by the two low retail units of Costco and the former Toys R Us, surrounded by large areas of parking. These are poor quality buildings, with dedicated parking areas surrounding them, and form a hard edge to the area, with pedestrian access discouraged.

A major addition to the area is the Leeds-Liverpool canal, which enters the former dock system at Stanley Dock, and which has been extended to link from there to the Albert Dock in the city centre. This runs directly to the west of the development site, and is a unique asset in the area. Whilst not fully accessible for pedestrians or other users, as there is no dedicated tow-path route to follow, it does provide a readily identifiable feature, and has the potential to add considerably to the grain of the area.

#### 8.5.4.3 Public Realm

Liverpool's city centre and waterfront have undergone a substantial period of regeneration, and incorporates some of the city's most prominent landmarks and tourist attractions in a high quality public realm setting, including the Three Graces at the Pier Head and Albert Docks. This redevelopment continues at Kings Dock, with the mixed-use development incorporating conference and arena facilities, which contribute significantly to the public realm. The northern waterfront, will add to this process with the provision of a new cruise liner terminal and Isle of Man ferry terminal, the on-going development of Princes Dock, works to Great Howard Street and the major developments within the Liverpool Waters and Atlantic Corridor. There is a real opportunity to form a coherent sequence of key destinations and landmark features, connected by high quality routes with active frontages providing continuity and enclosure. With the further redevelopment of the waterfront area, this represents a significant change.

Similarly, the city centre can be divided into a series of streets, junctions and squares, which are concentrated in key areas or around key features, and form a legible framework. Key areas of public realm are centred around the cathedrals, the Anglican Cathedral to the south and the Metropolitan Cathedral to the north. Both cathedrals form key visitor destinations and gathering spaces on the fringes of the city centre, and the Hope Street linkage that joins then has benefitted from a much enhanced public realm. The historic Ropewalks area has undergone significant regeneration in recent years and has become a popular location for cafes and bars, and a centre for night-time activity. Extensive improvements to the public realm have been made, with the creation of several contemporary public squares, which form a coherent network of spaces through the tight urban grain.

The area around the site currently represents a void within the overall framework, due to its former use as operational dockland and then effective redundancy and abandonment. The quality of the public realm in the vicinity of the site is poor, and there is currently no public access to the site. The nearest public route is Waterloo Road, a harsh environment for pedestrians and cyclists, and dominated by traffic, including heavy goods using the existing port facilities to the north in Bootle. Whilst plans are being drawn up that will improve this route, including a framework for public realm works, this is yet to be implemented.

#### 8.5.4.4 Movement and Linkages

Whilst the site is connected to the city centre and to the north via Waterloo Road, this is dominated by vehicular traffic, and is a harsh environment for other users. The Dock boundary wall severs any informal links that could be used, and the private nature of the Dock estate prevents public access. The potential remains for much more effective and attractive links for pedestrians, providing choice and quicker routes into the city centre via a potential waterfront park, and across the West Waterloo dock at its southern end, into Princes Dock. This is a major component of the Liverpool Waters parameters plan, and is subject to on-going detailed work as part of a neighbourhood masterplan.

Similarly, linkages to the north are also problematic, with the development site wholly enclosed by private land, including the Waterloo Warehouse and its curtilage to the east, and the derelict and infilled spaces of the central docks to the north. The possible access point to Waterloo Road is enclosed with a fence line, and is not currently available as a direct route to link with the main movement corridors. Whilst such a provision to facilitate the development of the Isle of Mann ferry terminal is planned, this forms a separate project. Current access arrangements rely on the use of a road that allows service vehicles into the central docks further to the north, and which then allows for movement to the south. However, this is shared with vehicular traffic, with no footpaths, and it is in poor condition. Once Waterloo Road is reached, movement and linkages are possible both north and south, and the urban grain of the Ten Streets area also allows for movement to the east, and Great Howard Street. Improvements to these routes are either being implemented or planned, and the further development of the Liverpool Waters project will also lead to new and improved linkages, as part of a detailed neighbourhood masterplan.

#### 8.5.4.5 Landmarks

The site itself is not marked by any structures, although in close proximity there is the Waterloo Warehouse and the Kingsway Ventilation Shaft, and these provide key landmarks within the townscape. These will be added to with the developments at CO4-CO6. However, to the south within the commercial quarter, and at Princes Dock the tall buildings cluster dominates the skyline and the area. Within the wider context, the Three Graces form Liverpool's most familiar and spectacular landmark buildings, with the Albert Dock further south also contributing to the waterfront skyline.

Liverpool's two cathedrals form highly prominent landmarks in the city, with the distinctive crown of Metropolitan Cathedral forming a common feature in city views, and the Anglican Cathedral appearing as a dominating feature from many angles due to its positioning on higher ground. The Cathedrals mark the north-easterly and south-easterly extents of the city, whilst St John's Beacon provides a distinctive marker for the city centre. The more recent high rise buildings of Beetham Tower 1 and 2 (West), the twin towers of the Unity building and City Lofts and the Alexander Tower at Princes Dock together form a cluster marking the northern edge of the city centre. Dramatic waterfront buildings of Mann Island and the Museum of Liverpool, whilst lower in height, contribute significantly to the contemporary design quality of the waterfront, as does the Arena and Conference centre at Kings Dock. To the north, the monumentalism of the Stanley Dock Tobacco warehouse is also a landmark, and provides a more industrial aesthetic to the area, consistent with the dockland setting of the site and its neighbour at Waterloo Dock.

#### 8.5.4.6 City Skyline

The city skyline is perhaps best perceived from the Wirral side of the River Mersey and a number of strategic viewpoints exist along the Wallasey and Birkenhead riverside, providing panoramic views across to Liverpool.

When viewed from the north, for example, from Seacombe Ferry Terminal, the built mass of the central part of the city becomes more tightly defined with the prominent landmark buildings viewed in close context with each other. The central part of the city is defined on the skyline as a distinct grouping of tall buildings that contrasts with the flatter more horizontal forms that line the docks to the north. Moving further south, the two cathedrals and St. John's Beacon appear as more isolated landmarks, set apart from the Pier Head buildings and the modern cluster of buildings that includes the Beetham Towers and other buildings around the Old Hall Street commercial area.

The Three Graces that rise majestically from the waterfront at Pier Head represent an iconic image that symbolizes the city of Liverpool. The substantial scale and mass of the buildings and the grandeur of their architecture sets them apart from the more utilitarian forms of the dock warehouses which add a more horizontal emphasis along the water front. The exception to this is the huge presence of the Tobacco Warehouse at Stanley Dock, that dominates this part of the dock system. Of the modern architectural forms on the skyline, the mass and form of the Sun Alliance building tends to compete visually with the Pier Head buildings. Its heavy concrete construction gives the building a substantial presence, but not one that enhances the setting of the Three Graces. In contrast, the slender form of the Beetham towers and the use of light and reflective materials adapts well to the setting. The stone construction of the Pier Head buildings retain a distinct and dominant presence on the skyline.

The heart of the city centre, back from the riverside, is currently characterised by a relatively low-rise built form, with few landmarks, although St. John's Beacon does provide a distinctive landmark on the skyline marking the retail core around the St. Johns Centre. Further out from the city centre lie the two city cathedrals on higher ground to the south and east. The Anglican Cathedral, in particular, provides one of the most prominent landmarks on the city skyline. Sitting on an elevated position, the substantial scale and mass of the red sandstone building gives it a dominant presence, although often perceived as visually remote from other tall buildings in the city.

#### 8.5.4.7 Environmental Designations and Public Open Space

There are no formal environmental designations on the site, nor any areas of public open space. The site is landlocked within an area that formed part of the private dock estate, and with no public access. There are occasional uses to the north of the site that allow people to attend events.

### 8.5.5 Principal Viewpoints

The Assessment uses 21 specific viewpoints, and these are outlined below and are shown in Appendix 8A.

### 8.5.5.1 VIEW 1: Magazine Promenade, Wallasey

This panoramic view includes most of the waterfront within the WHS, including Albert Dock, Pier Head, Waterloo warehouse, Stanley Dock, Victoria Cock Tower and Dock Masters House and the Metropolitan Cathedral. The view captures the powerful presence of the river itself in the foreground, a kinetic force that acts as a compelling visual focus. It also shows the importance of the tiered horizontality of the city centre, the topography of the city, and the manner in which the existing tall buildings work as a cluster. The viewpoint clearly describes the relationship of the city centre to the river, and the importance of the topography. It also illustrates the contrast between the dense city centre, and the void that is the central docks area on the waterfront.

The Albert Dock, Waterloo warehouse and Tobacco Warehouse are marked by the similarity of tone and materiality through the use of red brick, and their strong horizontal datum. However, the roof-lines of the two warehouses have a backdrop of higher development behind them which compromises their silhouettes. The twin towers of the Liver Building, and its pale colour, as well as its location at Pier Head where it breaks forward further into the river, provides a unique quality on the skyline from this point. Similarly, the Metropolitan Cathedral stands apart from other buildings in this view, and its lantern acts as a landmark. The setting of these assets relies on the relationship of the assets to the river, the continuity of tone of the warehouses, the layering of the city and the location of the tall buildings within the cluster. This view from the Vale Park area aligns all the tall buildings within the city centre and the waterfront within a single grouping. The tall buildings are perceived as a clearly defined group on the skyline that appears distinct from the markedly lower built form of Albert Dock to the south. Although the Three Graces are buildings of significant scale and mass, they each have vertical elements that contribute to a rhythm of vertical forms against the skyline. In contrast, the Plaza building appears as a solid horizontal mass against the skyline, not helped by its distinctive use of materials and colour. View Value is **High.**

### 8.5.5.2 VIEW 2: Egremont Promenade

This view is taken from the promenade, at the base of the steps leading to the eastern façade of the Town Hall. From this point, the view is concentrated more on the waterfront buildings rather than the overall cityscape. The cluster of tall buildings within the commercial quarter and Princes Dock are more apparent, and catch the eye, whilst the Liver Building is also a key focal point. The horizontality of the Waterloo Warehouse, and the Liverpool Museum at Mann Island provide strong bookends to contain the verticality of the Pier Head and the commercial quarter, although the tall buildings, rising as sequence of slender punctuation marks, are a compelling counterpoint to the general horizontal axis seen within the view. View Value is **High**.

### 8.5.5.3 VIEW 3: Seacombe Promenade, Wallasey

The view is taken further to the south than View 2, and illustrates the crucial role of kinetic sequences, as the perspective and townscape qualities change with movement. The river again captures the foreground, providing the context for the view beyond of the city. Despite the presence of taller buildings to the south, and of the Wallasey Tunnel Ventilation Shaft to the north, Waterloo Corn Warehouse is a prominent feature in the viewpoint. This is due to the combination of factors: the strong horizontality of its roof line broken by the two vertical elements of the hoist shafts; the uniform tonality of the brick and its regular pattern of fenestration; the sheer mass of the building and its length, providing a strong north-south alignment; and the contrast with the more contemporary buildings to the south and north. The series of 4-storey apartment blocks constructed to the west of the warehouse are negative factors, and their diminutive scale and ungainly form detract from a fuller appreciation of the warehouse. View Value is **High**.

### 8.5.5.4 VIEW 4: Woodside Ferry, Birkenhead

Taken from the viewing area on the riverside promenade next to Woodside Ferry Terminal and represents one of the strategic views of the River Mersey identified in the World Heritage Site SPD. The location provides an excellent view of the central portions of the World Heritage Site waterfront. The Pier Head group are prominent features, and contrast with the vertical punctuation of the tall buildings cluster in the commercial quarter and Princes Dock. The view also shows the horizontal line of the roofline of the Tobacco Warehouse at Stanley Dock and this provides a visual termination point to constrain the view. The view of the Waterloo Warehouse has been interrupted by Alexandra Tower at Princes Half Tide Dock, and the impact of reading that building with the Tobacco Warehouse to the north has been compromised. The view also illustrates again the visual importance of the river. Also particularly marked are the differences in tone and texture between the Pier Head group and the tall buildings. View Value is **High**.

### 8.5.5.5 VIEW 5- Port Sunlight River Park, Wirral

A long distance view taken from the south west, which shows the vast expanse of the river. The view point is too far to pick out much architectural detailing, and it is the series of simple massing, tonality and composition of the city which are the chief characteristics of the view. The view is mostly concerned with context rather than detailing, but it does illustrate the creative tension of the city captured in the coming together of historic building forms, with more contemporary neighbours, and the contrast between the horizontality of the pavilions at Royal Albert Dock, with its taller and more flamboyant historic neighbour of the Royal Liver Building and the Three Graces. The punctuation provided by the modern tall structures is also a noticeable feature in the view, although from this angle, they merge as a cluster in the centre, with outliers the north and west. The huge red cranes of the operational docks mark a shift in port related activity, away from the historic city centre, to the north and Bootle. View Value is **Medium.**

### 8.5.5.6 VIEW 6- Royal Albert Dock

A view some distance from the site, to the south. The combination of historic buildings which collectively help form and define the Liverpool World Heritage

Site, and more contemporary structures. The contrast between the older buildings and their modern neighbours is striking, with ornamentation, richness and complex forms marking out the older structures, and a simplicity of form and much simpler architectural detailing characteristic of the recent buildings. Tying these different qualities is the context of the river, and the combination of river, sea wall and robust public realm, all of which feature in the view. The ostentation of the historic buildings relies on a strict architectural rigour and the richness of the heavily articulated facades and roofs, which provide a series of silhouettes and vertical features as part of the Three Graces. The more modern buildings are much simpler in form and geometry, and with little extraneous detailing, and rely on their more industrial character for presence in the townscape. This ‘collision’ between the old and the new is very much part of Liverpool’s defining townscape, and the history of the city is marked by these contrasts. Underpinning all this is the river, and its presence in the view provides immediate context and distinctiveness. View Value is **High.**

#### 8.5.5.7 VIEW 7- Museum of Liverpool

The viewpoint looks north towards the site, and shows the ostentatious Royal Liver Building framing the view to the east, with the river to the west. The main structure within the viewpoint is the contemporary Mersey ferry terminal, with its angular form, contrasting with the more complex and free-form elevations and roofscape of the Royal Liver Building. The association of the river with the city is readily apparent in the view, with the Mersey hard against the city centre, and with one of the ferry’s tethered and passengers embarking. The view illustrates the relationship between the city and its river, and the importance of public realm which allows for waterfront walks and appreciation of the river. Seen beyond the ferry terminal, the upper floors of Alexandra Tower and the Malmaison Hotel can be seen, with cranes showing the construction of towers at Princes Dock. The suggestion of continuity and further activity beyond the ferry terminal is provided, as such these buildings have landmarking qualities, which help navigate the waterfront. View Value is **High**.

#### 8.5.5.8 VIEW 8- Canada Boulevard

The viewpoint is taken near the northern end of Pier Head, looking beyond the floating roadway for the existing Isle of Man ferry, and towards Princes Dock. Other than the hint of historic surfacing, which is a more recent creation than it appears, there is little in the viewpoint which relates to the quality of the city’s heritage, and all of the buildings in the viewpoint are relatively recent. Collectively they do not reference their location, and are a series of individual structures which pay little regard to distinctiveness or context. The Malmaison Hotel which helps to frame the viewpoint to the east, and Alexandra Tower are slight exceptions to this. With the Malmaison in particular taking on the form of a ‘silo’ structure, which says something of the industrial past of the area, and the Alexandra Tower angled towards the river and the sea. The configuration of the structures does allow for reading the ‘void’ that is the water space for Princes Dock itself, and acknowledges that the buildings are arranged around a space. View Value is **High**.

#### 8.5.5.9 VIEW 9- King Edward Street

The foreground features the inner ring road of the Strand, and illustrates how the waterfront can be perceived to be 'cut-off' from the city centre, by 6 lanes of highway. It also shows the topography, with the river more suggested than seen in the view due to the view of the Wirral shoreline across the Mersey. The view focuses on two of the waterfront towers, Alexandra Tower and City Lofts, which are contemporary buildings, and other than a glimpsed view of the south gable of Waterloo Warehouse, there is little in the image to show the quality of the heritage buildings within the city. The juxtaposition of the industrial sheds of the King Edward trading estate, which are low-lying and utilitarian, and the two towers is a compelling contrast, and helps to illustrate the changing nature of the waterfront, with low-value and architecturally simple buildings which are basic containers, and the aspirational verticality of the towers as new typologies and land uses start to populate the area. View Value is **Medium**.

#### 8.5.5.10 VIEW 10- Everton Park

This view from Everton Park is close to the key view identified in the World Heritage Site SPD, and looks towards the city from the top of the sandstone ridge to the east of the city centre. The core of the city is visible, and the distant views of the Wirral peninsula and the Welsh Hills beyond provide a context unlike any other panorama of the city. From this perspective the foreground comprises suburban housing, with the core clearly landmarked by a series of tall buildings. These are the distinctive elements of the city centre from this viewpoint, with the mass of the other city centre buildings too cluttered to identify individual buildings. The impression is one of a diverse scale, with the tall buildings appearing as a sequence rather than a cluster from this angle. To the north (right) of the image, the Tunnel Ventilation Shafts stand as simple sentinels or monoliths, removed from the tall buildings cluster to the south, and seen as an isolated pair of unadorned and functional constructions. The river is not seen, but its presence is indicated by the distance of the Wirral peninsula. View Value is **High**.

#### 8.5.5.11 VIEW 11- Arena, with Royal Albert Dock

A long linear view, with the river and the buildings sharing the same axis and orientation. The view is marked by a simplicity of form and palette, from the consistent orange hue of the pavilion buildings and the wall, the dark grey of the granite setts and flags, and the steely grey of the Mersey. The view point is terminated by the vertical axis of Alexandra Tower, acting in contrast in form, tone and materiality with the other buildings and features in the image, although it does also act as an element of continuity in that the distance between the Tower and the pavilions acts as a softening element, and the perspective means that despite its size, it appears to be little higher than the roof of the Royal Albert Dock warehousing. There are glimpsed views of the southern gable of the Museum, with its spectacular picture window, and of the Mersey Ferry Terminal, but these appear to be simple intrusions into what is a highly consistent group of features. The view captures Liverpool's relationship with its river in a single image, and the proximity of the warehouses to the water, with the arc of the gangway for the Mersey Ferry protruding from the land and out into the river, illustrates the importance of the Mersey, and its continued influence on the city. This is a view which captures the intrinsic industrial nature of the warehousing and its public realm. View Value is **High**.

### 8.5.5.12 VIEW 12- Pier Head

The foreground shows the continuation of the public realm along the river walkway, with its carpet of granite setts, and the contemporary geometry of the Ferry terminal itself. To the east, and holding the image, is the west façade of the Royal Liver Building, and beyond that, the vertical expanse of Beetham Tower West, with its contrasting elevation of coloured glass. The gangplanks for the Mersey Ferry provide important clues to the function of the building, and the way in which the river is used as a mode of transport. The war memorial in the foreground commemorates the merchant seamen who lost their lives in World Wars I and II, and is another clear link with the sea, and part of the city's heritage and character. There are other memorials close by, and collectively they serve to illustrate the importance of the river and the sea to Liverpool, and the role it played in these conflicts. Continuity of public realm along the waterfront, and the way in which it helps celebrate Liverpool's connection with the sea, is a crucial characteristic of the city. View Value is **High**.

### 8.5.5.13 VIEW 13- Princes Parade South

Other than the river Mersey itself, there is little in the view which celebrates Liverpool's distinctiveness, and the modern buildings are simple, anonymous structures which could populate a business park in any location. Nevertheless, they are adjacent to the river, and are evidence of the continued re-populating of the waterfront area which has been redundant for decades. They represent a re-interpretation of the former docks, and there is consistency of scale which promotes some acknowledgement of collective identity despite their rather different appearances. This datum is broken by Alexandra Tower and City Lofts, which have different uses to the offices in the foreground, and as such the typologies can be seen as having different architectural forms and approaches. They share the connection with the river, and the feature of a riverside walk, which is an iterative theme within the area. The palettes, tones and materiality are very different from the historic buildings seen in proximity to the river, such as view 11, but this is a modern interpretation of the relationship between buildings and river. View Value is **Medium**.

### 8.5.5.14 VIEW 14- Junction of Leeds Street/King Edward Street

The foreground is dominated by the highway, and the self-sown trees which screen views towards the river. It is a situation and urban environment which tells little of place, and is thoroughly anonymous, and which could be replicated in many other cities. There are no clues in the image as to the location of the place, and the general building typology is one of functional, low-value industrial buildings, of small scale, and which provide no visual interest, enclosure, continuity or quality of character. The exception is the glimpsed view of

Alexandra Tower, which does provide a real presence due to its height and copper coloured cladding. View Value is **Medium**.

### 8.5.5.15 VIEW 15- Metropolitan Cathedral

A distant view from the east, on top of the sandstone ridge which surrounds the city in an arc, and provides its distinctive amphitheatre raking. The view looks towards the city centre and the river to the west, along the view corridor provided by Mount Pleasant. In the foreground are buildings which form part of the Knowledge campus, and these contrast with the rows of Georgian buildings which terrace down the slope, with the LJMU John Foster campus opposite. To the right, and just glimpsed, is the bell tower of the Metropolitan Cathedral., whilst he rotunda entrance to the grade II* listed Wellington Rooms can be seen separating the modern buildings and the Georgian terraces. The view helps to explain the evolutionary narrative of Liverpool, with the Georgian buildings a result of the increased industrialization and commercial expansion of the city centre around the river and docks, and the consequential provision of Georgian suburbs away from that activity and up towards the sandstone ridge. The Wellington Rooms were early Assembly Rooms created for the merchants and their families for cultural entertainment, and which remains a feature of this part of the city centre in the form of theatres and concert venues. With the exception of the modern buildings, the street has a continuity of enclosure, tone, texture and palette, and there is a consistent, falling datum as the roofs retreat down the slope. The larger scale buildings occupying the city centre can be seen in the distance, and this contrasts with the domestic scale of the Georgian buildings. View Value is **Medium**.

### 8.5.5.16 VIEW 16- Anglican Cathedral

Taken at Cathedral Gate, with the pastiche classical buildings of the LIPA Primary School in the foreground, and in the distance, the distinctive verticality of Beetham Tower West which marks the inter-face of the waterfront and the commercial quarter of the city centre. The Georgian suburbs are also evident in the view, marking the same expansion as in view 15 near the top of the eastern ridge line of the city. There is a clear demonstration of the topography of the city, with Upper Duke Street leading down towards the city centre, and the 38 storey Beetham Tower West at the heart of the commercial quarter towards the river. The view looks over the rooftops of Ropewalks, with most of the retail area screened by the corner cupola building of the LIPA Primary School. The contrast between the traditional density of Georgian Liverpool and the warehouses and early merchants houses of the area, with the tall buildings of the commercial quarter is a feature of the view, and shows the clustering of tall buildings in that area as opposed to a widespread peppering throughout the city centre. View Value is **Medium**.

### 8.5.5.17 VIEW 17- Bidston Hill, Wirral

Long distance view identified in the World Heritage Site SPD. The city is captured with a foreground of trees and scrubland, with the river Mersey all but invisible. From this location, more of the city is seen, and the topography of the city in the form of a natural amphitheatre is readily apparent. The city centre is markedly different from the lower scale surrounding areas, and is the clear visual focus in the view. The relative isolation of the Anglican Cathedral at the high point of the escarpment draws the eye, and acts in contrast to the cluster of tall buildings to the north, although its spatial relationship with the Metropolitan cathedral is clear. In this view it is difficult to disaggregate the buildings in the cluster from their respective locations at either the commercial quarter on Old Hall Street or Princes Dock, as the two appear to merge into a single entity. The twin Ventilation Shafts of the Kingsway Tunnel are seen, one on each side of the river, with the most prominent being the one on the Wirral side of the river due to the distance between them. The sandstone ridge that encompasses the eastern part of the city can be seen beyond the northern docks area. View Value is **Medium**.

### 8.5.5.18 VIEW 18- Holt Hill, Birkenhead, Wirral

The view focuses on the tall buildings cluster of the commercial quarter, as a series of vertical elements which collectively form a varied cadence. This includes the towers of the Royal Liver building, to the south, and terminates with Alexandra Tower to the north, with both these buildings located on the waterfront. The collection of towers is in contrast with the domestic properties in the foreground, although there are several tall structures seen in the view which form part of Wirral's skyline, rather than Liverpool's. These include Birkenhead Town Hall, Wallasey Town Hall, Hamilton Square Station and the Birkenhead Tunnel ventilation shaft at Woodside. Beyond the tall buildings in Liverpool can be seen the sandstone ridge, and the image illustrates the manner in which the city is layered from east to west, with the low point of the river itself, which is not on view in this image. View Value is **Medium**.

### 8.5.5.19 VIEW 19- Victoria Clock Tower

In the foreground are the grade II listed sea walls of the entrance to Salisbury Dock and the Dock Masters Office, also grade II. The image was taken adjacent to the Victoria Clock tower, which is also listed and its isolation provides it with some prominence as a landmark. The view looks over the Central Docks area of Liverpool waters, with its largely infilled Trafalgar Dock and towards the city centre with its cluster of tall buildings, and the eastern turret of the Royal Liver building seen in the distance. The contrast between the foreground/middle ground and the distance is marked, with different scales, and densities. The Central Docks area is derelict, with no activity other than the on-going construction of CO4-CO6 seen in the centre of the image, and provides a clear narrative of abandonment of the docklands, and the evolution of the city centre and commercial quarter. The monumental sea walls constructed in Cyclopean masonry are evidence of the quality of workmanship and design which were part of the dockland aesthetic, but there is little other remaining infrastructure which provides evidence for the former global importance of the docks. As the viewpoint is inaccessible to the public, the View Value is **Medium**.

### 8.5.5.20 VIEW 20- Northern Link Road

The view point looks north across Princes Half Tide dock towards the application site, and illustrates the industrial character of the area, but also provides a real sense of abandonment and dereliction. The dock walls are prominent features and the lack of buildings, with the exception of the underscaled 4-storey apartment blocks of East Waterloo Dock, indicates that the whole area is redundant. The river is sensed rather than observed, beyond the dock water spaces, with the Wirral shoreline beyond, including the tower of Wallasey Town Hall. Nevertheless, the dock retaining walls provide a sense of monumental industrial achievement, and the nature of the spine and branch system of port management, with dock water spaces interconnected, is visible in the view as the docks recede into the background. View Value is **Medium**.

### 8.5.5.21 VIEW 21- Central Docks

The view looks south towards the city centre, across the application site. The river is to the right (west) of the image, whilst in the distance, the Royal Liver building is framed by the more contemporary towers of City Lofts and Alexandra Tower, with the commercial quarter tall building cluster emerging beyond the lower scale buildings, in a layered townscape. The long roofline of the Waterloo Warehouse, interrupted by the twin vertical hoist shafts, contrasts with the vertical axes of the tall buildings, and provides a more serene and less animated and dynamic feel to the Central Docks area, and whilst the modern apartment blocks screen most of the warehouse, are of poor design quality and underscaled for the area, they at least offer a continuity of tone and texture which complements the historic warehouse. The image demonstrates the way in which the city continues to be layered, and whilst this is more obvious from the panoramic views from the west across the river, and from the sandstone ridge to the east, it is apparent that this is also the case with more local views from the north. The image also shows some of the dock related surfaces of granite setts which can be found in isolated areas across the northern docks, and which provides a clear indication of the former industrial uses of the site, and its robust and functional infrastructure. As the viewpoint is inaccessible to the public, View Value is **Medium.**

## 8.6 Environmental Impacts and Significance of Effects

This section identifies the likely significant environmental effects (positive and negative) resulting from the proposed scheme. Construction and operational effects are considered separately.

### 8.6.1 Construction Phase

The proposed scheme is at a relatively early stage in the design and construction programme. It is therefore difficult to predict with certainty the precise methodology that will be adopted for construction and site management. However, it is possible to identify some broad impacts that may arise during the construction phase:

- Noise and disturbance to adjacent residents and businesses
- Contractors parking arrangements leading to traffic problems
- Delivery of goods and materials
- Intrusive lighting
- Decrease in air quality due to dust
- Disturbance to wild life
- Pollution of the dock water space
- Visual impacts
- Damage to underground undesignated heritage assets

### 8.6.2 Operational Phase

The design proposals have been formulated through a lengthy iterative process involving assessment and consultation. This process has allowed site constraints and opportunities to directly influence the evolution of the proposals including public realm. As a result, mitigation measures are embedded within the proposals as part of the detailed design of the landscape and built form. Consideration has been given to alternative designs, and a number of iterations have been amended in order to take account of feedback within the professional team and that received through the stakeholder engagement process.

## 8.7 Mitigation Measures

### 8.7.1 Construction Phase

The precise methodology that will be adopted in order to mitigate against potential construction phase impacts will be formulated as part of the ongoing design development. However, it is anticipated that measures to control construction impacts as outlined in the following list, will be incorporated into a Construction Environmental Management Plan (CEMP), and should include:

- Site compounds to be positioned close to the proposed access points and as remote from existing developed areas as feasible;
- Use of directional lighting will be used across the site.
- Stockpiles will be located on site to limit visual impacts where possible. Through the adoption of a Code of Construction Practice (CoCP), good site management shall be achieved through the following measures:
- Strict adherence to the self storage areas and construction access roads;
- Use of site hoarding where appropriate; and
- A phased planting and landscaping programme.

- Structures have been designed to avoid all known archaeological deposits to preserve them in-situ
- An air quality plan will be adopted
- A water quality plan will be adopted

The implementation of good site management, maintenance and housekeeping should ensure that temporary deterioration to landscape resources, character and visual amenity will be kept to a practicable minimum. Despite these better practice measures, there would still remain minor adverse effects during construction, due to the movement of plant and machinery, and the construction process itself. However, in overall terms the residual effects upon townscape features, character and the visual envelope are not anticipated to be significant and the majority of which are short term, temporary and local.

### 8.7.2 Operational Phase

A summary of mitigation measures, which have been ‘designed in’ to the proposals in order to reduce or where possible, avoid townscape and visual impacts is provided below.

The building has been developed in accordance with good urban design principles, which avoids, reduces or offsets potential impacts on the townscape and views. The key design principles incorporated into the design are outlined below:

a. Arrangement and site composition, scale, massing and height of building responds to the surrounding context, and the guidance within the WHS SPD and Regeneration frameworks for this part of the city.

b. The choice of materials, comprising a limited palette and with the main component of brick, provides a continuity of tone and texture with the warehouse aesthetic prevalent in the area.

c. The building addresses and helps to improve activity in this area.

d. Car parking provision has been carefully located with associated landscaping so that it does not dominate the area.

e. Infill of West Waterloo Dock has been limited to that approved as part of the Liverpool Waters parameters plan, and will provide a fully accessible public route at the dockside.

f. The arrangement of the blocks across the site has been amended following pre-application discussions with Liverpool City Council to ensure that they take a more orthogonal form, and that they address areas of public space. Heights have also been reduced.

g. Piling for foundations has been designed to preserve heritage assets in-situ, and mostly avoided.

h. A Public Realm and Landscape Management Plan will be employed to provide further mitigation once the site is operational, following the implementation of the landscaping schemes within the submission. The Plan would ensure that a maintenance regime for public spaces is in place, including areas of soft planting and landscaping, and the upkeep and maintenance of the publicly accessible area of the dock side boardwalk.

i. Heritage interpretation will be provided

## 8.8 Residual and Cumulative Effects

The residual impact assessment assumes that all mitigation described in the section above has been implemented. The predicted townscape effects are summarised below.

### 8.8.1 Heritage Designations

Please refer to the 'Heritage Impact Assessment' which accompanies the application submission for a full assessment of the heritage impacts. The assessment relating to impact on heritage is primarily concerned with the setting of designated assets rather than any impact on fabric and the physical remains of designated assets, as the site lies outside any designated areas. Of particular importance is the visual relationship of the proposals and existing landmark buildings, including listed buildings.

The location of the proposals adjacent to the Grade II Waterloo warehouse has been taken into account in the design of the building, including height and mass, and the setting of other landmark buildings and heritage areas has also been considered as part of the design process. The use of sympathetic materials and the design aesthetic, which acknowledges the warehouse typology, are positive aspects of the proposal which aid placemaking and distinctiveness.

The views of the WHS Character Areas in key views will not be totally obscured by the proposed scheme. Other views have been assessed as part of the visual impact assessment.

Taking into account all of the above the impact on the heritage designations has been assessed as **slight adverse.**

### 8.8.2 Townscape Character

The existing site is a utilitarian and redundant site located in an area that has suffered from a generation of low-scale uses, and has been largely abandoned. The current arrangement fails to perform a role in helping to define legibility, or hierarchy, and the lack of any buildings or activity, the absence of any landscaping, and the fact that there is no public access either to or through the site, means that the site does not contribute to the townscape qualities of the city in any real sense. This contrasts with the townscape of adjacent areas, and with the city centre itself. The proposal will help to create a critical mass of development that will benefit the townscape character of the Central Docks area of the Liverpool

Waters project, and also to repair some of the fragmented and denuded townscape in the area. The form of the development, as a series of structures, with two 'bookends' of greater scale, joined by a series of landscaped spaces, and with public access encouraged to east and west with a protective colonnade to the dockside, will substantially enhance the existing townscape and provide a focal point for this crucial site, at a key location in the Liverpool Waters development scheme. Its location and scale resonate with the previous warehouse buildings that formed part of East Waterloo Dock. The overall impact on townscape has therefore been assessed as **Moderate Beneficial.**

### 8.8.3 Urban Grain

The existing site is a small scale, utilitarian presence in an area without public access, and is a large void in the urban grain of the Waterloo Road corridor and the Central Docks. Any change, compared against this would represent a large-scale change in the urban environment. The proposals show an urban grain which is in keeping with the scale of Waterloo Warehouse and the Ventilation Shaft, providing continuity and a suitable monumental scale to this area of abandonment. The former use of the area, as a series of water spaces, has been compromised by the infilling and re-ordering of a number of the original docks, and the development proposal acknowledges this. However, the area will not return to its former port related use, and the Liverpool Waters parameters plan illustrates how the nature of the area will change in the long term. The development works with the proposed larger development potential of the area, and the plans for the Isle of Man Ferry Terminal at Princes Half Tide Dock to the south. It responds to the existing canal link, and to the site of the proposed cultural building immediately to the north. A residential scheme in this location will provide the first new use for the site that will bring a high density population that will greatly benefit the area, and open up a hitherto private part of the waterfront for the general public. The proposal creates improvement to pedestrian movement and aids legibility. The overall urban grain impact has therefore been assessed as **Moderate Beneficial**.

### 8.8.4 Land Use

There is no current land use of the site, which is redundant. However, the residential use proposed will encourage movement and activity, and also help to create a critical mass in an area largely devoid of people. The overall impact on land use has therefore been assessed as **Moderate Beneficial.**

### 8.8.5 Building Heights

The site as exists has no above ground structures. The proposed scheme will complement the Waterloo Warehouse, repairing some of the fractured townscape following the demolition of the other two Waterloo Warehouses, and re-providing a suitable volume and scale. The building is of mid-rise height rather than a high-rise, and is significantly lower than any of the buildings that make up the tall buildings cluster in the city centre cluster, or those recently permitted at Princes Dock. It is also of a suitable scale as the southern 'gateway' building for the

Liverpool Waters scheme as it evolves in later phases. The overall townscape impact has therefore been assessed as **Moderate Beneficial.**

## 8.8.6 Movement and Linkages

Vehicle access into the site is currently provided along Waterloo Road, but this is not a direct access, and is essentially a service road to enable vehicles to use the derelict central docks area. Whilst it is intended to provide a directly accessible route that will link the development in an easier manner, this is not yet in place, and is part of a phased programme. Currently the site is difficult to reach by pedestrians and cyclists, and there is no consideration of access for all facilities. The location and legibility of the access is poor. The proposed scheme will allow for a much clearer access arrangement, including a riverfront walk, and a protected dockside walk via the proposed boardwalk. This will have the benefit of a sheltering colonnade, and public uses, as well as allowing a closer relationship with the remaining dock water space and the canal. This is a unique addition to Liverpool's waterfront, and will also start to open up an area of the waterfront that has never been accessible to the public in the past. Therefore, the movement impact has been assessed as **Substantial Beneficial.**

## 8.8.7 Environmental Designations and Public Open Space

Proposals seek to improve the public realm around the footprint of the development, in a series of public spaces with landscaping, and with public access at dock level. The opening up of the routes will allow for an appreciation of the river to the west, and to the dock water spaces to the east. Therefore, the impact has been assessed as **Slight Beneficial.**

## 8.8.8 Key Views

The baseline analysis of the key viewpoints concludes that 10 of the views are '**high**' in terms of the overall sensitivity of the visual receptors, whilst the remainder are classed as '**medium**'.

### 8.8.8.1 VIEW 1- Magazine Promenade Wallasey

The viewpoint has been assessed as high in terms of value and overall visual receptor sensitivity. The proposal is identified in the mid-view, to the west of the Waterloo Warehouse, which it partially obscures form this angle and perspective. Its materiality and tone allow the proposal to blend seamlessly into the dockland landscape, with the eye distracted by the tall buildings cluster further to the south in mid-frame, and sequentially by the Liver Building and the wider waterfront fronting the river. The lantern of the Metropolitan Cathedral, St John's Beacon and the mass and volume of the Tobacco Warehouse at Stanley Dock remain as individual structures of some visual importance, and the proposal does not interfere with any of these from this viewpoint. The Ventilation Shaft also remains as a prominent structure in the immediate vicinity of Central Docks and the development site, and the highest point of the proposed building forms a distinctive line of visual continuity with that structure from this angle and perspective, which helps to ground the development in its immediate context. The new building also helps to populate the urban void created by the abandonment of the docks and their associated structures.

The cumulative development proposals relate to the higher ground beyond the proposal (as shown in the views at Appendix 8A), or to the Princes Dock area further to the south on the waterfront, although the parameters for the Liverpool Waters proposals are also included. Where the proposal is read with the tall buildings cluster as a backdrop, it helps to soften the impacts by providing a slightly higher building on the waterfront, so that the substantial difference in height between the existing buildings within the former docks, and those to the south, is softened.

The overall magnitude is assessed as **moderate beneficial**, which is considered **significant/moderately significant** both when assessed as a stand-alone development, and cumulatively as part of the wider city context.

#### 8.8.8.2 VIEW 2- Egremont Promenade

The view point has been assessed as **high** in terms of overall value and visual receptor sensitivity. The buildings are located to the west of the grade II listed Waterloo Warehouse, and help to define the location of the Waterloo Docks, and returns the perception of activity and a tighter grain to this part of the city and the waterfront. The development echoes the former arrangement of the long-demolished western Waterloo Warehouse, and responds to the need for a suitable scale in the area, to act in counterpoint to the apartment development, as a series of individual blocks to the west of the Warehouse. Materiality and tone are appropriate to the location, and in this perspective, the rhythm of the buildings illustrate the aesthetic provided by the warehouse typology. Read against the vastness of the river in the foreground, the scale of the buildings provides a suitable volume that adds to the composition of the townscape, without becoming overly- dominant in the view. They also help to provide balance between the heights of the existing buildings in the vicinity, and the existing and proposed additions to the tall buildings cluster further to the south and west, that form the backdrop to the proposal. As a series of mid-range buildings, the proposal provides a ‘mini’ cluster and whilst they partially screen the Waterloo warehouse, their aesthetic is very much of the industrial silo and warehouse typologies which were a part of the docklands. The conformity to the general scale and absolute heights in this part of the waterfront, ensures that there is a cohesive townscape character.

The overall magnitude of the impact is assessed as **moderate beneficial**, which is considered **significant/moderately significant**, both when considered as a stand-alone development, and cumulatively as part of the wider city context.

#### 8.8.8.3 VIEW 3- Seacombe Promenade

The viewpoint has been assessed as **high** in terms of overall value and visual receptor sensitivity. The buildings are seen directly in front of Waterloo Warehouse, but the expedient of breaking up a single building into a series of structures allows for views through from the river, and for the residents of Waterloo Warehouse, to the river. It also ensures that the Waterloo Warehouse is not entirely screened, but views of it are filtered through the gaps between the proposed buildings, in a further layering of the townscape which is a characteristic of the city. Whilst all of the Waterloo Warehouse and the Waterloo Apartments cannot be seen in the viewpoint, their continuity is still apparent. The impression of a series of silos is given further emphasis in this viewpoint, adding to the industrial aesthetic, which is also captured in the tone of the materials used.

The cumulative view illustrates how the proposal will work with the emerging skyline cadence of the city, and despite their mid-range scale, they appear as a ‘trough’ in the overall silhouette of the city, set between the consolidated existing cluster, and the secondary cluster to the north at Central Docks.

The overall magnitude of effect is assessed as **slight adverse** for the stand-alone development, **slight adverse** in the cumulative view, and **moderately significant.**

### 8.8.8.4 VIEW 4- Woodside, Birkenhead

The viewpoint has been assessed as **high** in terms of overall value and visual receptor sensitivity. From this location on the waterfront, the development is seen as part of a waterfront that is almost devoid of buildings of scale. The Waterloo Warehouse is screened by a tall building (Alexandra Tower) and set back from the river in this perspective, whilst the small apartment blocks to the west are identified as a series of individual blocks that are poorly scaled in relation to the river and the other buildings in the view. Although the proposed buildings partially obscure the grade II listed Tobacco Warehouse at Stanley Dock, they also provide for a continuity and horizontality which is part of the overriding character of this part of the waterfront. This helps to counter the negative impact of the small apartment buildings at Waterloo Dock, and helps deliver a horizontal axial continuity with other mid-range buildings seen in the view, such as the buildings at Princes Dock, and those of East Waterloo Dock.

The existing and cumulative views concentrate the eye on the city centre and the southern waterfront, and although the proposed building is within the view, it does not detract from the main agglomeration of the dense buildings of the city centre. The view of the Tobacco Warehouse at Stanley Dock is partially screened from this location, but it remains partially visible. In townscape terms, the architectural approach of the buildings, and the influence of the warehouse typology on elevational treatment and material, means that a similar effect as the existing view is referenced.

The overall magnitude of effect is assessed as **moderate beneficial**, which is considered **significant/moderately significant** when considered cumulatively.

### 8.8.8.5 VIEW 5-Port Sunlight River Park

The viewpoint has been assessed as **medium** in terms of overall value and visual receptor sensitivity. The buildings are barely perceptible in this viewpoint, which is taken at some distance. They are glimpsed beyond the Alexandra Tower, which screens the series of structures, and the vast panorama of the city and its docks against the riverfront setting remains substantially as in the baseline condition. The cumulative view illustrates that in the future, the number of tall buildings both to the south and within the Central Docks area to the north will draw the eye towards them as a focal point, and the impact of the current proposal will be less discernible than as a stand-alone development.

The overall magnitude of the impact is assessed as **neutral**, which is considered **not significant** when considered as a stand-alone building and cumulatively.

#### 8.8.8.6 VIEW 6- Royal Albert Dock

The viewpoint has been assessed as **high** in terms of overall value and visual receptor sensitivity. The development does not register in this viewpoint, apart from the part of the roof of the most southern building beyond the top of the Mersey Ferry terminal.

The overall magnitude of the impact is assessed as **neutral,** which is considered **not significant** when considered as a stand-alone building and cumulatively.

#### 8.8.8.7 VIEW 7-Museum of Liverpool

The viewpoint has been assessed as **high** in terms of overall value and visual receptor sensitivity. The development does not register in the viewpoint.

The overall magnitude of the impact is assessed as **neutral**, which is considered **not significant** when considered as a stand-alone building and cumulatively.

#### 8.8.8.8 VIEW 8- Canada Boulevard

The viewpoint has been assessed as **high** in terms of overall value and visual receptor sensitivity. The development does not register in the viewpoint.

The overall magnitude of the impact is assessed as **neutral**, which is considered **not significant** when considered as a stand-alone building and cumulatively.

#### 8.8.8.9 VIEW 9- King Edward Street

The viewpoint has been assessed as l**ow** in terms of overall value and **low** in visual receptor sensitivity. The development is partially seen beyond the City Lofts building, but from this perspective and distance, it provides a common datum line at roof level with the buildings of Waterloo Dock, and is substantially lower than the towers in the foreground. The buildings are identifiable as background buildings, with the focus remaining on the towers, and this will be given further emphasis with the build-out of the permissions within Princes Dock, seen in the cumulative image/does not register in the viewpoint.

The overall magnitude of the impact is assessed as **slight beneficial** townscape and visual effect, which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.10 VIEW 10- Everton Park

The viewpoint has been assessed as **high** in terms of overall value and visual receptor sensitivity. The proposal appears to the south (left) of the view, and is identified as a series of mid-range buildings, lower than the two Tunnel Ventilation Shafts, also captured in the image. The focus of the view is the tall buildings cluster, and this is especially so in the context of the cumulative view.

The proposed buildings fit as part of a sequence of stand-alone structures, rather than as part of a merging cluster, and also as a terminating point to the mass of the city centre. They remain below the escarpment line of the Wirral peninsula, allowing the topography of the area to be read, and although the proposal is viewed with two storey residential development in the foreground, the distance means that it does not dominate this typology. The materiality and tone blends with the general townscape, and although it is visible, it is a unifying element rather than an alien feature simply dropped into the view.

The overall magnitude of the impact is assessed as **neutral,** which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.11 VIEW 11- Arena- Royal Albert Dock

The viewpoint has been assessed as **high** in terms of overall value and visual receptor sensitivity. The development does not register in the viewpoint.

The overall magnitude of the impact is assessed as **neutral**, which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.12 VIEW 12- Pier Head

The viewpoint has been assessed as **high** in terms of overall value and visual receptor sensitivity. The development does not register in the viewpoint.

The overall magnitude of the impact is assessed as **neutral**, which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.13 VIEW 13- Princes Parade South

The viewpoint has been assessed as **medium** in terms of overall value and visual receptor sensitivity. The development does not register in the viewpoint.

The overall magnitude of the impact is assessed as **neutral**, which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.14 VIEW 14- Junction of Leeds Street/King Edward Street

The viewpoint has been assessed as **low** in terms of overall value and **low** in visual receptor sensitivity. The development does not register in the viewpoint.

The overall magnitude of the impact is assessed as **neutral,** which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.15 VIEW 15- Metropolitan Cathedral

The viewpoint has been assessed as **medium** in terms of overall value and visual receptor sensitivity. The development does not register in the viewpoint.

The overall magnitude of the impact is assessed as **neutral**, which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.16 VIEW 16- Anglican Cathedral

The viewpoint has been assessed as **medium** in terms of overall value and visual receptor sensitivity. The development does not register in the viewpoint.

The overall magnitude of the impact is assessed as **neutral**, which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.17 VIEW 17- Bidston Hill, Wirral

The viewpoint has been assessed as **medium** in terms of overall value and visitor receptor sensitivity. The proposal is located to the north (left) of the view, in the distance. Due to the long distance and the fragmented and highly articulated townscape, incorporating both sides of the river Mersey, it remains an inconsequential addition to the view. It remains below the crest of the sandstone ridge to the east of the city, and the materiality and tone provide some 'anonymity' to the buildings, as they blend with the general tone of buildings both in the foreground on the Wirral side of the river, and within the general townscape in Liverpool.

The character and appearance of this general view of Liverpool is defined as a series of horizontal layers rising from the river, with vertical punctuation provided by the tall buildings cluster, and isolated tall buildings. The proposal complies with this general description of the city, and in the cumulative view it takes the role of slightly raising the overall scale of the waterfront buildings in between the two clusters of tall buildings.

The overall magnitude of the impact is assessed as **neutral**, which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.18 VIEW 18- Holt Hill, Birkenhead, Wirral

The viewpoint has been assessed as **medium** in terms of overall value and visual receptor sensitivity. The development does not register in the viewpoint.

The overall magnitude of the impact is assessed as **neutral,** which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.19 VIEW 19- Victoria Clock Tower

The viewpoint has been assessed as **low** in terms of overall value and visual receptor sensitivity, due to its location in an area which is inaccessible to the public. From this perspective, the buildings merge with those in the city centre, and work together with plots CO4-CO6 currently under construction, to illustrate the urban expansion which underscores the Liverpool Waters project. From its current situation as a redundant and derelict site, the proposal provides a new waterfront use, with a clearly defined urban edge, and continuity with the city centre to the south. The existing dock water space is acknowledged as a voided separation between the proposed buildings and the small apartment blocks on the eastern quayside, and allows for framed views back to Pier Head area of the waterfront. The location means that there are only two of the proposed buildings in the viewpoint, with the others screened by the northernmost structures. In terms of a cumulative impact, the existing consent for Liverpool Waters and the parameters plan indicates a series of tall and mid-range buildings would occupy the Central Docks area, which would completely screen the proposal.

The overall magnitude of the impact is assessed as a **slight beneficial** townscape and visual effect, which is considered **not significant** when considered as a stand-alone building.

### 8.8.8.20 VIEW 20- Northern Link Road

The viewpoint has been assessed as **medium** in terms of overall value and visual receptor sensitivity. The proposal is seen occupying part of the West Waterloo Dock, to the north of Princes Half-Tide dock, which is grade II listed. It has a more monumental and civic scale than the adjacent Waterloo apartments, which appear diminutive in such a large expanse of space, and with the wide horizons provided by the riverine location, and the proximity of the dock water spaces. The colonnade which will serve the boardwalk is clearly visible at the base of the rear bay overlooking the dock water space, and which provides public access and movement through the site in a sheltered location. Whilst the dock water space is partially infilled to take the scheme, enough remains of the water to ensure that its waterside setting remains.

The overall magnitude of the impact is assessed as **moderate beneficial** townscape and visual effect, which is considered **not significant** when considered as a stand-alone building and cumulatively.

### 8.8.8.21 VIEW 21- Central Docks

The viewpoint has been assessed as **low** in terms of overall value and visual receptor sensitivity, due to its location in an area which is inaccessible to the public. The proposal is viewed as a series of blocks, somewhat monolithic in character due to the architectural rigour of expressing the frame, and the simplicity of detailing, which is a characteristic of contemporary developments within the city. The proportions of the facades are carried through the framing, and resonate with the warehouse typologies which are a key feature of the docklands. The double height ground floors provide a human scale to the local context, in an area which is currently unwelcoming and devoid of public realm or activity. The tones of the materials used for the buildings are inspired by the bricks of the Waterloo warehouse and the granite setts seen in the foreground, and these provide a contextual link to place.

The series of blocks provide an arrangement which will allow for public space in the interstitial areas, and provide some relief to the industrial aesthetic, whilst the colonnade to the dock side will allow for a public access alongside the dock water space.

In visual terms, the buildings completely screen the view back towards the Royal Liver Building, and sever the connection with the waterfront to the south and the Three Graces, but this is a view which is not currently available to the public.

The overall magnitude of the impact is assessed as **large beneficial** in townscape impacts, and **slight adverse** as a visual effect, and overall is **minor beneficial** which is considered **not significant** when considered as a stand-alone building and cumulatively.

## 8.9 Assessment Summary and Conclusion

### Table 8.9: General assessment of effects

| Townscape Elements | Timescale | Sensitivity of Receptor | Magnitude of Impact after mitigation | Significance of Impact | Confidence |
|---|---|---|---|---|---|
| Heritage Designations | Permanent | Very High/High | Minor adverse | Moderately significant | High |
| Townscape Character | Permanent | Medium | Moderate beneficial | Moderately significant | High |
| Urban Grain/Public Realm | Permanent | Low | Moderate beneficial | Not significant | High |
| Land Use | Permanent | Low | Moderate beneficial | Not significant | High |
| Building Heights | Permanent | Low | Moderate beneficial | Not significant | High |
| Movement and Linkages | Permanent | Low | Substantial beneficial | Not significant | High |
| Environmental designations and Public Open Space | Permanent | Low | Minor beneficial | Not significant | High |

In conclusion, this study provides a townscape and visual impact assessment of the proposed scheme at site C02 in the central docks area. The development will have a largely **beneficial effect** on the townscape of the neighbourhood.

Potential impacts at construction and operational phases have been identified, and a series of actions undertaken to ensure that residual and cumulative effects will be reduced.

In particular, the opportunity has been taken following initial consultations to re-arrange the configuration of the proposed blocks, and change their alignment from an east-west orientation, to north-south, following the established axis of West and East Waterloo Docks and the East Waterloo Corn warehouse. Whilst this will retain some views towards the East Waterloo Corn warehouse from the west, it also provides greater continuity and enclosure for the riverside promenade, and allows for the inclusion of a dock-side walkway to West Waterloo dock. Movement and linkages are improved, in part by providing a protected route along the proposed dock walkway, and by establishing a city scale block to the wide promenade at the river side.

The development proposal includes uses which will encourage active uses and frontages, and a residential population which will ensure that there is adequate natural surveillance. A heritage interpretation strategy will be formulated as part of the public realm improvements, allowing for a greater understanding of the site and its surroundings.

**Table 8.10: Summary of Effects**

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| **Construction** | | | |
| WHS and WHS Buffer Zone | Temporary, minor adverse | CEMP | Temporary, minor adverse |
| Stanley Dock WHS Character Area | Negligible | None required | Negligible |
| Stanley Dock conservation Area | Negligible | None required | Negligible |
| Pier Head WHS Character Area | Negligible | None required | Negligible |
| Views from the Wirral- Magazines, Egremont, Seacombe, Birkenhead, Port Sunlight | Temporary, minor adverse | CEMP | Temporary, minor adverse |
| Views from the south at Pier Head, Canada Boulevard, Albert Dock, Arena and Museum of Liverpool | No effect | None required | No effect |
| Views from King Edward Street and King Edward Street | No effect | None required | No effect |

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Distant views from east-Cathedrals, Everton Park | Negligible | None required | Negligible |
| View from Northern Link Road | Temporary, minor adverse | CEMP | Temporary, minor adverse |
| Views from Victoria Clock Tower | Temporary, minor adverse | CEMP | Temporary, minor adverse |
| Views from Central Docks | Permanent, minor adverse | CEMP | Permanent, minor adverse |
| **Operational** | | | |
| WHS and WHS Buffer Zone | Permanent, minor adverse | Design has been amended | Permanent, minor adverse |
| Stanley Dock WHS Character Area | Permanent, minor adverse | Design has been amended | Permanent, minor beneficial |
| Stanley Dock conservation Area | Permanent, minor adverse | Design has been amended | Permanent, minor beneficial |
| Pier Head WHS Character Area | Permanent, minor adverse | Design has been amended | Permanent, minor adverse |
| Views from the Wirral-Magazines, Egremont, Seacombe, Birkenhead, Port Sunlight | Permanent, minor adverse | Design has been amended | Permanent, minor adverse |
| Views from the south at Pier Head, Canada Boulevard, Albert Dock, Arena and Museum of Liverpool | No effect | None required | No effect |
| Views from King Edward Street and King Edward Street | No effect | None required | No effect |
| Distant views from east-Cathedrals, Everton Park | Negligible | None required | Negligible |
| View from Northern Link Road | Permanent, minor adverse | Design has been amended | Permanent, minor beneficial |
| Views from Victoria Clock Tower | Permanent, minor adverse | Design has been amended | Permanent, minor beneficial |

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Views from Central Docks | Permanent, minor adverse | Design has been amended | Permanent, minor beneficial |

# 9 Cultural Heritage and Archaeology

## 9.1 Introduction

This chapter presents an assessment of potential impacts on Cultural Heritage and Archaeology associated with the proposals, described in Chapter 2. The proposed scheme is located at site C02 (as referred to in the Liverpool Waters Outline Consent), located on the western quayside and partially within West Waterloo Dock, within the Central Docks system on Liverpool's waterfront. It is a combination of desk-work assessment and site survey of the scheme and its context, and covers baseline conditions, and the potential impacts, both on the site and within the larger cityscape. Significance is described and assessed, and relevant mitigation, if any, is also considered.

The assessment has been undertaken by Rob Burns, formerly of Liverpool City Council and English Heritage (now Historic England), and a qualified archaeologist, urban designer and heritage specialist. The separate ICOMOS compliant Heritage Impact Assessment accompanying this ES should be read in conjunction with this chapter, to fully understand the heritage context, and the potential impact on Outstanding Universal Value of the Liverpool, Maritime Mercantile City World Heritage Site.

Cultural Heritage and archaeology deals with the physical evidence of human activities across a timescale, and can relate to both existing, visible fabric in the form of structures, and hidden deposits of past activity at sub-surface level. As well as buildings, it also relates to other man-made elements such as spaces, urban morphology, water bodies and any physical remains resulting in human action. Cultural Heritage also deals with the intangible aspects of society and individuals, as evidenced through examination of physical remains.

Heritage assets that are identified as part of the Cultural Heritage environment are a finite resort, and they are material considerations in determining planning applications. Aspects of physical changes to their environment and setting range from direct impacts to the fabric of the assets, including removal and destruction, and impacts on their setting that is detrimental to their context.

This chapter is supported by the following figures and appendices:

- Appendix 8A: Baseline, CO2 Development and Cumulative Viewpoints

## 9.2 Methodology, Scope and Significance Criteria

### 9.2.1 Legislation

Cultural Heritage issues are covered by a range of legislation and guidance, including the following principal legislation:

- The Planning (Listed Buildings and Conservation Areas) Act, 1990 describes the protection of designated heritage assets, listed buildings and conservation areas.
- The Ancient Monuments and Archaeological Areas Act (1983) and (2002). This provides Scheduled Monuments with the status of national importance, and describes the provisions for their protection.

The National Planning Policy Framework (NPPF), 2019, and its accompanying guidance, the Planning Practice Guide, contains policies and guidance on both designated and undesignated heritage assets, and in developing this strategy, local planning authorities should take into account:

- the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
- the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring;
- the desirability of new development making a positive contribution to local character and distinctiveness; and
- opportunities to draw on the contribution made by the historic environment to the character of a place. (Para. 185).

Significance of assets is a crucial point in understanding, and the NPPF states that:

*In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.*
*Local planning authorities should identify and assess the particular significance of any heritage asset that may be affected by a proposal (including by development affecting the setting of a heritage asset) taking account of the available evidence and any necessary expertise. They should take this assessment into account when considering the impact of a proposal on a heritage asset, to avoid or minimise conflict between the heritage asset's conservation and any aspect of the proposal.* (Paras 189-190).

The PPG confirms that: the conservation of heritage assets in a manner appropriate to their significance is a core planning principle. Heritage assets are an irreplaceable resource and effective conservation delivers wider social, cultural, economic and environmental benefits. (Para. 003).

In addition to the main legislation and policy guidance, Historic England has also produced guidance that is relevant in terms of assessing impacts for the purpose of

EIS documents. This includes Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment (2008, updated 2015), and Seeing the History in the View (2011, updated 2012). The advice provided in these documents has been used in the preparation of this section.

Local policy and guidance is provided through the Liverpool Unitary Development Plan (2002). Relevant policies are HD1: Listed Buildings, HD4: Alterations to Listed Buildings; HD5: Development affecting the Setting of a Listed Building; HD8: Preservation and Enhancement of Conservation Areas; HD12: New Development adjacent to Conservation Areas; HD16: Protection of Ancient Monuments; HD17: Protection of Archaeological Remains; and HD18: General Design Requirements.
The draft Local Plan (2018) contains policies on Heritage, at HD1 and HD2. The former deals with designated and non-designated Heritage Assets, whilst the latter relates to the Liverpool Maritime Mercantile City World Heritage Site. Policy HD1 states that:

1. *The City Council will support proposals which conserve or, where appropriate, enhance the historic environment of Liverpool.*
2. *Particular consideration will be given to ensure that the significance of those elements of its historic environment which contribute most to the City's distinctive identity and sense of place are not harmed. These include:*

- *The docks, warehouses, ropewalks, shipping offices, transport systems and other maritime structures associated with the City's role as one of the World's major ports and trading centres in the 18th, 19th and early 20th Centuries;*
- *The architectural innovation and exuberance of the nineteenth and early twentieth Century banks, exchanges and offices in the commercial centre;*
- *The nineteenth Century Institutional buildings including its libraries, institutes, schools, university buildings, public baths and hospitals (particularly those which sprang from the City's role as an international port such as the seaman missions, sailors' homes and orphanages);*
- *The City's mid and late nineteenth Century civic buildings;*
- *The Georgian Terraces of the Canning Street area;*
- *The extensive network of historic open spaces, parks, gardens, cemeteries and squares; The dominance and views of its two Cathedrals;*
- *The range, wealth and quality of its places of worship;*
- *The distinctive designs and detailing of its surviving late 19th and early 20th Century public houses;*
- *The eclectic mix of buildings associated with the oldest Chinese Quarter in Europe.*

3. *Proposals affecting a designated heritage asset (or an archaeological site of national importance) should conserve those elements which contribute to its significance. Harm to such elements will be permitted only where this is clearly justified and outweighed by the public benefits of the proposal. Substantial harm or total loss to the significance of a designated heritage asset (or*

*an archaeological site of national importance) will be permitted only in exceptional circumstances.*

4. *Proposals which would remove, harm or undermine the significance of a non-designated heritage asset will only be permitted where the benefits are considered sufficient to outweigh the harm to the character of the local area.*

Policy HD2 on World Heritage Site is discussed within the ICOMOS compliant Heritage Assessment on Outstanding Universal Value which accompanies this submission.

The Liverpool World Heritage Site Supplementary Planning Document (2009) provides detailed guidance for new development, regeneration and conservation in the WHS and its Buffer Zone. It supplements the existing "saved" UDP, and acts as a guide to future development in and around the site and provides advice based on the core principles of managing the WHS, as outlined in the Management Plan. The site is within the World Heritage Site Buffer Zone, adjacent to the Stanley Dock Character Area. Section 4.25- 4.29 provides general guidance on the development within the Buffer Zone, stating that:

*All developments in the Buffer Zone, whether in an area of surviving historic character or not, will, in accordance with HD18, need to respond to and reflect the characteristics of the area around them. The design and scale of developments will need to respond to, and respect, their context proportionately to their potential impact on the setting of a conservation area and the WHS. Major schemes adjacent to conservation areas and the WHS will be considered more carefully for their impact on the OUV of the WHS and character of conservation areas than minor developments further away from the WHS and conservation areas.*
*Where a proposal in the Buffer Zone is for: 1) a tall building, 2) a building with a mass that significantly exceeds that of surrounding buildings, 3) a development that is immediately adjacent to the WHS, 4) a building which has a significant impact upon key views or key landmark buildings, 5) a building of architectural or historic interest (whether listed or not), or 6) a development that affects a site of archaeological interest: special consideration should be given to the relationship between the development and the WHS and the impact of development on the historic character of its locality and any buildings that contribute to that character.*

Para 4.2.12 states that:-

*The architectural quality of a proposal within the WHS and Buffer Zone must be of the highest quality of contemporary design but respect, respond to and enhance its highly sensitive and important historic context…..In all cases, the emphasis should be on quality architecture which is grounded in understanding and design concepts, informed by the context.*

Section 4.2.13- 4.2.17, and table, provides advice on Urban design considerations that covers the issues of character, continuity and enclosure, ease of movement, quality of the public realm diversity, legibility and sustainability.

Section 4.4 of the SPD relates to the issue of views and landmarks that are important to the Outstanding Universal Value of the WHS. These are fully assessed in the accompanying Heritage Impact Assessment.
Section 4.5 of the SPD relates to riverside development, and the fundamental importance of the relationship between the river Mersey and the WHS. The guidelines at Para. 4.5.2 state that:-

*Riverside development is therefore a particular consideration in terms of UDP policies HD5, HD12 and HD18 (particularly vii). In this context it will be important to deliver riverside development within the Buffer Zone in a manner that respects the WHS's OUV and the following particular features:*
*The importance of the Pier Head buildings as the focal point for Liverpool's and the WHS's river frontage.*

*The varied skyline of city centre in particular views to the cathedrals, other landmark buildings and the ridge of higher ground to the east of the city centre*
*The careful juxtaposition of buildings of different periods along the waterfront, which demonstrates the evolution of the waterfront and can create an exciting visual interplay.*

*The aim is to create a cohesive and exciting waterfront of both historic and contemporary buildings, which sit harmoniously together.*

### 9.2.2 Assessment Methodology

The study comprised a review of pertinent cartographic and other historical sources, and Historic Environment Record (HER) entries. A site walk-over survey and a detailed examination of existing buildings were also carried out.
This assessment covers the entirety of the application site, together with additional features within the vicinity. Consideration is also given to the potential cumulative impact with other currently proposed development sites.

The EIA regulations stipulate that an ES should, where possible, identify, describe and assess the likely significant effects of the development on the environment. The methodology sets out three stages to identify the significant effects:

- Receptors
- Environmental Impacts
- Significant Effects

### 9.2.3 Potential Receptors

The potential receptors are outlined in Table 9.1

**Table 9.1: Potential Receptors**

| Sensitivity | Receptors |
|---|---|
| Very High | World Heritage Sites, Grade I and II* listed buildings, Scheduled Ancient Monuments |
| High | Grade II listed buildings, conservation areas, sites of national importance |
| Medium | Sites of Regional/County importance |
| Low | Sites of local interest, sites with a low local value or interest for educational or cultural appreciation, sites that are so badly damaged that too little remains for inclusion into higher grade. |

### 9.2.4 Designations of potential receptors

The significance of an effect is directly related to the sensitivity of the receptor, which have a magnitude of importance, and which approximate to the designation. The site is adjacent to the WHS, within the Buffer Zone, and is also adjacent to a number of listed buildings, or within the setting of listed buildings. There are no Scheduled Ancient Monuments or Historic Parks or Gardens near the location.

Within the area the Waterloo Warehouse is grade II listed, as is the Dock Boundary Wall, lock gates to Princes Half Tide Dock, and the retaining walls of Princes Half Tide Dock itself. The warehouse at 68 Waterloo Road to the north east of the site is grade II, and further north again at Stanley Dock, the twin north and south stack warehouses by Hartley are grade II* and grade II respectively, whilst the enormous Tobacco Warehouse is grade II. On the edge of the waterfront overlooking the river, the Victoria Clock Tower is also grade II.

Whilst the proposed development site is located wholly within the partially in-filled West Waterloo Dock and its western quayside, there are other non-designated heritage assets around the area, including historic surfacing, rail tracks and structures associated with dock management. These relate to the post-1949 infrastructure of the wholesale re-arrangement of West Waterloo Dock.

### 9.2.5 Magnitude of Impact

The magnitude of impact is the ratio of effect of development on the significance of the heritage asset, although the value rating of the asset is not used to differentiate the various impacts at this stage. Impacts can be beneficial or adverse, short, medium or long-term, direct or indirect, permanent or temporary, and cumulative when taken together with other schemes within the area. Magnitude is expressed as substantial, moderate, slight or negligible. The criteria are shown in Table 9.2.

**Table 9.2: Magnitude Criteria**

| Magnitude of Impact | Description |
| --- | --- |
| Substantial | Significant change in surrounding environment; Complete destruction of the site or feature. Change to the site or feature resulting in a fundamental change in ability to understand and appreciate the heritage asset and its cultural heritage value/historical context and setting |
| Moderate | Significant change in environmental factors; Change to the site or feature resulting in an appreciable change in ability to understand and appreciate the resource and its cultural heritage value/historical context and setting |
| Slight | Change to the site or feature resulting in a small change in our ability to understand and appreciate the heritage asset and its cultural heritage value/historical setting |
| Negligible | Negligible change or no material change to the site or feature. No real change in our ability to understand and appreciate the heritage asset and its cultural heritage value/historical context and setting |

### 9.2.6 Significance of Impact

The significance of the impact is assessed by measuring the magnitude of the impact, with the degree of sensitivity of the asset. Table 9.3 illustrates the matrix used to calculate the significance of the impacts.

**Table 9.3: Significance of Impact**

| Sensitivity | Substantial Impact | Moderate Impact | Slight Impact | Negligible Impact |
|---|---|---|---|---|
| Very High | Major | Major/Intermediate | Intermediate | Minor |
| High | Major/Intermediate | Intermediate | Intermediate/Minor | Neutral |
| Medium | Intermediate | Intermediate/Minor | Minor | Neutral |
| Low | Intermediate/Minor | Minor | Minor/Neutral | Neutral |

The study area for the assessment includes part of the WHS and Buffer Zone, Stanley Dock, and landmark buildings at some distance such as the two Cathedrals due to their location and prominence. Each of the assets identified have been allocated a sensitivity category.

### 9.2.7 Residual Impacts

Mitigation of any identified impacts is considered, to reduce any harm.

### 9.2.8 Design Evolution/Response

The EIA process has been integrated into the design process, so that cultural heritage impacts can be accounted for should harmful impacts be identified, or where the possibility of enhancing heritage assets exists. Mitigation can be termed as prevention, reduction, off-setting or enhancing. The scheme has benefitted from very early consideration of potential impacts, so that, for example, basement parking has been avoided, the footprint of the building is arranged to take account of the existing dock walls and will not require their removal, and the early consideration of extending in-fill beyond that permitted as part of the original Liverpool Waters planning permission, parameters plan, has been reversed, and the infill is limited to that already permitted. Views have been considered from the start of the design process, and the material, tone and texture of the design have been included as key elements. Geo-technical work in advance of deciding foundation works have confirmed that there are null archaeological deposits of significance to OUV on the site, and construction traffic and site compounds are to be located away from areas of potential archaeological interest, and where the historic environment has been heavily denuded through in-filling, changes to or removal of assets at earlier dates, and which will not require further changes to assets or their settings. Existing entrances and service roads will be used for construction purposes, including the northern link road currently under construction.

## 9.3 Consultation

The Liverpool Waters Conservation Management Board has seen the proposals as part of a presentation by the design team, and it has been reviewed by Places Matter at pre-application stage. Consultations have taken place with Liverpool City Council, Historic England, Merseyside Environmental Advisory Service, and with the residents of Waterloo Warehouse and within the area. Comments made at pre-application stage by consultees have been addressed as far as possible with the current submission.

## 9.4 Limitations and Assumptions

Ground conditions have been tested, and a foundations and piling strategy adopted, but this may require amendments during construction after further testing has been undertaken.

## 9.5 Baseline Conditions

#### 9.5.1.1 Background

One of the key attributes of Liverpool, and a fundamental reason for the inscription of the WHS, is the presence of the docks. At their peak the operational docks ran for c.12km north to south along the Mersey waterfront, and were a feat of engineering marked by innovative water management techniques and advances in cargo handling, that made them the most effective docks of the period. This was accomplished not through a long, drawn out process of gradual evolution, but over a relatively short time-frame, starting with the opening of the Old Dock by Thomas Steers in 1715, and which at the time was the world's first commercial wet dock. Although fraught with risk, and the enterprise heavily mortgaged to pay for the investment, the success of the Old Dock, built within the confines of the original 'pool', and with space to take 100 vessels, established the commercial imperative and the general construction approach to the provision of the future dock system.

Following on from the Steers Dock, an octagonal tidal entrance basin was built, with graving docks and a landing stage, and the first sea wall was constructed that started to define the new shoreline. The huge investment in land reclamation, with docks and sea walls built into the river, was supported by the requisitioning of waste material from the growing population of the city, including pottery, quarry waste, and organic matter generated by the butchers, tanners etc who were increasingly based along the new waterfront. The area known as Nova Scotia, constructed around a slipway to the river, and located in the present day Mann Island area, provided a ready supply of infill material, and led to further westward expansion of the sea walls, and the Manchester Basin. By 1771, the area of Pier Head had also been reclaimed, with the central area of that location occupied by Georges Dock, and linked to Canning Dock via George's Dock passage to the south. Further change came with the construction of Georges Dock Basin and Georges Ferry, which effectively created a series of small 'islands' linked by swing bridges. At the end of the 18$^{th}$ century, the construction of the Manchester

Dock was swiftly followed by that of the Chester Basin to the south of Pier Head. Whilst warehouses were generally located to the east of the Pier Head around Goree Plaza, transit sheds were provided on the west and east sides of Georges Dock in 1829 and 1836 respectively, and in 1828 Georges Baths were established at Pier Head. Figure 9.1 shows the situation in 1810, a snapshot of this part of the city made by a German cartographer. At this stage, the northern docks, including Princes Dock, Princes Half Tide Dock, Waterloo and Victoria Docks were not constructed, the map clearly showing those areas still within the River Mersey.

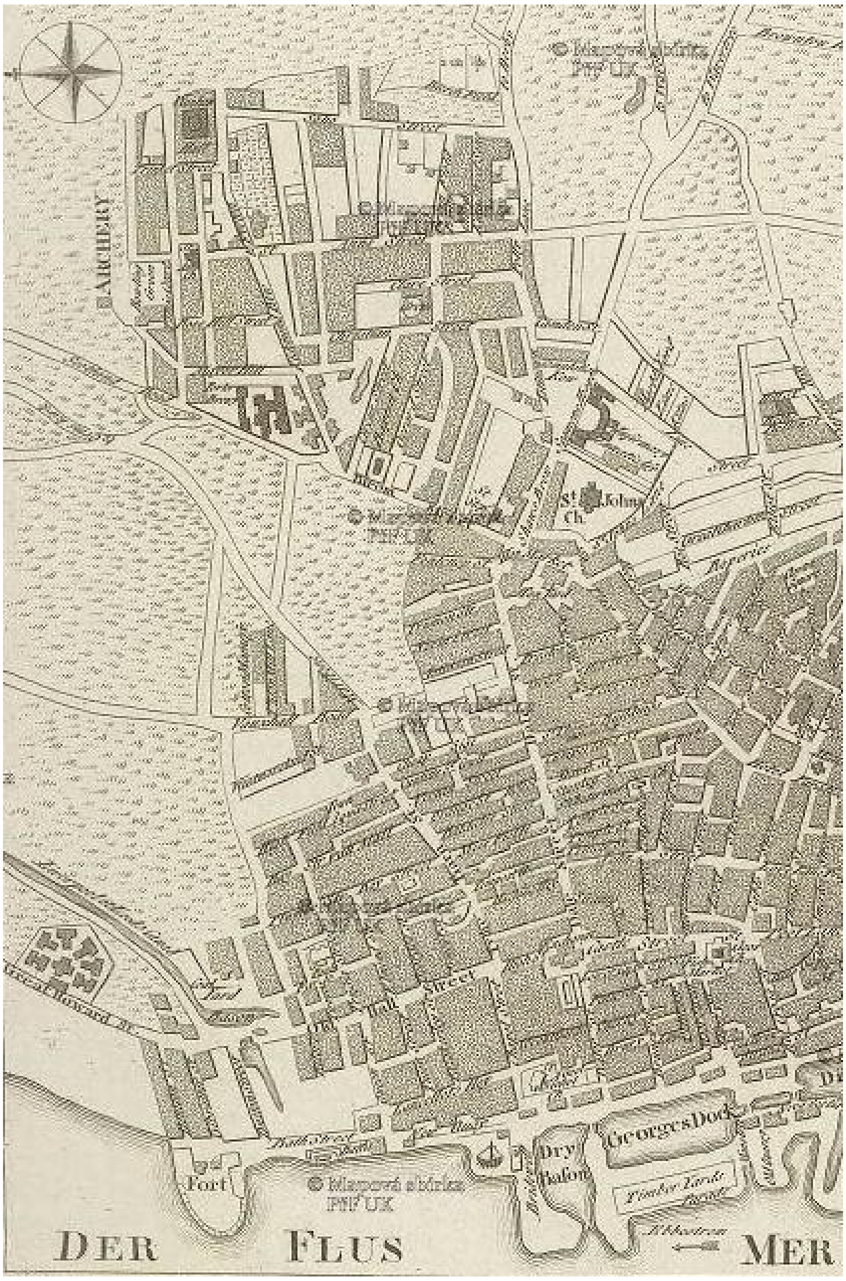


**Figure 9.1: Liverpool in 1810- based on an earlier plan of 1795. (Old Maps online).**

To the north of Georges Dock, there followed a series of construction projects in quick succession. Princes Dock was completed in 1821, with a connection to

Georges Dock to the south, and accessed from the Mersey via the Princes Dock Basin to the north. At the same time, the first of the Dock boundary walls was provided, to control access between the operational docks and the city.

The next phase of dock construction was overseen by Jesse Hartley, between 1824 and 1860, the pre-eminent engineer who more than doubled the dock accommodation in the city. Clarence Dock and Clarence Graving Dock opened in 1830, with Waterloo Dock completed in 1834. By 1836, Victoria and Trafalgar Docks were open, and along with Waterloo Dock they formed a uniform trio of inter-connecting water spaces, with river access gained through the Victoria Dock lock gate. However, this access was closed after just 10 years, meaning that access could only be gained through the dock network. This made the trio of docks the first real examples of spine and branch dock, with the docks aligned on an east-west axis, and transit sheds surrounding them on each side. Figure 9.2 shows the arrangement in 1841.

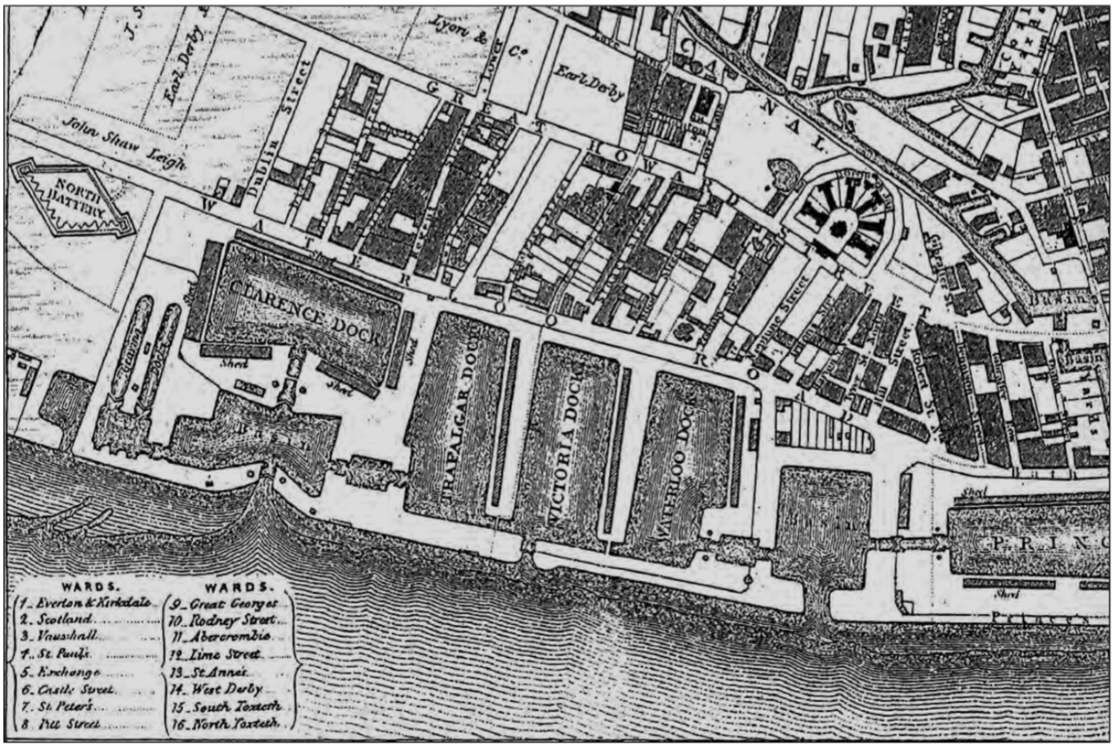


**Figure 9.2: Bennison plan of 1841**

All of these docks were built into the river, and archaeological excavations in advance of the Leeds-Liverpool canal link demonstrated that the majority of reclaimed land around the Trafalgar and Victoria Docks comprised quarry waste and beach sand mixed with waste brought from the city. Parts of the Victoria and early original Trafalgar Dock walls were demolished to accommodate the canal link, and a 15m section of each was demolished. The remainder of the dock walls survive beneath a layer of nineteenth and twentieth century backfill. As part of the construction of these docks, the Dock wall was extended.

The Dock Act of 1844 was followed by the construction of 8 new docks, including Albert Dock to the south. In the northern docks, Wellington and Sandon were built in 1848, with the central dock system occupied by Salisbury, Collingwood, Stanley, Nelson and Bramley-Moore Docks., also open by 1848. As with the 1830's docks, they formed a series of interconnecting water spaces. Alongside Princes Dock, Waterloo Dock was used as a berth for trans-Atlantic packet ships, and played a role in Liverpool's migration trade.

From 1830, Hartley's dock retaining walls, previously of sandstone, were constructed in the much harder granite. The quality of the work was high, and this allowed the use of much thinner walls with only a slight batter. This was a crucial intervention, as straighter dock walls could accommodate deep, square-hulled steamships, and this provided a degree of future-proofing for the huge investment. The retaining walls were constructed using piers that were taken down to the general foundations, working with the bedrock, and then building flat, relieving arches. The walls were supported by counterforts, 6 feet square and 12 feet apart, which were cruciform buttresses set into the rear of the walls. Each wall was 12 feet thick at the base, 6 feet at the capping and 36 feet high, with a batter of just 1 inch to the vertical. Like his Dock boundary wall, the dock retaining walls were built in 'cyclopean' technique, using huge bonding headers, and with small irregular pieces of rubble in between. The pieces fitted together precisely, with very thin mortar joints to minimise leakage.

Hartley's successor, GF Lyster, was responsible for re-modelling a number of the docks, including Princes Basin in 1868, which was re-modelled and re-named as Princes Half-Tide Dock. In 1873, Georges Dock Basin was infilled allowing for a floating roadway leading down to the landing stage. Georges Dock itself was infilled c.1900, and the area of the former dock was used as the site for the construction of the Three Graces.

Waterloo Dock was re-developed in 1868 following the repeal of the Corn Laws, and this allowed the Dock to become the world's first specialist grain dock. From its original 5 acre space, the new dock was completely re-orientated, and two basins were constructed, on a north-south axis, and named Waterloo Docks East and West.

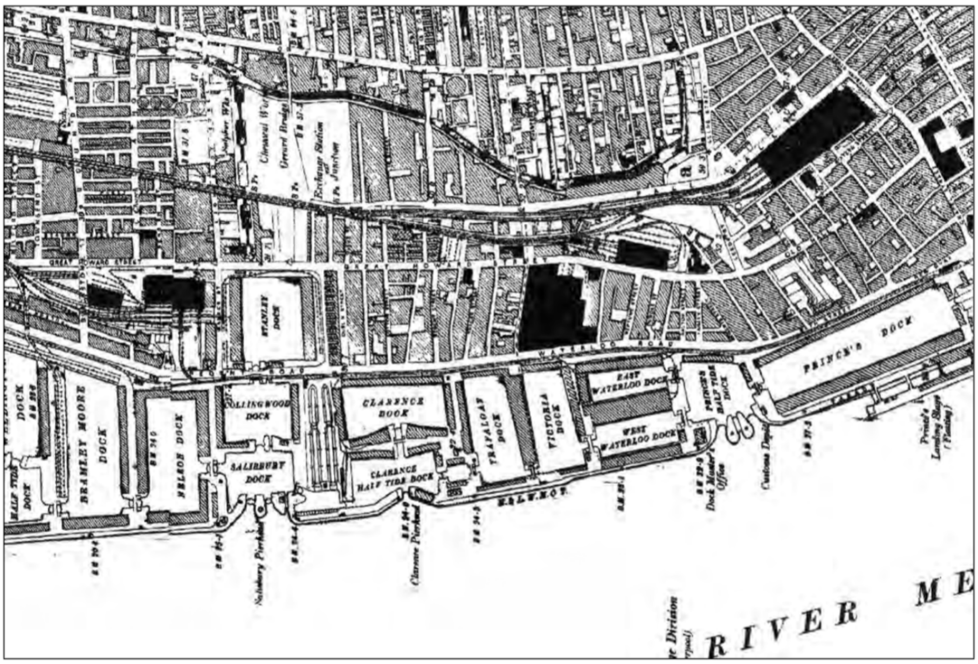

**Figure 9.3: OS plan 1894**

East Waterloo Dock became the specialist grain dock, with huge brick warehouses with colonnades. The three buildings were located on all three sides of the dock, with that on the northern quay being shorter than those to east and west. The long warehouses had granite bases with limestone floors, of 5 working storeys, plus basement and mezzanine. These levels housed machinery and conveyor belts, operated hydraulically, which in turn worked three bridges, ten ship capstans, and 24 gate engines. West Waterloo Dock provided a passage between Victoria Dock and Princes Half-Tide Dock, as well as berths for ocean going vessels, but its role as a focal point for migration was much reduced, and it was largely utilised for general cargo. It had long transit sheds on its east and west quays, with a smaller one to the south. The northern warehouse was destroyed in the air-raids of 1941, whilst the western warehouse was demolished in 1969, along with the smaller transit buildings. The eastern warehouse remains, although it was converted into residential accommodation in the 1980's, and is now a grade II listed building. The site of the northern warehouse is now partially a car-park for the residents of the former eastern warehouse, whilst the western warehouse was replaced with a series of stand-alone apartment blocks of poor design quality.

In 1929, a modernization programme was undertaken that saw the in-filling of Clarence Dock, Clarence Half-Tide Dock and part of Victoria Dock, whilst Trafalgar Dock was substantially re-ordered, and a power station was constructed within the in-filled Clarence Dock. Figure 9.4 shows the Waterloo warehouse complex in 1920, with Victoria Dock to the north. Figure 9.5 shows the docks from the south in 1949, following the substantial re-modelling and the construction of the power-station.

**Figure 9.4: Waterloo warehouses and docks, 1920. Also notable is the scale of Bibbys Warehouse to the east, beyond the warehouses. (Historic England)**

**Figure 9.5: Aerial Photo 1949. Northern Warehouse at Waterloo Dock has been demolished, although the western Warehouse is still in situ, as is Bibbys warehouse on Waterloo Road.**

With the provision of lock gates as part of the re-modelled West Waterloo Dock in 1949, which allowed direct access to the Mersey, Victoria Dock was used as a small container port in the 1970's. However, this proved short-lived, and the Dock closed in 1988. Following its in-filling, it was partially re-excavated with the construction of the Leeds-Liverpool canal link in 2007.

Waterloo Dock, and its neighbouring docks at Victoria and Trafalgar, has been subject to substantial transformations, and the landscape around the site bears little resemblance to the original docks layout. Of the three docks that were originally planned and designed, only part of the Waterloo dock remains intact, and this following its sub-division into East and West water bodies, and a change in orientation. Trafalgar and Victoria Docks have been completely in-filled, West Waterloo has been partially in-filled., and the only vessels that now use the former spaces are the narrow-boats that utilize the relatively new Leeds-Liverpool canal link from Stanley Dock to Albert Dock. In its later years, West Waterloo Dock lost its northern wall and was effectively subsumed by Victoria Dock as part of the container port, with open access to the river, thus losing its original importance as an early spine and branch dock.

Nevertheless, the site of West Waterloo Dock still retains a visual relationship with the remaining warehouse at Waterloo East Dock and the dock boundary wall, although large parts of this have been breached and removed. It is relatively isolated from the main elements of the WHS, centered along the waterfront and office area further to the south, and on Stanley Dock to the north-east, but is also readily identifiable through its position, and its relationship to the river and other parts of the dock estate, as part of the evolved Liverpool waterfront.

#### 9.5.1.2 Character Assessment

Whilst the site is part of a post-industrial denuded landscape, the combination of the barrier presented by the extant Dock Boundary Wall, and the river to the west, have both helped to preserve a unique identity. There is little to indicate its former role in the maritime trade that was central to Liverpool's development and success, but the series of transformations that West Waterloo Dock experienced is very much part of the narrative of Liverpool, and the way in which adaptation and commerciality were central to the evolution of the docks and the city itself. The topography of the site, and its relationship with the nearby docks and other spaces, identifies it as part of the great reclamation of land from the river, that is central to the innovative approach to dock construction, and which provides a context to the low-level datum of the site, and its relationship to the river.

This helps to characterize and understand the distinctive topography of the city, and the contrasting axiality of a low-horizontality at river level, with vertical punctuation rising to the sandstone ridge to the east of the city centre. This is best appreciated and understood from across the Mersey to the west, and in certain views from the higher ground to the east, but the site itself is flat and uninterrupted, and provides views to the west and along the linear, north-south locations of the remainder of the dock system.

Whilst the dock is partially infilled, the site remains part of the dockland context, and elements such as the Dock Boundary Wall, location of warehouses, relationship to river and other dock water spaces (both open and infilled) and its shared topography, help in defining the setting of the WHS. As the site is within the Buffer Zone of the WHS, it does not convey OUV, but any residual elements of authenticity and integrity may add to the narrative of the WHS, as well as its setting.

The site tells the story of loss and under-investment rather than the success of the docklands, and it has the look and feel of a temporary environment. Waterloo Dock has changed substantially over time, from the original Hartley Dock which was a single dock water space aligned east-west, to the Lyster re-modelling of 1868 which sub-divided the dock into two basins and changed the alignment to a longitudinal axis running north-south, and then to its merging with Victoria Dock to the north through the removal of its northern retaining wall. Its role in the spine and branch dock system also shifted with the breaking through of the river dock in 1949, which removed substantial portions of the western dock retaining wall, and changed the angle and location of the river wall to accommodate the lock, as well as reducing the extent of the western quayside. With the infilling of the two neighbouring docks to the north, and the partial infill of West Waterloo Dock, the character of the dock, its setting, and the nature of the water space has also shifted dramatically. Each phase of the dockland evolution in this section of the system has led to an increasing north-south axial alignment, as the docks have been repurposed. The following figures illustrate the evolutionary timeline of Waterloo Dock:

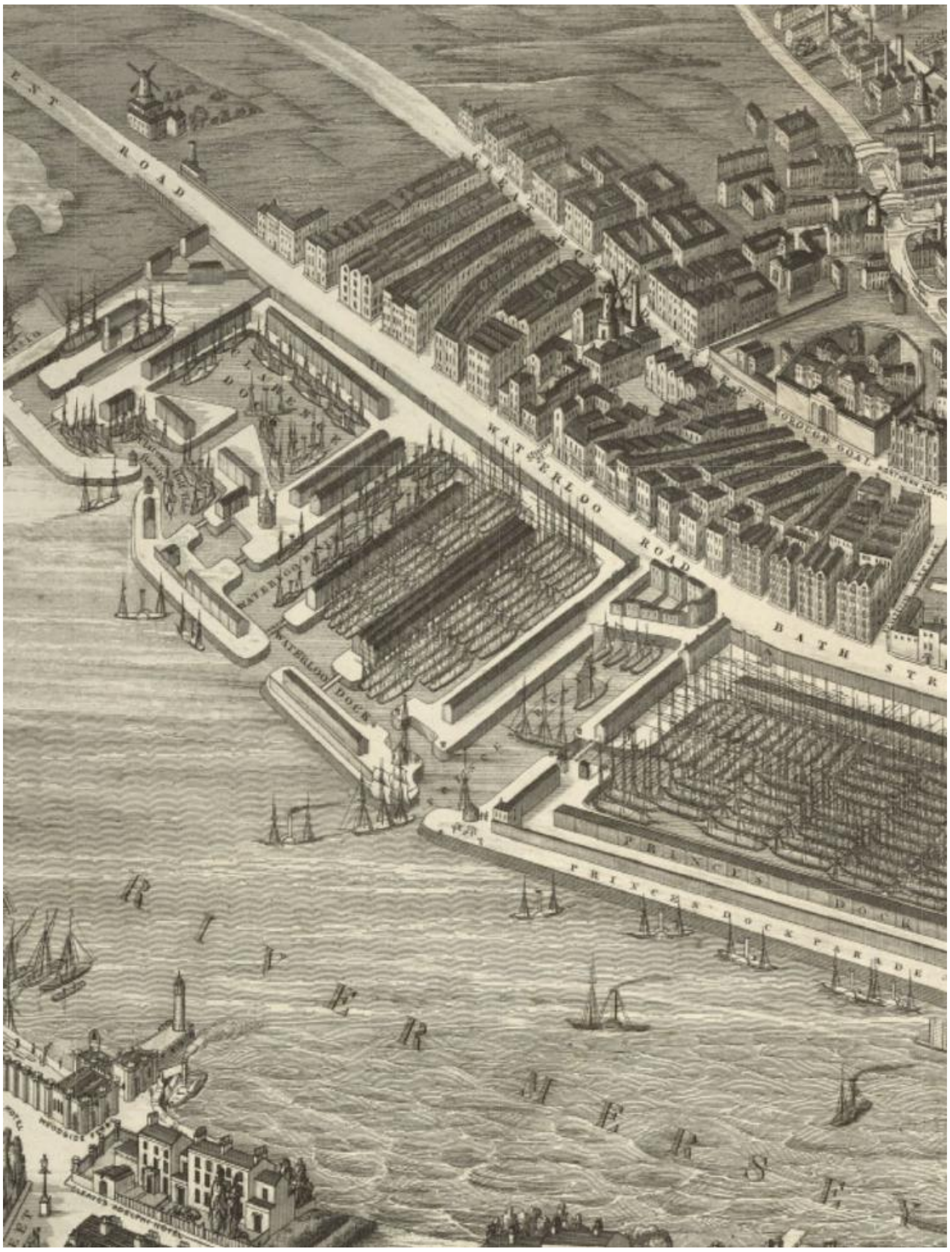


**Figure 9.6: Ackermanns Plan (detail) of 1847, showing the original layout and alignment**

**Figure 9.7: Waterloo and Victoria Docks, 1920. Waterloo Dock has been completed re-ordered and re-aligned, and divided into two dock water spaces rather than the single entity in its original form. There is a clear division between West Waterloo Dock and Victoria Dock to the north (English Heritage).**


**Figure 9.8: 1934. The Clarence Dock power station opened in 1931, infilling a large percentage of the dock water space, and leaving a much narrowed north-south axis through the dock system (Historic England)**

**Figure 9.9: 1946, before the provision of the river lock to West Waterloo Dock. The dock remains distinct from the neighbouring Victoria Dock to the north.**

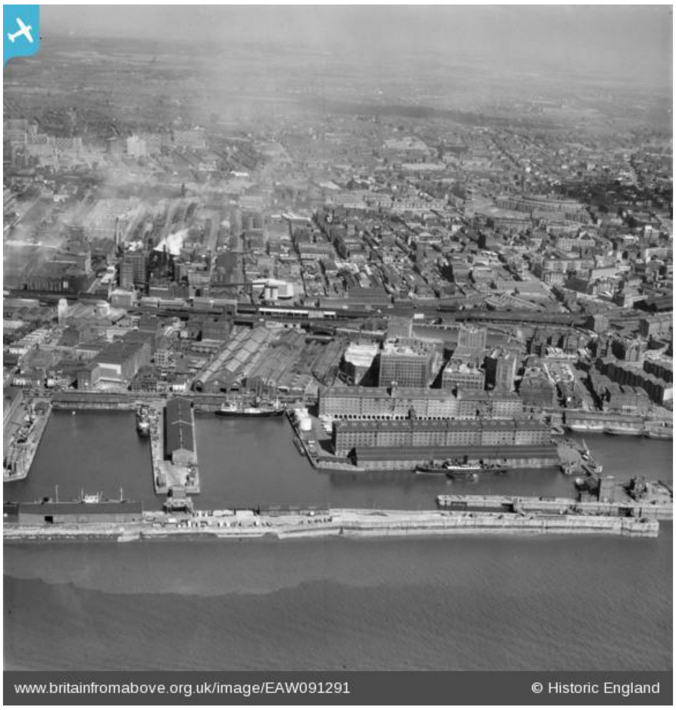


**Figure 9.10: 1949-West Waterloo Dock has been re-configured with the addition of the river lock, and the re-building and change in orientation of the sea wall. The northern quay wall to West Waterloo Dock has been removed. (Historic England).**


**Figure 9.11: 1990- The western Waterloo warehouse and transit shed have been demolished, and the river lock has been infilled. From 1972 until 1983, the combined West Waterloo and Victoria Docks had been used by the British and Irish Steam Packet Company (Bernard Rose Photography).**

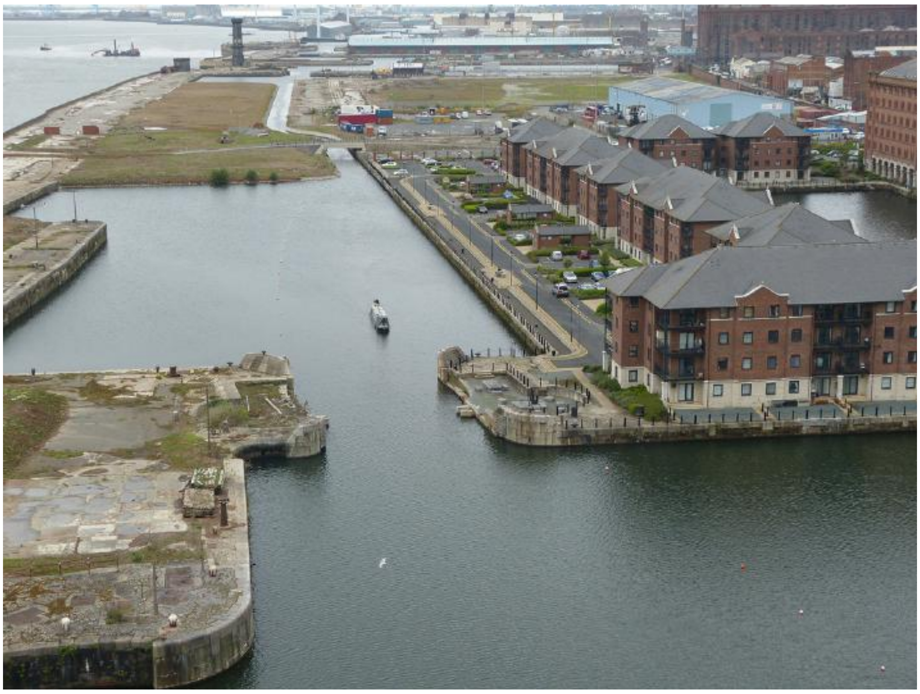

**Figure 9.12: Present. The docks to the north have been infilled, and West Waterloo Dock partially infilled in the late 1990's, with the cutting for the Leeds-Liverpool canal link as a partial re-excavation in 2007. West Waterloo warehouse has been replaced by a series of 4 storey apartment blocks.**

**Figure 9.13: 1999. West Waterloo Dock from the north showing the western quayside occupied by the B and I ferry terminal, before the construction of the apartment blocks. (John Luxton).**

**Figure 9.14: 1999 showing the demolition of the accumulator building used in conjunction with the river lock at West Waterloo Dock. The infilled lock is to the right of the image (John Luxton).**

## 9.5.2 Views

The views into, from and within the WHS are important aspects of OUV, and a number of them are identified within the SPD. They consist of panoramas, focal views, view corridors and views to a series of landmarks, and they are located both within the WHS and the Buffer Zone. In terms of OUV, the test of significance is how the views contribute to appreciation and understanding of the tangible and intangible attributes enshrined in the Statement of OUV and what impact, if any, the development proposals would have on those values.

The SPD contains figures which show the important viewpoints, and these are reproduced as Figures 9.15 and 9.16.


**Figure 9.15: key landmark buildings and key vistas (reproduced from the WHS SPD, Liverpool City Council).**

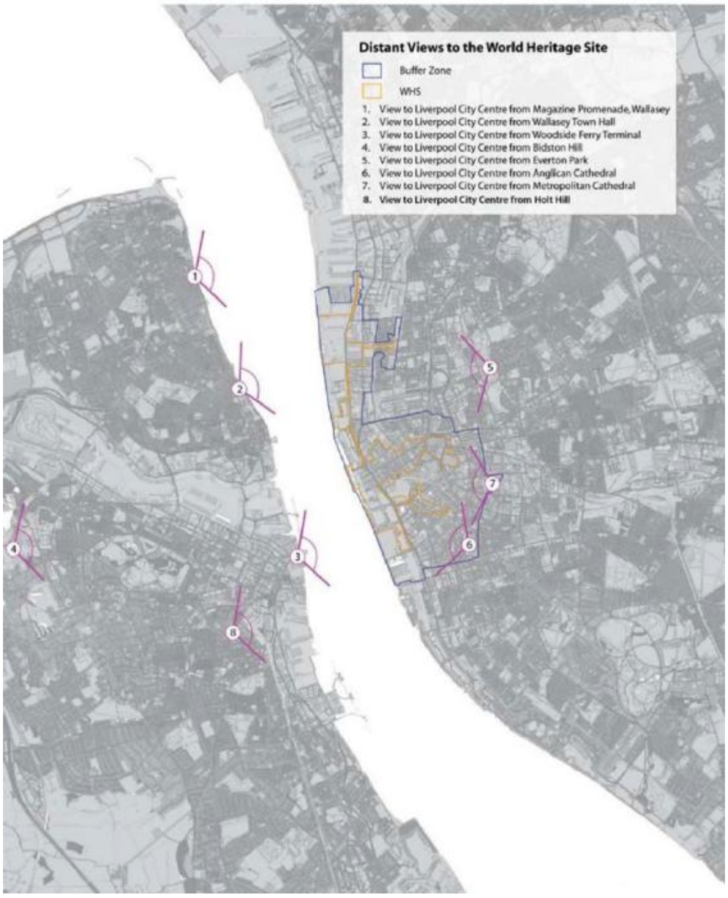


**Figure 9.16: Distant views to the WHS (reproduced from the WHS SPD, Liverpool City Council)**

The assessment considers impacts on a number of key individual buildings, as well as areas of the WHS, Buffer Zone, and Stanley Dock Conservation Area. These are described in Table 9.4.

**Table 9.4: Local Receptors**

| Receptor | Location | Designation | Sensitivity |
|---|---|---|---|
| Waterloo Grain Warehouse | WHS | Grade II | Very High |
| Dock Boundary Wall, Waterloo Road | WHS | Grade II | Very High |
| Anglican Cathedral | Buffer Zone | Grade I | High |
| Metropolitan Cathedral | Buffer Zone | Grade II* | High |
| Royal Liver Building | WHS | Grade I | Very High |
| Cunard Building | WHS | Grade II* | Very High |

| | | | |
|---|---|---|---|
| Port of Liverpool Building | WHS | Grade II* | Very High |
| Stanley Dock Tobacco Warehouse | WHS | Grade II | High |
| Victoria Clock Tower | WHS | Grade II | High |
| Character Area 1 (Pier Head) | WHS | | Very High |
| Character Area 2 (Albert Dock) | WHS | | Very High |
| Character Area 3 (Stanley Dock) | WHS | | Very High |
| Castle Street Conservation Area | WHS | | High |
| Albert Dock Conservation Area | WHS | | High |
| Stanley Dock Conservation Area | WHS | | High |

## 9.6 Environmental Impacts and Significance of Effects

### 9.6.1 Construction Phase

Construction impacts relate to the potential damage caused to sub-service remains, either directly on the site or adjacent areas, due to vibration or displacement of strata. This is usually subject to mitigating management protocols. In addition, the construction equipment and working methods can also have an impact, due to poor location of compounds, equipment and plant such as cranes, as well as noise and dust.

Potential impacts in this phase could therefore include physical damage to heritage assets, such as the buried retaining wall of West Waterloo Dock and adverse impacts on the setting and experience of heritage assets, including the experience of the assets, such as the Waterloo Grain warehouse.

Initial geotechnical on the site and desk-based assessment have demonstrated that no archaeological deposits of significance are located on the site. The footprints of the buildings have been positioned to minimise construction impact on any residual walls, and the infilling process will be reversible, and will not require removal of the extant dock retaining wall. There is no public access to this area of the waterfront, although the site can be viewed from the northern entrance road into Princes Dock from the south. Any impacts on views will be local, and the strategic views will not be affected during the construction period.

### 9.6.2 Operation Phase

Operational activities may have both positive and negative impacts, and include the secondary impacts of sub-surface landscaping through root damage, and impacts on the setting of heritage assets through screening or obscuring them. In these circumstances, mitigation is required to limit any damage or intrusion, and to preserve the legibility and character of the townscape.

Potential positive benefits include the repair of shattered heritage townscape, and the possibility of development leading to greater public access to the site, and interpretation, either passive or active, that will lead to greater understanding and legibility. The proposal includes a dock side walkway, which will allow public access close to the remaining water space.

The visual aspects of the proposed scheme are described in full in the accompanying Heritage Impact Assessment (HIA), which examines the effects of the scheme on the OUV of the WHS. The visual assessment in the HIA focuses on the key elements that help to define OUV, and assesses the impact of the proposal on those areas that individually and collectively help to describe OUV, with each asset considered. The Townscape and Visual Impact Assessment chapter in this document also explores some of the importance of the views in relation to general townscape and heritage.

The proposed building will, in part, help to replace two of the Waterloo Dock warehouses lost through enemy action and demolition, and restore some of the earlier scale in this part of the dock estate. Earlier buildings associated with Victoria Dock were simple, single storey transit sheds, of utilitarian character and appearance, which ran parallel with the alignment of the waterspace. Whilst the proposal shares this alignment, it is higher than single storey, and as its location is wholly within the former dock, as opposed to on the quay, it is not a replacement for these earlier simple structures. However, in distant views in particular, it re-establishes the earlier arrangement of a series of large-scale warehouse-scale buildings in a dockland location. It will also help to establish a new route into the dock areas, and encourage access into an area of the waterfront that is currently privatized.

### 9.6.3 Heritage Impact Assessment

The Heritage Impact Assessment (HIA) relating to the proposed scheme has been carried out in accordance with the International Council on Monuments and Sites (ICOMOS) Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (2011), a methodology which was prepared at the request of the World Heritage Committee. The document is included as a planning application document. The report focuses solely on heritage issues, and does not take account of wider benefits, which are addressed in other planning application documents.

World Heritage Sites are recognised under the World Heritage Convention to be of Outstanding Universal Value (OUV) through inscription on the World Heritage List. The concept of OUV is encapsulated at the time of inscription in a Statement of OUV, which clearly defines its international value. Applications for planning permission within a WHS or its Buffer Zone are assessed for their potential impact on OUV as well as the aspects of integrity and authenticity which are also defined in the Statement of OUV.

The ICOMOS methodology used in the report states that assessments should provide the evidence on which decisions can be made in a clear, transparent and practicable way, and states that ‘the assessment process is in essence very simple:

- What is the heritage at risk and why is it important – how does it contribute to OUV?
- How will change or a development proposal impact on OUV?
- How can these effects be avoided, reduced, rehabilitated or compensated?’ To reach such decisions, the potential impact of development on aspects of the historic environment that convey OUV has been assessed under the following five categories:
    - Direct impacts on a schedule of heritage assets identified as reflecting OUV.
    - Impact on key views of and from the Liverpool Waters site.
    - Impact on views and setting of strategic landmark buildings within the WHS and buffer zone.
    - Compliance with guidance in Liverpool City Council’s WHS Supplementary Planning Document (which sets out detailed policy and design guidance for protecting the OUV of the Liverpool WHS).
    - Cumulative Impact Assessment on OUV.

In the methodology used, heritage resources are evaluated in accordance with statutory designations, and assessed for their contribution to OUV. The assessment draws on the Historic England Conservation Principles, 2008 for guidance on evaluation of significance, and the Historic England guidance Seeing the History in the View, 2011 for views analysis.

## 9.7 Mitigation Measures

Mitigation is two-fold:

- The development has been designed to accord with the heritage context, including scale, mass, volume, materiality, texture, tone and design aesthetic. Geotechnical exploration has been undertaken to allow for a foundations strategy that will not cause harm to potential features of sensitive archaeological interest such as the original Waterloo Dock retaining wall.

Whilst the eastern wall of the 1949 river lock may be impacted, this is less sensitive than earlier dock infrastructure.

- Conditions imposed on the final detailing of the proposal will also act as a safeguarding measure, and the overall envelope of the building complies with the Liverpool Waters parameters plan, the ES for which illustrated that a building in this location and within these parameters, would not be harmful to OUV or other heritage assets.

## 9.8 Residual Effects

The potential effects following mitigation a show that there will be no adverse impact on OUV, and a single slight adverse impact on the setting of Waterloo Warehouse, Royal Liver Building and the Stanley Dock Tobacco Warehouse and their character area. This is illustrated in the accompanying HIA, and relates to single viewpoints. As such, the proposal complies with international, national and local policy and guidance in relation to heritage management

## 9.9 Cumulative Impacts

There will be both positive and negative impacts during the construction phase, and positive and negative impacts during the operational phase. The negative impact relates to increased noise and dust, during construction, and the use of some machinery on site., whilst for the operational phase, the negative impacts are on setting of Waterloo Warehouse, Royal Liver building and Stanley Dock Tobacco Warehouse, although these are limited to only certain viewpoints.

The positive cumulative impact relates to the opening up of this part of the historic dockland, and the re-imposition of a scale that is represented by the existing Waterloo Grain warehouse, and which was compromised by the loss of two warehouses of the same scale. The opportunity to provide legibility in the area that has been lost through redundancy and neglect will bring public benefits of interpretation through the new accessible area, as well as allowing, uniquely for Liverpool, close public access to the dock water space at West Waterloo Dock with a low-lying boardwalk.

There will be no detrimental cumulative impacts on the setting of heritage assets in proximity to the site as a result of this development.

## 9.10 Assessment Summary and Conclusion

Tables 9.5 and 9.6 show the construction impacts and operational impacts of the development.

In terms of construction impacts, following mitigation such as site and construction management inductions for operators; siting of machinery and compounds further to the north of the Site, away from Princes Half Tide dock; impacts of the proposed scheme are at most, minor adverse or neutral. In terms of the operational impact, design mitigation has already been undertaken and therefore there are only minor adverse impacts arising from the change to the setting on cross-river views and local views from the north, as a result of the development.

There is the potential for the proposed scheme to impact in a minor way on heritage assets, although some mitigation has been undertaken at the design stage. The benefits of the development in terms of opening up the waterfront area and providing a more appropriate scale and mass in this location, that resonates with the original arrangements and townscape, outweigh any potential for minor harm.

The HIA that accompanies the proposals confirms that there will be no adverse impacts on the OUV of the WHS, and Cultural Heritage/archaeology and OUV will not be subject to any permanent significant adverse effects.

**Table 9.5: Construction Impacts Summary of Effects**

| Heritage Asset | Potential Impact Summary | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|---|
| Anglican Cathedral setting | None | Neutral | None | Neutral |
| Albert Dock setting | None | Neutral | None | Neutral |
| Royal Liver Building setting | Temporary negative impact on setting due to construction work and plant | Neutral | Siting of compounds to minimise visual impact | Neutral |
| Metropolitan Cathedral setting | None | Neutral | None | Neutral |
| Cunard Building setting | None | Neutral | None | Neutral |
| Port of Liverpool building setting | None | Neutral | None | Neutral |
| Stanley Dock Tobacco | None | Neutral | None | Neutral |

| | | | | |
|---|---|---|---|---|
| warehouse setting | | | | |
| Victoria Clock Tower setting | None | Neutral | None | Neutral |
| Princes Half Tide Dock setting | Temporary negative impact on setting due to construction work and plant | Intermediate-slight adverse | Siting of compounds to minimise visual impact | Minor adverse |
| Waterloo Corn Warehouse/East Waterloo Dock setting | Temporary negative impact on setting due to construction work and plant | Intermediate-slight adverse | Siting of compounds to minimise visual impact | Minor adverse |
| WHS Character Area 1 Pier Head setting/part Castle Street conservation area setting | None | Neutral | None | Neutral |
| WHS Character Area 2 Albert Dock setting/Albert Dock conservation area setting | None | Neutral | None | Neutral |
| WHS Character Area 3 Stanley Dock setting/Stanley Dock conservation | None | Neutral | None | Neutral |

| | | | | |
|---|---|---|---|---|
| area setting | | | | |
| Undesignated heritage asset of West Waterloo dock retaining walls and river lock | Temporary negative impact | Intermediate/Minor | Protection of dock retaining walls and river lock walls during construction | Neutral |

### Table 9.6: Operation Impacts Summary of Effects

| Heritage Asset | Potential Impact Summary | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|---|
| Anglican Cathedral setting | None | Neutral | None | Neutral |
| Albert Dock setting | None | Neutral | None | Neutral |
| Royal Liver Building setting | Change to setting from a single viewpoint from north of the development site | Intermediate-slight adverse | None proposed-development of a smaller scale would have a similar impact. | Minor adverse |
| Metropolitan Cathedral setting | None | Neutral | None | Neutral |
| Cunard Building setting | None | Neutral | None | Neutral |
| Port of Liverpool building setting | None | Neutral | None | Neutral |

| | | | | |
|---|---|---|---|---|
| Stanley Dock Tobacco warehouse setting | Slight impact on setting in a single view from the south west | Moderate adverse | None | Minor adverse |
| Victoria Clock Tower setting | None | Neutral | None | Neutral |
| Princes Half Tide Dock setting | Impact on setting from the north | Intermediate-slight adverse | Dockside walkway to link with southern section in Princes Half Tide dock to allow for interpretation and experience the dock | Minor adverse |
| Waterloo Corn Warehouse/East Waterloo Dock setting | Impact on setting from the north | Intermediate-slight adverse | Design amended to provide 4 orthogonal blocks in pairs, with a central gap allowing glimpsed views through. Palette of materials to reflect tone and texture, and warehouse typology. Height reduced from earlier iterations | Minor adverse |

| | | | | |
|---|---|---|---|---|
| WHS Character Area 1 Pier Head setting/part Castle Street conservation area setting | Impact on setting from single viewpoint to the north of the development site | Neutral | None | Minor adverse |
| WHS Character Area 2 Albert Dock setting/Albert Dock conservation area setting | None | Neutral | None | Neutral |
| WHS Character Area 3 Stanley Dock setting/Stanley Dock conservation area setting | Slight impact on setting from the south | Intermediate-slight adverse due to impact on setting of Tobacco Warehouse in limited views. | Blocks re-orientated to preserve more of the setting. | Negligible |
| Undesignated heritage asset of West Waterloo dock retaining walls and river lock | Dock retaining walls retained in-situ behind newly constructed wall for walkway | Intermediate/Minor | Engineered to ensure the walls remain in-situ.<br><br>Heritage interpretation as part of new dockside walkway | Negligible |

### Table 9.8: Summary of Effects

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Construction | | | |
| WHS and WHS Buffer Zone | Temporary, minor adverse | CEMP | Temporary, minor adverse |
| Stanley Dock WHS Character Area | Negligible | None required | Negligible |
| Stanley Dock conservation Area | Negligible | None required | Negligible |
| Pier Head WHS Character Area | Negligible | None required | Negligible |
| Archaeological deposits | Permanent, minor adverse | Testing of ground conditions/survey | Temporary, minor adverse |
| Operational | | | |
| WHS and WHS Buffer Zone | Permanent, minor adverse | Design has been amended | Permanent, minor adverse |
| Stanley Dock WHS Character Area | Permanent, minor adverse | Design has been amended | Permanent, negligible |
| Stanley Dock conservation Area | Permanent, minor adverse | Design has been amended | Permanent, negligible |
| Pier Head WHS Character Area | Permanent, minor adverse | Design has been amended | Permanent, minor adverse |
| Archaeological deposits | Permanent, minor adverse | Testing of ground conditions/survey, amending piling strategy | Permanent, negligible |

# 10 Ground Conditions and Contamination

## 10.1 Introduction

This Chapter assesses the likely significant effects of the proposed scheme with respect to ground conditions and contamination.

This Chapter also describes: the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.

Adverse environmental effects associated with ground contamination principally concern:

- pollution of groundwater
- pollution of surface waters
- human health and safety on and off site
- ground conditions aggressive to construction materials
- plant growth restriction

This chapter is supported by the following appendices:

- Appendix 10A: Phase 1 and 2 Ground Contamination Report

## 10.2 Methodology, Scope and Significance Criteria

### 10.2.1 Legislative and Policy Context

This chapter describes the policies which are relevant to ground conditions with which the proposed scheme must comply.

#### 10.2.1.1 National Planning Policy

National planning policy is set out in the National Planning Policy Framework (NPPF).

The underlying principle of the NPPF is a presumption in favour of sustainable development. It requires both that geology and ground conditions are considered as a resource and that the effects that they may have, including as a result of contamination, are taken into account in the planning process.

Paragraph 109 of the NPPF identifies that:

… ”protecting and enhancing… geological conservation interests and soils

….remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.”

Paragraph 121 provides further detail requiring the site to be suitable for its new use, taking into account the effects of ground conditions, land instability and pollution, and the potential effect of any mitigation or remediation measures on the environment. It requires that, as a minimum, the land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990 after any remediation has been completed.

Part 2A comprises the primary UK legislation specifically relating to land contamination. Section 78A29 states that : "contaminated land" is any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land that:

- significant harm is being caused or there is a significant possibility of such harm being caused; or
- significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.

This definition is intended as an upper bound level of contamination, where intervention is legally required. The NPPF, however, places emphasis on the requirement for the developer to appropriately demonstrate and ensure that a site is safe for its new use in relation to contamination and ground stability issues.

The National Planning Practice Guidance (NPPG) has been produced by the Government to support the NPPF. The guidance refers to hazardous substances, land remediation and brownfield land. It highlights that a core principle of the NPPF is to:

"…encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value".

The guidance section on land affected by contamination outlines the approach that should be taken within the planning regime and states that if contamination could be an issue:

"…developers should provide proportionate but sufficient site investigation information (a risk assessment) to determine the existence or otherwise of contamination, its nature and extent, the risks it may pose and to whom/what (the 'receptors') so that these risks can be assessed and satisfactorily reduced to an acceptable level".

It also states that the risk assessment should:

"…identify the potential sources, pathways and receptors ('pollutant linkages') and evaluate the risks. This information will enable the local planning authority to determine whether further, more detailed investigation is required, or whether any proposed remediation is satisfactory".

For the land to be determined as 'contaminated' in a regulatory sense, and thereby require remediation (or a change to a less sensitive use), all three elements (source-pathway-receptor) of a significant pollutant linkage must be present.

### 10.2.2 Data Sources

In respect of the proposed scheme, the following sources have been reviewed:

- Publicly available data from the British Geological Survey (BGS) and Environment Agency
- Groundsure Geo-nsight Report, Groundsure Enviroinsight Report, and Historical Mapping

- Explosive Ordnance (EO) Threat Assessment (EOTA): prepared by PLANIT UXB LTD: Doc Ref: 0123 EOTA Liverpool Waters 13/01/17
- Liverpool City Council Environmental Protection Unit contaminated land search information

### 10.2.3 Assessment Methodology

The role of the planning process is to ensure that land is made suitable for its proposed future use, both in relation to land contamination and geotechnical hazards, and to protect important geological sites. The National Planning Policy Framework (NPPF) aims to encourage sustainable development and the reuse of brownfield land. The national legislative framework for contaminated land set out in Part 2A of the Environmental Protection Act 1990 (EPA) is risk based, where remedial action is only required if there are unacceptable risks to health or the environment, taking into account the use of the land and its environmental setting.

The assessment of existing contamination is risk-based and is in accordance with government guidance and the UK framework for the assessments of risk arising from contaminated land. The assessment takes into account principles adopted by the Environment Agency in Model Procedures for the Management of Land Contamination, Technical Report CLR 11. The significance of impacts takes into account the principles of assessment identified in CIRIA Report C552, "Contaminated Land Risk Assessment – a guide to good practice.

The assessment of contaminated land is a tiered approach, whereby information relating to the site is gathered and used to define a conceptual site model (CSM) for the site. From this an assessment of risk is made in terms of the proposed use and should risks be identified further information is gathered through investigation and assessment to determine the extent of the risk and whether mitigation measures may be required. The assessment also considers potential geotechnical hazards and the presence of geologically important protected sites.

### 10.2.4 Significance Criteria

Where Potential Pollution Linkages (PPL`s) have been identified by the CSM, the likely significant effects associated with the proposed scheme during construction have been assessed using the significance assessment criteria detailed below.

The assessment of effects uses an incremental scale of significance ranging from a major adverse effect to a major beneficial effect. These criteria consider water resources and the human, ecological and property receptors listed in Tables 10.1 and 10.2 of the Statutory Guidance. The significance of effects is assessed based upon the known or potential ground conditions revealed by the baseline investigation and the proposed extent and anticipated method of ground works disturbance and construction. These criteria have been derived by taking account of the guidance provided in the Construction Industry Research Information Association (CIRIA) report C522.32 This describes the magnitude of potential consequences (severity) of risk occurring.

This assessment examines the contamination-related effects upon water resources but does not assess the physical effects on water resources (hydrology and hydrogeology).

**Table 10.1: Significance Scale of Ground Conditions Effects**

| Effect | Description |
|---|---|
| Major Adverse Effect | • Severe, temporary or irreversible, moderate detrimental effect to human health.<br>• Severe, temporary or irreversible, reduction in the quality of a potable groundwater or surface water resource of local, regional or national importance.<br>• Irreversible or severe temporary detrimental effect on animal or plant populations. Irreversible detrimental effect to nationally important geological feature.<br>• Irreversible detrimental effect to building structure resulting in collapse or demolition. |
| Moderate Adverse Effect | • Long-term minor or short-term moderate detrimental effect to human health.<br>• Slight or moderate, local-scale reduction in the quality of potable groundwater or surface water resources of local, regional or national importance, reversible with time.<br>• Reversible widespread reduction in the quality of groundwater or surface water resources used for commercial or industrial abstractions.<br>• Medium-term, reversible detrimental effect on animal or plant populations.<br>• Medium-term, reversible detrimental effect to nationally important geological feature.<br>• Detrimental effect to building structure requiring remedial engineering works. |
| Minor Adverse Effect | • Short-term minor detrimental effect to human health.<br>• Slight or moderate detrimental effect in the quality of groundwater or surface water resources that are used for, or have the potential to be used for, commercial or industrial abstractions.<br>• Short-term, reversible detrimental effect on animal or plant populations.<br>• Short-term, reversible detrimental effect to nationally important geological feature.<br>• Detrimental effect to building structures not requiring remedial engineering works. |
| Negligible Effect | • No appreciable impact on human, animal or plant health, potable groundwater or surface water resources or geological feature of importance. |

| | |
|---|---|
| Minor Beneficial Effect | • Minor reduction in risk to human, animal or plant health.<br>• Slight, local-scale improvement to the quality of potable groundwater or surface water resources.<br>• Moderate, local-scale improvement to groundwater or surface water resources that are used for, or have potential to be used for, industrial or commercial abstractions. |
| Moderate Beneficial Effect | • Moderate reduction in risk to human, animal or plant health.<br>• Moderate local-scale improvement to the quality of potable groundwater or surface water resources.<br>• Significant local-scale, or moderate wide-scale, improvement to the quality of groundwater or surface water resources used for commercial or industrial abstraction only |
| Major Beneficial Effect | • Major reduction in risk to human, animal or plant health.<br>• Significant local-scale/ moderate to significant regional scale improvement to the quality of potable groundwater or surface water resources. |

### 10.2.5 Baseline Methodology

The baseline conditions prevailing at the site have been established principally through desk study succeeded by intrusive investigation.

#### 10.2.5.1 Assessment Methodology for Construction Effects

A semi-quantitative assessment of the effects of the development arising from the ground conditions and contamination has been carried out within this section, based on the proposed scheme. The assessment has considered the extent and methods of foundation construction, the anticipated degree of disturbance of the ground, the final form of the development, and the relevant national and local policies for contaminated land assessment and management. Measures required to mitigate risks are identified and the residual risks assessed.

#### 10.2.5.2 Assessment Methodology for Operational Effects

A qualitative assessment of the effects of the operation of the development arising is described within this chapter. The assessment has considered the likely residual risks to workers, visitors and maintenance personnel which may exist during the operational phase. Measures required to mitigate risks are identified and the residual risks assessed.

## 10.3 Consultation

Guidance on the scope of the ES was provided by ARUP Planning Consultants in their advice on the structure of the ES provided by email on 11th October 2019.

# 10.4 Limitations and Assumptions

This assessment is based on a site-specific desk study and an intrusive investigation undertaken by CC Geotechnical Ltd (see Appendix 10A). The limitations inherent in ground investigation are stated in the referenced report. Notwithstanding these limitations, it is considered that the assessment based on the desk study and intrusive investigation, is sufficiently robust for the purposes of this ES.

# 10.5 Baseline Conditions

## 10.5.1 Desk Study Information

### 10.5.1.1 Site History

The Site is located within the now defunct West Waterloo Dock to the north of Liverpool's iconic Pier Head and is located within the Liverpool Maritime Mercantile City World Heritage Site Buffer Zone and is adjacent to a World Heritage Site Character Area.

Waterloo Dock was laid down in the 1840`s. By the 1890`s the dock was subdivided into East and West Waterloo docks.

A series of transit sheds stood on the east and west sides of the dock. Swing bridge access to Victoria Dock to the north was put in place from the 1840`s.

By 1953, changes to the dock configuration had taken place with the West Waterloo Dock now opened up to be contiguous with the Victoria Dock, the swing bridge having been removed. Around the same time, Waterloo Lock was constructed within the west side of Waterloo Dock. The lock required the construction within the dock of a new quay roughly parallel to the riverside quay to create the lock channel, in which 3 sets of lock gates were installed

By 1974, the Kingsway Road Tunnels had been constructed immediately to the north of the site

Around 1970, the Victoria Dock was enclosed by the construction of a sheet pile wall on an alignment just east of the river wall allowing the original dock to be infilled and forming a section of the proposed canal link which opened in 2009. Residential development of the East Waterloo Dock quaysides had taken place by this time.

### 10.5.1.2 Published Geology

The British Geological Survey (BGS) indicates that the bedrock geology comprises the Sherwood Sandstone Group – Chester Pebble Beds Formation. Superficial deposits are indicated to be Tidal Flat Deposits, associated with the tidal zone of the River Mersey. Given the known development of the site, with dock basins understood to have been excavated into the sandstone, natural superficial deposits are understood to be absent from the site.

#### 10.5.1.3 Hydrology and Hydrogeology

The Leeds - Liverpool Canal Link is contiguous with the expanse of water in the West Waterloo Dock, delineated by a series of floating buoys. The proposed site development will form the western bank of the canal alignment.

The Environment Agency has classified the superficial deposits in the area as ‘unproductive’. This means they are low permeability and have negligible significance to water supply or base flow. As discussed above, from the archive information obtained, it is thought unlikely that natural superficial deposits remain on site and that sandstone is overlain directly by made ground (which includes silt deposits laid down during dock operations – dock silt). It is likely that the made ground has the potential to hold groundwater at a local scale, which is likely to be influenced by the water level of the dock.

The Environment Agency has designated the bedrock geology as a Principal Aquifer, defined as ‘layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale’.

No groundwater or surface water abstraction licences have been identified on the site, the nearest active licensed abstraction being 639m SE of the site.

The site is not within a groundwater source protection zone.

#### 10.5.1.4 Landfills and Waste

Whilst there are no formally documented historic landfills or waste treatment sites within the site boundary, it is evident that the West Waterloo Dock has been partially infilled, leaving about 3m of freeboard. Three formerly licensed landfills have been identified within 1km of the site. These are between 350m and 700m to the north and northwest. In addition, a number of waste treatment sites (generally associated with vehicle dismantling) are recorded at distances of between 300m and 950m to the north of the study site.

#### 10.5.1.5 Radon

The site is not within an area where radon protection measures are necessary, according to the map information published online by Public Health England on the UK Radon website.

#### 10.5.1.6 Mining

The site does not lie within a Coal Mining Report Area indicating that the site is not at risk from historical coal mining activity.

#### 10.5.1.7 Unexploded Ordnance (UXO)

CIRIA Report C681 “Unexploded ordnance – a guide for the construction industry” sets out a framework for the management of risks posed by UXO to the construction industry. The framework for the risk management process is divided into four distinct stages: preliminary risk assessment; detailed risk assessment; risk mitigation; and implementation. This is intended to ensure that the potential risk from UXO is addressed in an efficient and cost-effective way

A UXO Risk Assessment procured from PLANIT UXB LTD: Doc Ref: 0123 EOTA Liverpool Waters 13/01/17, concluded that `considering the findings of the assessment, a UXO Threat Mitigation Strategy was not required to be in place prior to intrusive engineering works at this site.

#### 10.5.1.8 Previous Ground Investigation Information

Searches and consultations did not establish any evidence of previous site investigations having been undertaken at the subject site, or at a location which may be regarded as indicative of conditions likely to prevail on the site

#### 10.5.1.9 Preliminary Conceptual Site Model

Appendix 10A presented a preliminary conceptual site model based on the information that had been collated during the desk-based review of the Site.

A conceptual site model describes the scenario in which the risks to human health and the environment posed by contaminated land are assessed. It describes the ground and surface conditions, and the activities performed on site in terms of the proposed ground works and the final form of the development. In particular the model identifies and describes the sources of the potential contamination, the behaviour of the contamination in the environmental media such as soil and groundwater, surface water and air. It also identifies and characterises potential human health and environmental receptors, and plausible pathways.

The potential risks to human health and the environment were considered in the context of a conceptual source-pathway-receptor (SPR) model of the site, identifying:

- The principal pollutant hazards associated with the site (the sources)
- The principal receptors at risk from the identified hazard
- The existence, or absence, of plausible pathways which may exist between the identified hazards and receptor

For risks to be present at the site, all three elements (source-pathway-receptor) of a plausible pollutant linkage must be present. Potential SPR linkages are described below based on the proposed site end-use.

### 10.5.2 Potential Sources

A number of potential sources of contamination associated with historical land uses were considered to be potentially present within the site. Potential contaminants were identified, where possible, from the Department of Environment 'Industry Profiles' publications. These potential sources are summarised Table 10.2 below.

### 10.5.3 Receptors

The following potential receptors were identified at the site:

- Construction workers (during site construction/redevelopment)
- Users of neighbouring sites (during site construction / redevelopment);
- Future building resident/ building user;

- Future maintenance worker;
- Perched groundwater within made ground
- Bedrock groundwater (Principal Aquifer);
- Surface Water (Canal Link)
- River Mersey
- Vegetation in soft landscaping areas
- Structural concrete
- Services and utilities

**Table 10.2: Potential Sources of Contamination**

| Potential Source | Potentially Contaminative Materials | Comments |
|---|---|---|
| Made ground associated with dock / lock construction and dock partial infill and Waterloo Lock infill | Asbestos, Heavy metals, metalloids<br>Hydrocarbons (including petroleum hydrocarbons, phenols, Polyaromatic hydrocarbons (PAHs))<br>Inorganics (e.g. sulphate, sulphide, chloride, cyanide) | Fill used in reclamation work in mid-1970`s thought to be dredged sand and general construction waste.<br><br>Potential for generation of ground gas will depend on the organic content of the material |
| Historical dock activities including cargo storage, handling plant and equipment | Asbestos, Heavy metals, metalloids<br>Hydrocarbons (including petroleum hydrocarbons, phenols, Polyaromatic hydrocarbons (PAHs))<br>Inorganics (e.g. sulphate, sulphide, chloride, cyanide) | The contaminants will largely depend on the nature of cargo stored and the ancillary activities that were undertaken. |

### 10.5.4 Potential Pathways

Potential pathways that may be present during redevelopment and operation were considered to include:

- Human health – Ingestion of soils or dust;
- Human health – Inhalation of dust, vapour or soil gas;
- Human health – Dermal contact with soils or groundwater;
- Controlled waters – Migration of mobile or leachable contamination;
- Controlled waters (and human health by vapours) – Transport of non-
- aqueous phase contaminants (such as petroleum hydrocarbons and
- solvents);
- Ground gas – Ingress of ground gas into buildings;
- Vegetation – Uptake via root system;
- Building structures and utilities – Direct contact with aggressive
- ground conditions.

### 10.5.5 Preliminary Assessment of Potential Pollutant Linkages

#### Human Health

During any excavations and earthworks required as part of the development, dermal contact / inhalation / ingestion pathways will be present to construction workers and site neighbours.

Post development, ingestion / inhalation / dermal contact will only be present in areas of soft landscaping.

Gas and vapour pathways may be relevant in terms of the proposed building and protective measures may need to be incorporated into the building design.

### 10.5.6 Controlled Waters

The potential for pathways exists between possible contaminants in the made ground and the sandstone Principal Aquifer (via vertical and lateral migration of leachate).

Shallow groundwater is considered to be in hydraulic continuity with surface water within the Canal Link and subsequently the River Mersey.

### 10.5.7 Ecological Receptors and Vegetation

Existing soils in any areas of soft landscaping may present a risk to vegetation via uptake through root systems.

Buried structures such as water supply pipes, foundations (including piled foundations) and ground-floor slabs may come into direct contact with chemically aggressive ground which may reduce the integrity and design life of these structures.

**Table 10.3: Preliminary Conceptual Model**

| Source | Pathway | Receptor | Comment |
|---|---|---|---|
| **Construction** | | | |
| Made Ground Asbestos, heavy metals and metalloids, hydrocarbons, polyaromatics, sulphates, sulphide, chloride, cyanide | Ingestion of soil and soil dust | Construction Worker | Mitigated using appropriate PPE and site briefings on risks associated with the contaminants of concern |
| | Dermal contact with soil and soil dust | Construction Worker | |
| | Inhalation of soil vapours | Construction Worker | |
| | Inhalation of soil dust | Construction Worker | Mitigated using appropriate PPE, site briefings and dust suppression |
| | | User of neighbouring site | Mitigated using dust control |

| | | | |
|---|---|---|---|
| | | | measures and monitoring |
| Dock water / Lock water (Containing contaminants above) | Ingestion / dermal contact | Construction Worker | Mitigated using appropriate PPE and site briefings. Discharges to river under discharge consent setting chemical and solids limits |
| | Vertical migration Pumping to River Mersey | Bedrock aquifer Estuary waters | |
| Ground Gas from Made Ground<br><br>(Carbon dioxide, methane, carbon monoxide, hydrogen sulphide, VOC including light alkanes) | Accumulation and inhalation of hazardous gases at asphyxiating/ toxic concentrations | Construction Worker (working in confined space) | Mitigated using gas monitoring alarms and following confined space working procedures (if necessary) |
| | Accumulation and ignition of hazardous gases at explosive concentrations | Construction Worker | Mitigated using monitoring alarms (if necessary) |
| **Operation** | | | |
| Soft landscaping (potentially site Made Ground) | Ingestion of soil and soil dust | Future building resident/ user/ maintenance worker | Maintenance worker most likely to become exposed to soils in soft landscaping. |
| Asbestos, heavy metals and metalloids, hydrocarbons, polyaromatics, sulphates, sulphide, chloride, cyanide | Dermal contact with soil and soil dust | Future building resident/ user/ maintenance worker | |
| | Inhalation of soil dust | Future building resident/ user/ maintenance worker | |
| | Uptake via root system | Vegetation | |
| Made Ground (Heavy metals and metalloids, hydrocarbons, polyaromatics, sulphates, sulphide, chloride, cyanide | Inhalation of soil vapours | Future building resident/ user/ maintenance worker | |
| | Leaching and vertical migration | Groundwater | |
| | Direct contact | Buried concrete and services | |
| Shallow groundwater (Containing dissolved contaminants listed above) | Lateral flow of shallow groundwater | Waterloo Dock, Canal Link, Trafalgar Dock | |
| | | River Mersey | |
| | Vertical flow of shallow groundwater | Sherwood Sandstone (Principal aquifer) | |
| | Preferential vertical flow along building piles | | |
| | Direct contact | Building foundations | Shallow groundwater may be chemically aggressive |

| | | | |
|---|---|---|---|
| Ground Gas from Made Ground (Carbon dioxide, methane, carbon monoxide, hydrogen sulphide, VOC including light alkanes) | Accumulation and inhalation of hazardous gases at asphyxiating/ toxic concentrations | Future building resident/ user/ maintenance worker | |
| | Accumulation and ignition of hazardous gases at explosive concentrations | Future building resident/ user/ maintenance worker | |
| | | Building fabric | |

## 10.6 Environmental Impacts and Significance of Effects

At the time of producing this chapter, an intrusive investigation had been undertaken by CCG and can be found in Appendix 10A

The report confirmed the succession underlying the site to be generally consistent with the documented geology insofar as no natural drift deposits were encountered in any borehole and made ground deposits were seen to extend from a depths of 2-3m below dock water level to bedrock at the dock base level, consistent with the site being a partially infilled dock. The infill deposits comprise of gravel and cobbles of brick, concrete, granite, limestone, shell, ceramics, sand, occasional wood, and shell. extending to around 3mbgl, before continuing to bedrock as silty gravelly sand – probably dredged material based on its visual consistency across the site. The bedrock was encountered as a slightly weathered reddish brown occasionally grey thickly laminated fine to medium grained rock.

The infill in the Waterloo Lock contains much heavier inclusions of boulders of concrete, aggregated brick, steel sections etc. These deposits are filled against the 3 intact lock gates still present within the infilled lock channel.

Dock water levels remained static. No tidal effects were recorded.

A semi-quantitative assessment of the effects of the development arising from the ground conditions during construction and subsequent operation, based upon the findings of this investigation is described within this section.

### 10.6.1 Construction Phase

#### 10.6.1.1 Human Health

A number of potential pollutant linkages were identified in the Preliminary Conceptual Site Model which relate to construction workers (dermal contact/ingestion/ dust inhalation) and neighbours (dust inhalation arising further infilling of dock and excavation in the infilled Waterloo Lock). These linkages are most relevant during phases of fill deposition, excavation or other ground disturbance.

The soil contamination testing obtained in the investigation did not identify concentrations of heavy metals, metalloids, hydrocarbons, polyaromatics, sulphates, sulphide, chloride, cyanides above Generic Assessment Criteria for Residential without Plant Uptake land use. However, it is acknowledged that further works may be necessary to increase the reliability of these preliminary conclusions.

Asbestos was not detected in any of the samples analysed as part of the site assessment. However, the heterogeneous nature of infill to the Waterloo Lock indicates that a precautionary approach to ground disturbance should be adopted

It is considered that the concentrations of contaminants that have been identified to date, do not indicate a significant constraint on the proposed residential end use and that it will be possible to address undetected risks presented by adoption of routine PPE and dust control measures. Contingency measures will be required to deal with the potential for encountering unidentified contamination during construction, particularly in the infilled lock.

It is recommended that specific precautions are taken during any future excavations within the infilled Waterloo Lock to reduce potential exposure to potentially contaminated soils in accordance with the principle of 'as low as reasonably practical' (ALARP). This would include appropriate briefings, dust suppression and protective equipment (PPE). Contractors should develop appropriate site practice based on guidance contained in CIRIA Report C733 – Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks.

Assuming that appropriate mitigation procedures are implemented during construction it is assessed that the risk of harm to construction workers and neighbours can be reduced to negligible levels.

During the construction phase, existing soil and groundwater contamination at the Site is considered to present a Minor Adverse potential risk to human health. Please note this conclusion has been assessed without consideration of control measures or other forms of mitigation. The risks to human health following the adoption of appropriate mitigation and control measures are addressed below in section 10.7

#### 10.6.1.2 Controlled Waters

The conceptual site model identified a possible pollutant linkage between any contamination within the water standing in the partially infilled dock, and the underlying Sherwood Sandstone Principal Aquifer (by vertical migration). A further potential pollution linkage may exist between the discrete body of water entrapped within the Waterloo Lock and the Sherwood Sandstone. The River Mersey may also be a receptor of water pumped out of the dock to draw water levels down such that earthworks filling to finished design levels may proceed in the dry conditions.

Broad spectrum analysis results obtained on samples of dock water and the River Mersey showed no significant difference in chemistry with all determinands below Annual Mean Classification of Coastal Waters (AMCCW) – also known as EQS Saltwater values, indicating that discharge of water from the dock to the river will not be chemically harmful. Control of suspended solids will be required for such discharges.

Some transgressions of the EQS values were recorded in analyses of water from within the Waterloo Lock, principally a number of exceedances of criteria for PAH species. It will not be practicable to remediate this water without excavating the infilled lock since it is leaching from the fill that has given rise to the water quality. This excavation is an unrealistic proposition. The proposed scheme will not require the opening of any of the gates and hence this body of water will remain laterally contained. At the base of the lock is a 2.5m thick concrete slab and it is anticipated that rotary bored piles will be installed through this base into the underlying sandstone bedrock. The nature of the infill through which these piles will be constructed will probably require that they be temporarily cased to the concrete base, the casing being withdrawn as the pile is concreted. This method of construction will effectively preclude the creation of a pathway via which the entrapped water may enter the sandstone. However, piling contractors must be required to confirm their proposals for prevention of migration of this water.

Given that made ground at the site is known to directly overlie the sandstone bedrock Principal Aquifer, none of the anticipated construction activities (borings for piled foundations etc.) will introduce new migration pathways for groundwater migration.

Given the context setting of the site, the risk from groundwater contamination at the Site during the construction phase arising from minor transgressions of the Drinking Water Standards and EQS Standards is considered to present a Minor Adverse potential risk to controlled waters. The risks to controlled waters following the adoption of appropriate mitigation and control measures are addressed below.

### 10.6.2 Operation Phase

#### 10.6.2.1 Human Health

The proposed scheme does not include private soft landscaped gardens and except for limited areas of soft landscaping, the proposed scheme will result in the provision of hardcover (ground floor slabs, external paving etc) across the majority of the development. Except for the proposed landscape areas, soil/dust ingestion, dust inhalation and dermal pathways will be broken by the development works resulting in there being no residual risks to human health. Existing monitoring wells within the infill in Waterloo Lock outside of the site boundary were monitored for ground gases. Installation details of these wells were not available but are assumed to have response zones within the infill. The monitored levels in one of these installations within the Waterloo Lock (at about 15m south of the southern boundary of the site) exhibited high gassing levels, with methane levels >75% and elevated $CO_2$, levels that warrant remedial/protective actions. The gassing regime may be significantly disturbed by the construction works on the adjacent Isle of Man Ferry terminal. The liberation of the high methane concentrations generated in Waterloo Lock infill south of the site may be substantially hampered and the migratory regime altered. Furthermore, biodegradation of plant and aquatic life in the infilled dock may give rise to gassing. In this circumstance, it is strongly recommended that as a minimum all buildings be protected by installation of proprietary gas proof membranes (i.e Visqueen low permeability Gas Barrier or similar) within the ground floor slabs, and that subfloor venting be incorporated.

In soft landscaping areas, the provision of a 300mm layer of clean cover soil will be sufficient to address residual human health risks.

A potential pollutant linkage exists between contaminants in the soil and maintenance workers who may need to dig through the soil, for example to repair utilities or general landscaping maintenance. As maintenance workers are likely to have a much lower frequency and duration of exposure to contaminated soils than residents, and maintenance workers are likely to be excavating for services which are typically laid in clean backfill, this risk is assessed as being Minor Adverse.

#### 10.6.2.2 Controlled Waters

The proposed scheme will result in the majority of the site being covered with new buildings and hardstanding, which will reduce infiltration into the made ground. During the operation phase therefore, the proposed scheme is considered to have a Negligible to Minor Beneficial Effect on the risk to controlled waters.

#### 10.6.2.3 Ecological / Phytoxicity

The ground investigation did not identify elevated levels of phytotoxic elements within the made ground at the site. During the operation phase, existing soil contamination at the Site is considered to present a Negligible Adverse phytotoxic risk.

#### 10.6.2.4 Buried Structures and Services

Buried concrete structures in contact with made ground may be subject to degradation, particularly from elevated concentrations of sulphates in the soil or groundwater. Relatively elevated concentrations of water-soluble sulphates were recorded in the soil analyses carried out as part of the ground investigation. On the basis of the foregoing assessments, concrete in the ground should be specified to conform to the compositional requirements of Design Chemical Class DC-3, as defined in BRE Special Digest 1: 2005. For a design life of 100 years a Design Chemical Class of DC-3 + one Additional Protective Measure (APM – Table D4 of the digest) should be adopted.

A potential linkage exists between certain (mainly hydrocarbon) contaminants in the made ground and potable water supply pipes, in that contaminants may permeate pipe materials, or the pipe materials may be degraded as a result of contaminants within the made ground. This may taint water supplies as well as shortening the lifespan of the supply pipes themselves. The findings of the ground investigation indicate that the soil concentrations of hydrocarbons are below the threshold concentrations permitted under the UKWIR and UUW guidance for normal PE water mains. However, given the history of use of the site, new water mains are recommended to be specified as barrier pipe (Protecaline or similar).

## 10.7 Mitigation Measures

### 10.7.1 Construction Impacts

There are potential risks posed to construction workers and site neighbours during construction as a result of exposure to site soils and inhalation of soil-derived dust and fibres.

Specific precautions can be taken to reduce potential exposure in accordance with the principle of 'as low as reasonably practical' (ALARP). This should include appropriate safety briefings, protective equipment (PPE) and dust suppression. In addition, any areas of contamination identified during construction should be removed and/or treated. Suitable guidance on control measures is contained in CIRIA Report C733 – Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks. The implementation of these measures will mitigate the risks to Negligible.

Although piled foundations are required for the proposed scheme, the absence of an aquitard overlying the sandstone aquifer (for example a low permeability clay layer) has demonstrated that the made ground forming the dock infill is in continuity with the sandstone. As such, the proposed scheme is not considered to increase the risk of mobile contaminants impacting the underlying sandstone aquifer. Piled foundations in the West Waterloo Lock will penetrate the concrete base of the lock potentially creating a temporary pathway for vertical migration of the contaminated body of water entrapped within the lock and piling contractors must propose methods of mitigating this risk. Following installation of piles, this risk will be restored to its present level.

### 10.7.2 Operational Impacts

Given the provision of hardstanding and floor slabs, for most of the site there will be no viable pathway between contaminants in made ground and users/occupiers of the operational Site.

A potential pollutant linkage has however been identified between the existing made ground on site and future site residents in landscaping areas via inhalation of dust and fibres, and it is recommended that all soft landscaping areas be capped with an appropriate thickness of clean soil cover – recommended as 300mm - in order to provide an effective barrier to prevent frequent contact between residents and the existing soil. Provided this mitigation measure is adopted, the risk to future site users from existing contaminated soils can be reduced to Negligible.

The risks to maintenance workers from any contaminated soils remaining following construction can be reduced to Negligible by implementing specific precautions to reduce potential exposure in accordance with the principle of 'as low as reasonably practical' (ALARP). This should include appropriate briefings, protective equipment (PPE) and hygiene facilities.

A potential pollutant linkage has been identified between soils with high water-soluble sulphate content and buried concrete structures within the ground. The specification of concrete as advised in the CCG Report will reduce the risk to buried concrete structures to Negligible.

# 10.8 Residual Effects

## 10.8.1 Construction

Provided that the recommended mitigation measures are adopted, the residual risks to the following are assessed to be Negligible:

- Construction workers and site neighbours as a result of exposure to site soils and inhalation of soil-derived dust and fibres

- The sandstone bedrock Principal Aquifer and the River Mersey as potential receptors of contaminated water entrapped within the Waterloo Lock

## 10.8.2 Operation

Provided that the recommended mitigation measures are adopted, the residual risks to the following are assessed to be Negligible:

- Future site residents via exposure to soils in landscaping areas via dust inhalation;

- Maintenance workers via exposure to any residual contaminated soils;

- Buried structures and services

# 10.9 Cumulative Impacts

No significant cumulative effects with other developments have been identified with respect to ground and groundwater conditions for the construction or operation of the proposed scheme.

As already mentioned, the gassing regime may be significantly disturbed by the construction works on the adjacent Isle of Man Ferry terminal. The liberation of the high methane concentrations generated in Waterloo Lock infill south of the site may be substantially hampered and the migratory regime altered. Furthermore, biodegradation of plant and aquatic life in the infilled dock may give rise to gassing. In this circumstance, it is strongly recommended that as a minimum all buildings be protected by installation of proprietary gas proof membranes (i.e Visqueen low permeability Gas Barrier or similar) within the ground floor slabs, and that subfloor venting be incorporated.

# 10.10 Assessment Summary and Conclusion

Table 10.4 below summarises the findings of the preceding assessment.

## Table 10.4: Assessment Summary

| Potential Impact | Environmental significant effect without mitigation | Environmental significant effect without mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Construction Phase risk to Human Health (all sources and pathways) | Minor Adverse | Construction workers – adoption of health and safety precautions, PPE etc Neighbours of the site – safeguarded by control measures such as dust suppression | Negligible |
| Construction Phase risk to Controlled Waters (all sources and pathways) | Negligible | Undertake further water quality monitoring in Waterloo Lock and West Waterloo Dock<br><br>Ensure leachability criteria conforming to EQS saltwater criteria are imposed on imported fill to be deposited in the West Waterloo Dock<br><br>Minimise discharges of water entrapped within Waterloo Lock<br><br>Monitor quality (chemistry and sediment load) of discharges from Waterloo Dock to River Mersey | Negligible |
| Operation Phase risk to occupants/users of the Site from soil contamination in landscaped areas | Minor Adverse | Provision of clean cover soils on cultivated landscaped areas | Negligible |
| Operation Phase risk to maintenance staff from soil contamination | Minor Adverse | Adoption of health and safety precautions, PPE etc | Negligible |
| Operation Phase risk to human health from hazardous ground gas | Negligible | Based on completed programme of standpipe monitoring | Negligible |
| Operation Phase risk to Controlled Waters (all sources and pathways) | Minor Beneficial | None | Minor Beneficial |
| Operation Phase risk to plants in landscaped areas (phytotoxicity) | Negligible | No significant phytotoxicity in existing made ground. Further improved by provision of clean cover soils on landscaped areas | Negligible |
| Operation Phase risk to buried structures and services | Potential Major Adverse effect | Adopt Design Chemical Class DC-3 + one Additional Protective Measure (APM) as defined in Table 4 of BRE Special Digest 1: 2005 | Negligible |
| Operation Phase risk to human health from asphyxiant and explosive ground gases | Potential major adverse | Install protective measures in building design to CS2 level in accordance with BS4987: 2015 | Negligible |

The most significant potential impacts of the proposed scheme are considered to arise during the construction phase when development work will expose the existing made ground forming the partially infilled dock and fill placement commences to raise the infill to finished ground levels. On the basis of information obtained from intrusive investigation, the existing dock infill does not contain significantly elevated concentrations of contaminants and it is considered that the enhanced risks identified during the construction phase can be adequately addressed by commonly used control measures. Particular vigilance will be required for excavations and piling in the infilled Waterloo Lock where the infill is much more heterogeneous and may contain contaminants not detected by the ground investigation survey. Appropriate methodologies must be developed for piling works in the Waterloo Lock to prevent the migration of water entrapped within the lock, to the bedrock underlying its base slab.

During the operational phase, most of the site will be covered by the floor slab of the building or by areas of adjacent hardstanding. As such, users/occupiers of the site will not be able to come into contact with any contaminants present in the made ground and risks to human health will therefore be negligible. Provision of clean cover in any limited areas of landscaping will address risks to human health associated with any contamination present in the un-paved areas of the site.

The provision of floor slabs and hardstanding will reduce infiltration from the surface into the made ground. This will reduce the potential for mobile or leachable contaminants to be leached from within the made ground underlying the Site and will therefore, slightly reduce the risk to Controlled Waters.

Buried concrete may be adversely affected by water soluble sulphates in the made ground, and provided that concrete is specified in accordance with the recommendations contained in Appendix 10A then the risk will be **negligible.**

Overall, contamination in made ground at the Site is considered to represent only Minor Adverse environmental effects which can be reduced to **negligible** residual effects by the adoption of appropriate routine control measures.

# 11 Dock Infill Methodology and Impact

## 11.1 Introduction

This chapter presents an assessment of potential impacts on Dock Infill Methodology and Impact associated with the proposals, described in Chapter 2: Scheme Description.

This Chapter outlines the findings of the Ground Investigation Report undertaken by CCGeotechnical Ltd (see Appendix 10A) and the initial methodology philosophy for the infill works of the dock and the piling operations for the proposed scheme (see Appendix 11A). The likely significant environmental effects associated with the infill works are set out, together with a summary of the proposed mitigation measures, where necessary.

There are a number of other proposed schemes in the vicinity of the site whose demolition and construction activities may overlap with that of the Development. Should this be the case, all necessary measures would be taken to ensure the close liaison and co-ordination between all parties involved as and when other schemes emerge.

This chapter is supported by the following appendices:

- Appendix 10A: Phase 1 and 2 Ground Contamination Report
- Appendix 11A: Dock Infill Methodology Report

## 11.2 Methodology, Scope and Significance Criteria

There is potential for significant impact on the existing body of water on the development.

The aim of water legislation and policy in England is to protect both public health and the environment by maintaining and improving the quality of natural waters. These include surface water bodies (e.g. rivers, streams, lakes, ponds) and groundwater.

The Department of the Environment, Food and Rural Affairs (Defra) is responsible for all aspects of water policy in England. Management and enforcement of water policy is the responsibility of the EA.

A summary of key relevant UK water legislation is provided below:

- Environmental Protection Act (1990): sets out a range of provisions for environmental protection, including integrated pollution control for dangerous substances;
- Water Resources Act (1991): consolidated previous water legislation with regard to both the quality and quantity of water resources;
- Water Industry Act (1991): consolidated previous legislation relating to water supply and the provision of sewerage services;

- Environment Act (1995): established a new body (the EA) with responsibility for environmental protection and enforcement of legislation. This Act introduced measures to enhance protection of the environment including further powers for the prevention of water pollution;
- Water Environment (Water Framework Directive) (England and Wales) Regulations (2014): requires the development and implementation of a new strategic framework for the management of the water environment and establishes a common approach to protecting and settling environmental objectives for groundwater and surface waters;
- BRE Pollution Control Guide Parts 1-5;
- British Standard 4142: 2014 – Methods for Rating and Assessing Industrial and Commercial Sound (N.B. this document should only be used in respect of the methodology for assessing background noise levels);
- British Standard 5228-1: 2009 + A1: 2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise & Part 2: Vibration;
- British Standard 6187: 2000 – Code of Practice for Demolition.

Consultation has been made with Merseyside Environmental Advisory Service (MEAS), Natural England and Canal and River Trust.

Environment Agency 2001 report – Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.

The methodology is a review of the desktop study and intrusive ground investigations to establish preliminary options for the construction of the new dock wall, the infilling of the dock and the piling methods considered for the foundations of the new blocks.

A new dock wall is to be constructed within West Waterloo Dock to form the separation between the development and the existing Leeds-Liverpool Canal.

This wall will follow a line that will encapsulate the existing Waterloo Lock and the quayside, running parallel with the opposite dock wall to create a channel for continued and uninterrupted vessel navigation along the Leeds – Liverpool Canal.

The line of the new wall is highlighted on the supporting plans and drawings submitted as part of this application.

It is expected that the new dock wall will be coordinated with the new dock wall proposed at the neighbouring development – The Isle of Man Ferry Terminal as set out within their planning application which has received consent (18F/3231). During detailed design, it will be imperative that both developments liaise with one another to ensure dock wall construction does not hinder each other's development.

At this stage, it is anticipated that the cut-off wall between the development and the dock will be constructed using a 'Combi-wall' piling solution or a similar type of arrangement.

This type of construction typically consists of tubular steel piles taken into the underlying sandstone bedrock in rock sockets at consistent centres along the length of the wall line with sheet piles installed between the tubular piles and taken down to the surface of the bedrock

The design of this type of arrangement considers the tubular piles acting as cantilever posts fixed into the sandstone bedrock, supporting the applied loading from the retained backfill to new site levels and the surcharges from, initially, the construction activities and then the car parking in the permanent condition. The sheet piles span between the tubular piles supporting the aforementioned backfill and surcharges which are then transferred into the tubular piles.

To ensure that the tubular piles are capable of supporting all relevant applied loads, the piles are likely to be secured into the bedrock by installing them with deep sockets which would then need to be grouted up.

It is likely, as CCGeotechnical Ltd's report (Appendix 10A) suggests, that the pile installation for the wall will use floating rigs loaded onto pontoons/ barges as opposed to undertaking these works from piling rigs running across the existing dock infill material and imported fill to raise it above existing water levels. This is for predominantly practicality reasons and are explored within CCGeotechnical Ltd's report (Appendix 10A).

### 11.2.1 Dock Infilling and Settlement Potential

On completion of the dock wall installation, land reclamation works behind the new dock wall line can commence. This is likely to involve the introduction of approximately 6m in depth of imported fill to raise levels (within the existing dock/ infilled lock) to proposed finished ground levels.

Initial proposed site levels can be found within the architectural plans submitted as part of the planning application.

Due to the known nature of the existing fill within the dock (worst case results are consistent with very loose made ground), filling the site with approximately 6m of imported material will impose loadings onto the existing fill which will settle/ depress under these conditions.

It is imperative that the imported fill is placed under controlled conditions – with attention drawn to the depth at which new layers of the imported fill are introduced and how each of these layers is compacted before the next layer can be introduced. A full a detailed method statement would be produced to demonstrate this and is expected to be conditioned as part of the application.

Details of these conditions, along with an outline material specification and suggested testing regime are included in the outline specification which is as follows:

### Table 11.1: Table of Controlled Conditions

| | |
|---|---|
| Acceptable materials | Virgin or recycled aggregates containing not more than 10% bituminous planings and excluding materials containing tar and tar-bitumen binders, chalk, unburnt colliery spoil |
| Grading limits | Conforming to Table 6/1 of DTp Specification for Highway Works – 6F2 material. Max particle size 125mm. Max passing 63um 12% |
| Acceptable moisture content | OMC +/- 3% as determined by BS1377: 1990: Part 4: Cl3.6 |
| Compacted layer thickness | 250mm |
| Compactive effort | In accordance with Table 6/4 of DTp Specification for Highway Works using vibratory roller of minimum mass per unit width of 2900kg and minimum 10 passes per layer |
| Acceptance testing | • Particle size analysis – 1 test for 200m$^3$<br>• Plate load tests at 2 per layer with max settlement of 2mm under 450mm dia plate loaded to 20kN/m$^2$<br>• Broad spectrum soil contamination analyses for compliance with LQM/CIEH criteria for Residential without Plant Uptake – 1 analysis per 250m$^3$ - see Table A in Appendix M for acceptance criteria<br>• Broad spectrum soil leachate analyses for compliance with EQS criteria for Estuarine Waters – 1 analysis per 250m$^3$ – see Table B in Appendix M for acceptance criteria |
| Monitoring | Installation of rod and plate settlement gauges at surface of insitu soil at say 6 locations prior to commencement of filling and monitoring settlement at monthly intervals |

The method of achieving the required density of the imported fill to be used as a platform may be achieved in a number of ways, including but not restricted to:

- Reducing the water level within the ‘dock’ which is now enclosed within this development to a level below the top of the existing fill to allow compaction of the upper levels of the existing fill.
- Raise the existing fill levels beyond the existing dock water level within the area now enclosed on the development with self-compacting rock fill typically graded to between 250mm down to 100mm.
- Introduction of hydraulically placed dredged sand to raise fill levels above the existing levels within the dock.

These options each have their own advantages and disadvantages – with each discussed briefly within CCGeotechnical Ltd’s report (Appendix 10A) and subject to further deliberation and investigation during the detailed design phase of the development.

It is estimated approximately 55,500m3 of imported fill will be required for this development.

Following review of the ground conditions encountered, a potential settlement of 200mm is estimated at the surface of the existing submerged fill across the development once the 6m of imported fill has been installed in accordance with the suggested specification.

The neighbouring development for the new Isle of Man Ferry Terminal also involves land reclamation as a result there will be an interface between the two developments.

During detailed design, it will be imperative that both developments liaise with one another to ensure the infill works do not hinder each other's development.

#### 11.2.1.1 Individual Block Foundations

The potential for high levels of settlement to the existing infill material within the dock make the use of conventional concrete foundations bearing onto the fill implausible.

Therefore, the individual buildings are likely to utilise piled foundation solutions and this section will discuss the suggested design concepts to overcome the known obstructions and ground conditions of the development.

Blocks A, B and C will be sited within the West Waterloo Dock. Based on overlays of current with proposed, a small percentage of Block C overlays with the quayside.

As Blocks A, B and C sit within the newly infilled dock, it is likely Continuous Flight Augured (CFA) piles will be taken down to and socketed into the sandstone bedrock.

Block D sits across a number of ground conditions and existing structures – in particular over the existing quayside and into the infilled Waterloo Lock.

Similarly to the other blocks where these sit within the infilled dock, Block D will likely use CFA piles taken down to and socketed into the sandstone bedrock.

Where Block D spans across the existing quayside and the potential chambers, voids and mechanisms for the gates hidden within this quayside, there are a number of potential solutions to be considered for the foundation solution here. These include, but are not limited to;

Bridging over the quayside with CFA piles likely to the West Waterloo Dock side and rotary piles likely to be installed within Waterloo Lock.

Piling through the quayside structure into the underlying sandstone bedrock using rotary percussive methods (ODEX or similar).

Removing the soil infill and mass filling with concrete to provide a large spread foundation to support the superstructure above.

Each of the above options have their advantages and disadvantages in providing a suitable foundation structure over the quayside, with each proposal discussed within CCG's report. These will be subject to further deliberation and investigation during the detailed design phase of the development.

It is likely that within Waterloo Lock, the depth to the natural sandstone bedrock (approximately 21m below ground level) will make the use of CFA piling unlikely as there is a 3m thick concrete slab at the base of the lock.

It is anticipated rotary piling methods will be required and due to the depth of loose materials around the piles, there may be a requirement for permanent casings around the piles to be used.

Existing structures may result in offset bases/ cantilever ground beams in order to avoid said structures. This will need to be established with a detailed overlay of the proposed footprint on site with digs undertaken on site to identify any potential clashes.

CCGeotechnical Limited within their report (Appendix 10A) discuss in detail the implications of piling in the vicinity of Merseytravel asset The Kingsway road tunnel, setting out some initial calculations and advising of vibration limits.

Outside of the superstructure and their foundations, the levels of potential settlement will necessitate that items such as drainage access chambers will need to be supported off piles to minimise the differential settlement between the neighbouring ground and the cover levels.

Plant and equipment likely to be used during the works during the works will include (but not limited to):

- Cranes – Mobile and Piling;
- Tower Crane;
- Floating Crane;
- Pontoons/ Barges;
- Safety Boats;
- Cement Mixer Vehicles;
- Concrete Pumps;
- Mechanical Excavators;
- Imported Fill/ Aggregate Haulage Vehicles;
- Imported Fill/ Aggregate Movement Vehicles;
- Scaffolding;
- Compaction Machinery;
- Piling Rigs;
- Water Pumps.

#### 11.2.1.2 Quality Assurance, Method Statements, Risk Assessments

A stringent regime of material selection, compaction control, monitoring and validation testing will be employed for the dock infilling and the piling methods used on this development to ensure accountability can be identified at any point along the design and construction process.

This will not only support the integrity of the design solutions chosen for the dock infill and piling solution but ensure the wider environmental risks have been considered.

It is anticipated the information required to demonstrate compliance with the regulations and conditions in place for the works will include (but not be limited to) the type and source of imported fill and test reports to demonstrate acceptability of the fill materials, along the lines of the specification previously referred to within this report.

All documentation presented should be accompanied by relevant certification

Method Statements will be presented to show the safe method of works to be used and that those undertaking the works have the competency and relevant experience to achieve this.

Risk Assessments will be presented in accompaniment to the Method Statements and reflect the proposed works – to cover not just the health and safety of those undertaking the works, but the surrounding environment effecting a number of receptors.

This can be undertaken and included within the preparation of a Construction Environmental Management Plan (CEMP). The CEMP will be implemented and adhered to throughout the Works.

The details of the CEMP will be agreed with LCC prior to the commencement of the Works and would comprise, in effect, an operational manual detailing the management, monitoring, auditing and training procedures to be followed during the Works to ensure compliance with relevant legislation, planning policy, regulations and best practice. It would also set out the specific roles and responsibilities of on-site personnel.

The CEMP includes but is not limited to:

- Details of the operations and phasing of the proposed dock infill and piling works.
- Prohibited or restricted operations;
- A framework for compliance with relevant legislation and guidance;
- Proposed Plant to be used;
- Details of proposed routes for vehicles travelling to and from the site;
- Roles and responsibilities of key staff including training of staff, liaison with stakeholders and management of enquiries and complaints;
- Details of emergency procedures which would be implemented;
- Details of general site management practices, including working hours, hoarding, access, lighting, site facilities, energy and water use, waste, materials procurement and storage;

- Details of environmental management and control procedures, covering issues such as traffic and access, noise and vibration, dust, archaeology, contamination, hazardous materials, drainage and pollution control;
- Requirements for auditing, monitoring and record-keeping;
- Mechanisms for third parties to register complaints and the procedures for responding to complaints; and
- Provisions for reporting, public liaison and prior notification, especially where dispensations would be required.

During the consideration of piling options, a piling risk assessment will be undertaken in accordance with the Environment Agency 2001 report – Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.

The Piling Risk Assessment will identify any potentially unacceptable risks from the proposed piling works (i.e. creation of pathways for contamination to become a risk to a variety of receptors).

## 11.3 Consultation

Further consultation has been made with:

- Merseyside Environmental Advisory Service;
- Natural England;
- Canal and River Trust.

## 11.4 Limitations and Assumptions

The proposals presented are subject to agreement from parties with vested interest in wider area that this project can influence – the dock operators, LLFA, MEAS, Natural England, Canals and River Trust and The EA.

Further investigations will be required to confirm the position of existing structures prior to finalising the design of the proposed piling works.

Where uncertainty exists, the assessments have assumed a reasonable 'worst-case' situation.

## 11.5 Baseline Conditions

The development falls within the wider Liverpool Waters site covering the re-development of up to 60 hectares of former dock land along Liverpool Waterfront providing mixed use developments and an extension from Liverpool City Centre northwards.

The overall area proposed for development is approximately 1.12 hectares.

The existing site is currently a derelict dockside wharf which was a key part of the historic dock system in Liverpool. The dock closed to shipping in 1988 and has remained undeveloped ever since.

Current site ground levels along the dock sides are generally flat at a level of approximately 8.000m AOD. The canal level is generally kept at approximately 4.770m AOD.

Appendix 10A indicates that the site is underlain by loose Made Ground deposits comprising silty sands, gravel and what could be described as construction waste materials over the natural sandstone strata at depths ranging between 8m to 21m below ground level (-0.600m to -13.000m AOD).

Groundwater encountered in each of the boreholes was recorded to around 4.9m AOD – consistent with the dock water level.

The development comprises initially of land reclamation from the dock by installing a new dock wall within West Waterloo Dock to provide a separation between the Leeds-Liverpool canal and the development.

Once the new dock wall has been installed, the area behind the wall will be infilled with imported materials to raise existing levels to proposed before piling operations can then commence for the foundations for the four new mixed-use blocks (A-D). These blocks range in height between 10 and 11 storeys and provide a total of 542 apartments (one – three bedrooms), along with associated commercial space, car parking, landscaping, servicing and access.

Three of the four blocks (A-C) will sit within the infilled dock with the remaining block (D) straddling over the quayside and partially within Waterloo Lock.

The development will also include a canal-side walkway along the canal perimeter of the development to provide access between the blocks and the canal itself.

Along this walkway, Blocks A and B will extend over the dock to create a colonnade with the ends of the buildings constructed within Waterloo Dock itself off a piled solution.

The surrounding areas of the development will be developed for car parking, access and communal spaces to provide access between the blocks, the Northern Link Road and the canal side. It is envisaged this will involve ground improvement methods undertaken as part of the infilling operations to provide

The surrounding areas of the development will be developed for car parking, access and communal spaces to provide access between the blocks, the Northern Link Road and the canal side. It is envisaged this will involve ground improvement methods undertaken as part of the infilling operations to provide suitable ‘platforms’ for vehicular and pedestrian access.

Appendix 10A highlights four potential sources of contamination with the current site arrangement;

1. The infill within Waterloo Lock
2. The deposits making up the infill within West Waterloo Dock.

3. Water entrapped within Waterloo Lock
4. Water within West Waterloo Dock.

## 11.6 Environmental Impacts and Significance of Effects

Impacts to the environment will be assessed and evaluated during construction and after completion of the proposed scheme.

### 11.6.1 Construction Phase

This section identifies the possible temporary impacts that this site may have on water quality or resources, such as the following:

During the construction phase of the proposed scheme, soil may be disturbed by the use of heavy machinery, excavations, stockpiling and filling which may affect sensitive receptors via ingestion, inhalation and direct contact. The effect significance is considered "**major – moderate**".

Ground stripping and the creation of dust during vehicular movements may enable the mobilisation of sediment during periods of heavy rainfall which could migrate into nearby field drains and watercourses leading to an adverse affect on the environment. The significance effect is considered "**minor**".

The use of plant machinery and storage of fuel oils / hydrocarbon could have localised adverse impact on the ground and groundwater conditions. The significance effect is considered "**major – moderate**".

Piling operations have the potential to remove spoil during installation operations – increasing dust to the air and exposing any trapped contamination. The significance effect is considered "**major – moderate**"

Due to the nature of the existing fill within the Waterloo Lock – Made Ground consistent with commercial waste infill due to the high levels of Methane recorded – any potential contaminants within this are assumed to be contained within the lock with no current pathway to either West Waterloo Dock or the River Mersey – water sampling tests have been undertaken and show no elevated levels within the water bodies. Piling operations will need to be coordinated in such a way that the assumed barrier preventing a pathway is not broken. The significance effect is considered "**major**".

Any generation of carbon dioxide or methane from these possible ground gas sources could have an adverse impact on construction. The significance effect is considered "**major - moderate**".

The gassing regime may be significantly disturbed by the construction works on this development and adjacent development. the liberation of high methane concentrations generated in Waterloo Lock infill may be substantially hampered and the migratory regime altered. Biodegradation of plant and aquatic life in the infilled dock may give rise to gassing. The significance effect is considered "**major**".

The introduction of new imported fill has the potential to introduce new contaminants and effect the current environment if it is reactive to the current chemical make-up of the existing dock water. The significance effect is considered "**moderate – major**".

Much of the development will be occupied by residential buildings built off piles, although ground floor slabs will be ground bearing. The significance effect is considered "**major - moderate**".

The construction of new structures will involve the use of buried concrete and plastic. Inadequate design could lead to possible deterioration of building materials in areas where aggressive ground conditions are present. The significance effect is considered "**moderate – major**".

Piling works will be in the vicinity of an existing road tunnel. The significance effect is considered "**moderate – major**".

### 11.6.2 Operation Phase

There may be potentially contaminated made ground at the site which could be adversely used on-site in landscaping areas and potentially expose end users of the Site to contaminants. The significance effect is considered "**minor**".

Other areas of the development are car parks and landscaped areas. It is plausible that any localised areas of ground contamination could result in exposure to future site residents. The significance effect is considered "**minor**".

## 11.7 Mitigation Measures

Mitigation during the construction phase will be provided via the development and implementation of a Construction Environmental Management Plan (CEMP). Included within the CEMP will be the following:

- Construction workers and visitors will wear appropriate Personal Protective Equipment (PPE) such as dusk masks, gloves and safety glasses;
- Additional site investigations will be required as considered necessary to provide a greater spatial coverage of the site and a more detailed contamination and ground conditions assessment;
- The additional investigations should include further a gas risk assessment with some exploratory holes targeting infilled pits and ponds and areas of potential made ground;
- In order to mitigate the generation of dust from vehicular movements and site stripping / excavation activities working areas should be dampened down during periods of dry weather; and
- To prevent impact to underlying soils and groundwater the storage of fuels and oils for plant machinery must be stored in appropriate containers and within a bunded compound area. This will mitigate against accidental spills and leaks.

- Piling operations will use displacement piles to minimise the removal of spoil.
- Guidance for piling works in the vicinity of the tunnels is provided within Appendix 10A.
- Further investigations on site with coordination of historical record drawings and proposals to be undertaken to minimise the risk that newly installed piles avoid piercing through the lock gates.
- It is anticipated the information required to demonstrate compliance with the regulations and conditions in place for the works will include (but not be limited to) the type and source of imported fill and test reports to demonstrate acceptability of the fill materials, along the lines of the specification previously referred to within this report.
- All documentation presented should be accompanied by relevant certification
- Concrete shall be designed and placed in accordance with best practice taking account of pH and sulphate conditions in the ground. Chemical test results from the preliminary investigations indicate that concrete should be prepared in accordance with BRE Special Digest 1 (2005) to conform with Design Chemical Classification DC-3. For a 100-year life span, 1No. Additional Protection Measure (APM) is also required.
- Gas monitoring wells should be installed in across the Site and a gas risk assessment undertaken. Sub-floor design of all new structures should be carried out based on the implementation of the required gas protective measures.
- Gas membranes are recommended within ground floor slabs and subfloor venting is incorporated.

### 11.7.1 Operation Phase

Potential contaminative uses have been found to be low risk and as such, no mitigation measures are considered necessary with regard to contamination risk to either human health or that of the environment.

## 11.8 Residual Effects

Following implementation of the mitigation measures the following residual effects are considered:

### 11.8.1 Construction Phase

The sensitivity of construction workers from ground contamination and disturbance of soils during construction is high and the magnitude of impact is negligible. The significance effect is therefore "**negligible**".

The sensitivity of the tunnel construction is high and the magnitude of impact is negligible. The significance effect is therefore "**negligible**".

### 11.8.2 Operation Phase

The sensitivity of the end users of the Site to ground contamination and hazardous ground gas risk is moderate and the magnitude of impact is negligible. The significance effect is therefore "**negligible**".

The sensitivity of the below ground structures to ground contamination is high and the magnitude of impact is negligible. The significance effect is therefore "**negligible**".

## 11.9 Cumulative Impacts

Given that no ground contamination has been identified at the site to date and that the significance effect of the proposed scheme is "**negligible**" no cumulative effects are anticipated. The cumulative effect can also therefore be considered "**negligible**".

When assessing the site for the likely significant effects of the proposed scheme a review of committed development set out within Table 3.3 of the ES has been considered. Through this assessment, the following schemes in a cumulative assessment for the Site due to the proximity of the development against the proposed scheme.

#### Isle of Man Ferry Terminal

The above development also involves the introduction of a new dock wall and dock infill works.

The neighbouring development for the new Isle of Man Ferry Terminal also involves land reclamation and piling works and as a result there will be an interface between the two developments. During detailed design, it will be imperative that both developments liaise with one another to ensure the works do not hinder each other's development. The cumulative effect can also therefore be considered "**negligible"** subject to the appropriate mitigation.

## 11.10 Assessment Summary and Conclusion

The proposed scheme will consist of the construction of a new dock wall within West Waterloo Dock and the subsequent infilling of this dock to provide a platform to construct four new residential blocks with additional areas for commercial use.

The desktop study and intrusive site investigations undertaken by CC Geotechnical and presented in Appendix 10A established West Waterloo Dock has an extensive history and has undergone significant alterations since its opening in 1834.

The report indicates the dock has previously been backfilled with loose granular material classified as 'Made Ground' with the water at a consistent depth of approximately 3m and the fill ranging in depth between 2.5 – 15m before the natural sandstone bedrock is encountered.

It is anticipated that the dock wall between the development and the dock will be constructed using a 'Combi-wall' piling solution or a similar type of arrangement.

It is estimated in the region of 6m depth of imported fill will be required to increase existing levels to the proposed scheme levels.

An outline specification has been provided for the imported fill, laying and testing procedures to be followed.

The introduction of the imported fill will result in settlement of the existing loose fill within the dock and this has been estimated to be in the region of 200mm.

A variety of piling techniques are suggested to support the superstructures of the proposed blocks due to the range of ground conditions and obstructions (dock walls, gate mechanisms etc.) likely to be encountered.

Some of the piling operations are likely to be over or in the vicinity of the existing Kingsway Road Tunnel with some initial recommendations noted with the Ground Investigation Report.

The proposed works will require stringent regime of material selection, compaction control, monitoring and validation testing will be employed for the dock infilling and the piling methods used on this development along with all relevant certification.

A Construction Environmental Management Plan (CEMP) will be necessary to ensure compliance with legislation, regulations, planning policy and best practice.

A Piling Risk Assessment will be required to show consideration of potential contamination, pathways and receptors.

The neighbouring development for the new Isle of Man Ferry Terminal also involves land reclamation and piling works and as a result there will be an interface between the two developments. During detailed design, it will be imperative that both developments liaise with one another to ensure the works do not hinder each other's development.

**Table 11.1: Summary of Effects**

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Soil disturbance by the use of heavy machinery, excavations, stockpiling and filling. | Moderate adverse | Implementation of CEMP including wearing of appropriate PPE, damping down areas of work during dry periods. | Negligible |
| Movement of soils into drainage and watercourses | Moderate adverse | Consideration of Environment Agency pollution prevention guidelines as outlined in statement. Testing of waters | Negligible |
| Leaks and spills from oils or liquids stored on site. | Moderate – Major adverse | Consideration of Environment Agency pollution prevention guidelines as outlined in statement. Testing of waters | Negligible |
| Piling Operations near tunnel | Moderate – Major adverse | Surveys, coordination with drawings. | Minor Adverse |
| Failure of the piling wall | Moderate – Major adverse | Surveys of ground conditions, understanding of ground capacity, QA procedure suitable to check designs and sign them off. Review of proposals. | Negligible |
| Removal of spoil due to piling operations | Moderate adverse | Implementation of CEMP including wearing of appropriate PPE, use of displacement piles to avoid the removal of fill. | Negligible |

| **Potential impact** | **Environmental significant effect without mitigation** | **Mitigation** | **Effect after mitigation (residual effect)** |
|---|---|---|---|
| Contamination release from lock | Moderate - Major adverse | Surveys, coordination with drawings. Testing of waters before and after. | Minor Adverse |
| Gassing regime disturbance | Moderate - Major adverse | Surveys, coordination with drawings. Testing of waters before and after. | Minor Adverse |
| Gassing regime disturbance below residential construction | Moderate - Major adverse | Gas membranes to be provided, natural venting required. | Minor Adverse |
| Imported fill | Minor adverse | Certification and correct QA to verify imported fill meets standards and suggested specification | Negligible |
| Deterioration of concrete | Minor adverse | Certification and correct QA to verify concrete is designed in accordance with requirements. | Negligible |

# 12 Flood Risk and Drainage

## 12.1 Introduction

This chapter presents an assessment of potential impacts on Flood Risk and Drainage associated with the proposals, described in Chapter 2: Scheme Description.

This Chapter assesses the likely significant effects of the proposed scheme with respect to Flood Risk and Drainage during the construction and operational phases of the proposed scheme. This Chapter also describes the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.

It is important that the proposed scheme remains free from flooding and does not exacerbate any flooding off-site and does not negatively impact on the quality of the water resources in the vicinity of the site.

The development is shown on the Environment Agency's (EA's) flood maps as being predominantly in Flood Zone 1, with an estimation of less than 4% of the site being considered to be in Flood Zone 3. A Flood Risk Assessment (FRA) is required because the site is over 1ha in area and as such the EA are understood to require a Flood Risk Assessment in support of any planning applications.

This chapter is supported by the following appendices:

- Appendix 12A: Flood Risk Assessment
- Appendix 12B: Dock Infill Methodology Report
- Appendix 12C: Central Docks Flood Risk Strategy

## 12.2 Methodology, Scope and Significance Criteria

### 12.2.1 National Planning Policy

In 2001 the Department for Transport Local Government Regions (DTLR) published Planning Policy Guidance Note 25 (PPG25), which explains how flood risk should be taken into consideration during the planning and development process.

PPG25 was replaced by Planning Policy Statement 25: Development and Flood Risk published in March 2010. This Policy Statement was introduced to place more emphasis on the increased flood risk from climate change.

PPS25 specified a sequential test which local planning authorities should apply to all future proposed development sites. An exception test may also be applied to provide a method of managing flood risk while still allowing necessary development to occur.

In February 2019, the Government released the updated National Planning Policy Framework (NPPF).

NPPF supersedes PPS25 although the principles set out in the new publication remain similar in terms of the flood risk aspect.

The NPPF has now been supplemented with a Planning Practice Guide which is available online.

The following zones define the levels of flood risk:

**Zone 1: Low Probability**

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any one year. (<0.1%)

**Zone 2: Medium Probability**

This zone comprises land assessed as having between 1 in 100 and 1 in 1000 annual probability of river flooding (1%-0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

**Zone 3a: High Probability**

This zone comprises land assessed as having between 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

**Zone 3b: Functional Flood Plain**

This zone comprises land where water has to flow or be stored in times of flood. Strategic Flood Risk Assessments should identify this zone.

As part of its general obligations under the Water Resources Act 1991, The Environment Agency has carried out surveys of its existing defences against flooding and has published a series of nationwide 'Indicative Floodplain Maps' based upon information from historic flood events and basic hydraulic modelling.

In general terms, these maps give a good indication of the areas likely to be affected by flooding. More recently the Environment Agency have published the 'Flood Map' on their website which is based on improved hydraulic modelling and detailed local data. The map indicates Zones 2 and 3 with Flood Zone 1 being all the land falling outside the Zones 2 and 3.

The EA Flood Map for the area of the proposed scheme indicates that the development is predominantly in Flood Zone 1. There is approximately less than 4% of the development which could be said to be within Flood Zone 3 and within the Flood Risk Assessment, further justification as to why this site should be considered Flood Zone 1 will be presented.

### 12.2.2 Local Planning Policy

This chapter has reviewed the Liverpool Development Plan (Liverpool UDP) and emerging Local Plan (submission draft 2018) when reviewing the impacts of the proposed scheme on Flood Risk and Drainage.

If the site has previously been developed it should be demonstrated that the drainage system is still operational for it to be classed as brownfield. Information should be obtained on the system, e.g. pipe diameters, levels, gradients, lengths, hydraulic controls, etc. These details should be used, along with the contributing area characteristics of the site, to set up a drainage model (or to inform another assessment method) in order to evaluate the peak flow rates at the outfalls from the existing site for the design return period events. The maximum allowed flow from the site should then be derived using the 1:2yr critical rainfall event with a 30% reduction applied to offer improvement.

The limiting discharge figure for the proposed scheme should be used in the design of the drainage system for the minimum requirement that flows for up to the 1:30yr critical rainfall event are retained within the system and that for the 1:100yr+30% climate change allowance, critical rainfall event there will be no flooding to any buildings and any excess volumes of water will be retained on site.

Notwithstanding the above, the existing site drainage constraints will also be taken into account when agreeing any discharge limits and the proposed flow should not exceed existing pipe capacity. For example, if the existing site outfall was a 150mm diameter pipe, irrespective of the area being drained, it would have a maximum flow capacity which may be lower than any proposed flows calculated using the above criteria, assuming a free discharge. Therefore, discharge to the existing drainage system from the development would be effectively increased from the existing situation which is contrary to Environment Agency and National Planning Policy Framework guidance for flood risk and surface water management.

Where records of the previously developed system are not available and system characteristics cannot otherwise be determined, or if the drainage system is broken or blocked (or no longer operational), then the run-off characteristics should be defined as greenfield.

If a site is classed as greenfield the flow rates from the development will be limited to the equivalent greenfield run off rates. For example, the flow rate from the development for the 1:30yr critical rainfall event should not exceed the greenfield run off rate for the site for the 1:30 year rainfall event, likewise for the 1:2 & 1:100 year scenarios. A minimum flow of 5 l/s can be used when the greenfield run off rate falls below 5 l/s.

It should be noted that this discharge figure will satisfy planning requirements but the applicant should consult United Utilities to determine if they have any discharge restrictions, which could be more restrictive.

For all developments over 1ha a FRA (Flood Risk Assessment) will be required which should be based on the requirements as detailed in Environment Agency (Greater Manchester, Merseyside & Cheshire) Local Planning Standing Advice and NPPF guidance. The detail and technical complexity of a FRA will reflect the scale, nature and location of the development. Where available, reference should be made to the Strategic Flood Risk Assessment (SFRA) for locally specific guidance and information.

The following list sets out key information that should be submitted within a FRA for developments;

- A location plan that includes geographical features, street names and identifies the catchment, watercourses or other bodies of water in the vicinity.
- A plan of the site showing existing site; development proposals; and identification of any structures (e.g. embankments), which may influence local flood flow overland or in any watercourses (e.g. culverts) present on the site.
- Site levels of both existing and proposed. Reference to Ordnance Datum, may be required where details of context of the site to its surroundings is needed.
- Details of the existing surface water drainage arrangements on site (if any) and the receptor e.g. soakaway, sewer, canal, watercourse etc.
- Proposals for surface water management that aims to not increase, and where practicable reduce the rate of runoff from the site as a result of the development
- Information about the surface water disposal measures already in place and estimates of the rates of run-off generated by the surfaces drained.
- An assessment of the volume of surface water run-off likely to be generated from the proposed scheme and confirmation of how any excess volumes would be retained within the development.
- Information regarding how the proposed drainage design will perform under the increased frequency and intensity of rainfall that is predicted as a result of climate change (30% for residential development & 20% for non- residential).
- Information about other potential sources of flooding, if any, that may affect the site e.g. streams, surface water run-off, sewers, groundwater, reservoirs, canals and other artificial sources or any combination of these; including details on how these sources of flooding will be managed safely within the development proposal.

It should be noted that the above list is not exhaustive but provides a framework for the FRA to be prepared.

For developments less than 1 ha, a FRA will not be required but a drainage design statement should be provided proportional to the scale of the development and follow the same design principles with regards to calculating the maximum design flow rates for the site.

In line with NPPF (National Planning Policy Framework) the development of a site should look towards the use of SUDS techniques as a method of reducing the run off from the site, as a result of the development. Government policy strongly encourages a hierarchical approach to the use of sustainable drainage systems in new developments and infiltration methods for private drainage should be used where possible.

For residential developments greater than 0.5 ha and where the floor space of any building is greater than 1000m² Ground Investigations should be carried out to BRE 365 to determine if infiltration drainage methods are practicable and suitable for the sites. A soils report including ground percolation test results and recommendations will need to be submitted within the drainage design statement or FRA, for approval, although any detailed soakaway design information is not required at this stage. If this proves that infiltration drainage is not a viable option, then a positive piped system of surface water run off disposal will need to be provided.

Any soakaway design and the sub ground strata of the sloping site areas shall be considered so as not to cause flooding to any adjoining third party land.

For developments containing prospectively adoptable surface water sewers the following document published by United Utilities should be referred to for guidance related to SUDS

Further reference has been made to Flood Risk Resilience Strategy (Condition 21) Report by Curtins (May 2019) (see Appendix 12C)

The methodology for the Flood Risk Assessment (FRA) comprised primarily of a desktop study of the Ground Investigation Report to ascertain the suitability of the soil conditions for infiltration SUDS drainage and groundwater levels via the use of boreholes and window sampling.

The methodology also included liaison with the LLFA and United Utilities. Reference has also been made to relevant plans, including plans showing the location of United Utilities sewers and the EA maps.

Mitigation measures are also discussed as means to reduce and manage potential flooding within the FRA.

The methodology of the Drainage Strategy is a combination of a desktop study to establish site characteristics, and existing drainage provisions, assessment of the SuDS hierarchy to determine which options are available to the development and preliminary details on foul and surface water drainage including outline model calculations and drawings.

Calculations are undertaken using the Wallingford Design Procedure to establish current flows from the development, with an initial design model created and analysed using Microdrainage drainage software, using the design criteria set out by the LLFA.

## 12.3 Consultation

United Utilities have been consulted previously to establish what existing drainage infrastructure they have in the vicinity of the development.

A formal Pre-Development Enquiry Form will for official consent from United Utilities.

Consultation has been made with Merseyside Environmental Advisory Service. During this assessment, Merseyside Environmental Advisory Service (MEAS) have been contacted and as per their correspondence dated 4th October 2018. Item 35 indicates a Flood Risk Assessment is required as part of the EIA.

Consultation has been made with Natural England.

Consultation with the EA on 29th October 2018 to discuss FFL against 2016 and confirm that a WFD screening was not required.

The LLFA were consulted on 7th November 2018 whilst compiling the FRA and DS. This established no betterment on current surface water flow from the existing site was required and that surface water discharge into the dock did not need to be controlled.

Further communications with LLFA on the 8th November 2018 established that the outfall be kept above the dock level to ensure it wasn't submerged during peak storm events.

A final consultation with LLFA on the 13th November 2018 confirmed that the development had no known historical flooding or predicted flooding from the 1 in 30 year or 1 in 100 year models.

The Canal and River Trust were consulted on the 12th November 2018 to establish any specific requirement regarding the level of the outfall entering the dock. They advised that the levels are generally kept constant throughout but in the periods where isolation structures are closed, for operations in the Central Dock, the level can rise from Stanley Flight and existing discharges. The FRA did establish any water level change due to this was generally considered to be minimal.

Peel Land and Property Group Management Limited (Dock Operators) have only indicated a maximum velocity for discharge into the dock.

## 12.4 Limitations and Assumptions

The proposals presented are subject to agreement from parties with vested interest in wider area that this project can influence – the dock operators, LLFA, MEAS, Natural England, Canals and River Trust and The EA.

A key assumption at this stage is that the outfall into West Waterloo Dock is to be set at 5.400m AOD. This give a freeboard of 600mm above the Dock water level which is maintained at 4.770m AOD.

The suggested entry velocity into the dock is outside the limit advised for best practice construction and within Sewers for Adoption in order to achieve self-cleansing within the surface water drainage network.

To achieve this, the energy generated within the flow of water along the surface water network must be disrupted to dissipate the energy and subsequently its velocity. This can be achieved in a number of ways such as including orifice plates or flow controls with the effective volume of water behind this stored in storage in order to remain within the design requirements. This will require conversations with all relevant parties to achieve an amicable solution.

## 12.5 Baseline Conditions

The development falls within the wider Liverpool Waters masterplan covering the re-development of up to 60 hectares of former dock land along Liverpool Waterfront providing mixed use developments and an extension from Liverpool City Centre northwards.

Outline planning was granted by Liverpool City Council in June 2013 (Application no. 10O/2424).

The overall area of the proposed scheme is approximately 1.12 hectares.

The existing site is currently a derelict dockside wharf which was a key part of the historic dock system in Liverpool. The dock closed to shipping in 1988 and has remained undeveloped ever since.

Current site ground levels along the dock sides are generally flat at a level of approximately 8.000m AOD. The canal level is generally kept at approximately 4.770m AOD.

The Site Investigation Report for the development undertaken by CC Geotechnical (Appendix 10A) indicates that the site is underlain by loose Made Ground deposits comprising silty sands, gravel and what could be described as construction waste materials over the natural sandstone strata at depths ranging between 8m to 21m below ground level (-0.600m to -13.000m AOD).

Groundwater encountered in each of the boreholes was recorded to around 4.9m AOD – consistent with the dock water level.

The current impermeable area is approximately 800 sqm – consisting predominantly of the dockside.

Asset drawings provided by United Utilities have shown no existing sewer infrastructure on or in the vicinity of the development.

Surface water currently discharges from the footprint of the development freely into West Waterloo Dock.

The development comprises of the formation of a new dock wall with the area behind infilled to provide the platform to erect four new apartment blocks (A-D) ranging in height between 10 to 11 storeys. A total of 542 apartments (one – three bedrooms) will be provided across the development along with associated commercial space, car parking, landscaping, servicing and access.

The ground floors of Blocks B and D are set at 8.400m AOD and the ground floors of Blocks A and C are set at 8.050m AOD. Across all the blocks, these contain commercial units, reception areas, plant rooms and storage for bicycles.

At Blocks C and D, the ground floor also contains residential dwellings facing onto the River Mersey.

A canal side walkway/ boardwalk will be provided at canal level with Blocks A and B projecting over into the canal to create a colonnade.

The lowest accessible level is set at 6.600m AOD (canalside/ colonnade) to provide a transition and access point between the blocks and the canal side.

The development is located 20m away from the River Mersey and located within a Flood Zone 1, with an area of less than 4% within Flood Zone 3.

There is no record of historical flooding on the existing site.

There are eight potential sources of flooding at the site which will be addressed in more detail in this report, i.e.

1. Flooding from The River Mersey - Fluvial.
2. Flooding from The River Mersey - Tidal.
3. Flooding from Surface Water run-off
4. Flooding from the surcharging of drains or sewers on or around the development.
5. Flooding due to high groundwater levels.
6. Flooding from Reservoirs.
7. Flooding from canals
8. Wave Action

There are no obstructions on the River Mersey within the immediate vicinity likely to result in flooding. The width and depth of the River Mersey reduce around Warrington where obstructions such as bridges can become a problem, but this is some 20km away.

The level of the canal is retained at 4.770m AOD and has a series of isolation structures primarily used to regulate water levels and contain any contamination should spills occur, along with a lock flight which is not believed to vary the water level significantly.

Flooding to the development from Rivers or the Sea considered as very low risk from fluvial flooding, although it is immediately adjacent to an area which is at high risk from fluvial flooding.

Liverpool Waters 2016 Extreme Sea Level Study indicates that for the 1 in 200-year extreme sea level up to the year 2115 has been estimated to be 6.830 m AOD. The existing site is generally above this and the new development will predominantly by above this also.

Although the Environment Agency note that there are no designated flood defences along the River Mersey adjacent to the development, there is a riverside dock wall. The lowest level surveyed on top of the wall adjacent to the site is 6.930m AOD which is just above the 1 in 200 + 2115 event.

Due to the topography of the development, any potential wave overtopping will still have approximately 20m to travel before getting to the site boundary and even if it does, it is likely to run straight across the site and into the dock which is considerably lower than the rest of the development.

The Environment Agency flood maps for surface water have been consulted indicate that there is generally a medium risk of surface flooding within the dock with a small area of high risk identified adjacent to the infilled lock.

There are no existing sewer apparatus located within the site and as such no flooding from surcharged drains or sewers are expected.

However, the adjacent site is to be developed for the Isle of Man Ferry Terminal and a new road (referred to as the Northern Link Road) is proposed to run along the perimeter of the site.

A Surface Water sewer is proposed ranging in diameter from 150mm up to 300mm but this appears to be solely for the road drainage as there are numerous gullies connected to it with no provisions for a connection for the development.

There is also a Foul Water sewer proposed below the road with a number of branches along the length coming onto the development for connection of the foul water system. However, this is not for use for this development and a new rising main will be installed which will run along the Northern Link Road and over the canal bridge before entering the United Utilities gravity fed system.

The Flood Risk Assessment for the Northern Link Road indicates the storm sewerage for the site has been designed in accordance with DMRB Volume 4 (HD 33/16 and HA 102/00) for a 1 in 100 year storm event with checks against 1 a in 30 year storm event. The drainage system has also been assessed for the consequences of exceedance for return periods in excess of 1 in 100 years to ensure any surcharge levels do not exceed the levels of chamber covers.

The South to North link road which runs parallel to the West boundary of the development has a lowest proposed level of 6.849m AOD – lifting, on average, the existing ground level by approximately 300mm and similar to this development.

The Flood Risk Assessment for the Northern Link Road states that the lowest level remains higher than the minimum ground level of 6.70m AOD as set out within Liverpool Waters ES.

Review of the Northern Link Road levels against proposed site ground floor levels show the development has been set to remain above the road level – further reducing the risk of flooding from the Northern Link Road.

The Flood Risk Assessment for the Northern Link Road indicates that stormwater run-off will be adequately managed by inclusion of road gullies and designated carrier networks, with discharge into the canal and locks – as existing drainage is believed to do.

Groundwater encountered in each of the boreholes was recorded to around 4.900m AOD – consistent with the dock water level.

The Environment Agency have modelled the potential effect of flooding from failures in retaining structures containing reservoirs and the site is at low risk from this form of flooding.

The Leeds-Liverpool Canal Link runs along the Eastern boundary of the development and the risk of flooding from the canal is considered low as the canal is interlinked between a series of docks with isolation structures in place to minimise water level change between adjacent docks.

### 12.5.1 Fluvial and Tidal Flooding Mitigation

Appendix 12C has specified that residential and commercial threshold levels should be set at a minimum 7.850m AOD to provide a 600mm above the 1 in 200 year extreme sea level up to the year 2115. This has been estimated at 7.250m AOD.

The development has a minimum ground floor level set at 8.050m AOD.

The risk from tidal flooding following mitigation can be considered generally low for the habitable areas of the development as the ground floor levels are set above or at the minimum required levels.

### 12.5.2 Wave Action Mitigation

The 600mm freeboard allowance noted in Section 6.1 is traditionally considered as a suitable allowance to counter the effects of extreme wave action.

There are mitigating factors which need to be considered alongside the assumed peak wave height and the implications this has on the development.

The river wall has a lowest level recorded on the topographic survey of 6.930m AOD. This will dissipate some of the energy of the waves when they crash against the river wall.

The development is in excess of 20m away from the river – and therefore the source of the source of the waves. The means the remaining energy from the waves after it crashes over the wall has to travel this 20m distance to come into contact with the development.

### 12.5.3 Groundwater Flood Mitigation

Groundwater flooding tends to last over a number of weeks or months rather than hours or days. Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, it can cause significant risk to property.

The development is considered to be at a low risk of groundwater flooding, ground water levels have been recorded comparable to the canal water level.

Finished floor levels are set above ground water levels.

External ground levels across the development fall away from the proposed buildings and ensure that the creation of low points are avoided (other than those used intentionally for drainage features) in order that in the unlikely event of groundwater flooding, the flood water is safely routed away from the buildings.

Providing the above mitigation measures are imposed, the risk from groundwater flooding would therefore be considered to be low post development.

### 12.5.4 Surface Water Flooding to the Site Mitigation

It is recommended that proposed external ground levels across the development should fall away from the proposed buildings in a manner which does not create low points where water may pond unintentionally. This will ensure the any surface water will not flow towards the proposed buildings.

Upon implementation of the proposed drainage network, it is proposed to accommodate the necessary flows generated from the site and therefore limit future surface flood risk from the development.

Providing the above measures are implemented on the development, flooding risk from surface water is therefore considered low post development.

### 12.5.5 Surface Water Flood from the Site Mitigation

All new development drainage will be designed in accordance with the FRA, Lead Local Flood Authority requirements and best practice.

The Appendix 12C requirements are that proposed surface water drainage network shall be designed to not surcharge any access chambers/ manholes for the critical 1 in 2 year storm event.

Appendix 12C has also stated that the attenuation requirements for the critical 1 in 30 year and the 1 in 100 year (plus climate change allowance) storm event can be satisfied by allowing the water level in the dock waters to temporarily rise during these storm events.

Based on the nature of the development, a lifespan in excess of 60 years is anticipated. Therefore, the potential climate change allowance for 2070-2115 ranges between 20% for the central allowance and 40% for the upper end allowance. As such, an average allowance of 30% for climate change on peak rainfall intensity will be included for within calculations.

Appendix 12C also indicates that the 40% allowance should be considered to understand the implications.

In following the hierarchy of drainage solutions, consideration has been given firstly to the discharge of surface water runoff by sustainable method of infiltration, through to discharge into a sewer. These options are discussed in Sections 5.3 and 5.4.

To minimise localised flooding within the development, the drainage design should ensure that gullies, drainage channels and drains are all suitably sized to accommodate peak storm flows. Additionally, all inlet features should include suitably sized sumps to catch silts and should be subject to documented maintenance and cleansing regime.

The invert level of the outfall into the dock should also be set at a level above the maximum level of the dock to ensure that the invert is never fully submerged and preventing discharge from the site. The canal level is generally kept to 4.770m AOD and therefore the invert of the outfall should be set above this level.

### 12.5.6 Flood Mitigation Generally

Flood water exceedance routes should be identified, both on and off site.

For any sustainable drainage systems employed in the development, an appropriate management and maintenance plan for the sustainable drainage system for the lifetime of the development should be submitted and should include;

Any arrangements for adoption by an appropriate public body or statutory undertake, management and maintenance by a Resident's Management Company.

Arrangements concerning appropriate funding mechanisms for its ongoing maintenance of all elements of the sustainable drainage systems (i.e. inspections, regular maintenance).

Means of access for maintenance and easements where applicable.

The site is in an Environment Agency Floodline Warnings Direct which is a free service that provides warnings by phone, text or email. Property owners and commercial unit managers can register to receive notifications. This will enable people to prepare for flooding and evacuate the building if necessary.

The development should be designed in accordance with guidance given in BS 85500:2015 - Flood resistant and resilient construction. Guide to improving the flood performance of buildings. This document can be used to help improve the resistance and resilience of buildings against flooding with the use of suitable materials and construction techniques.

For example, materials that are to be used up to first floor could be resilient to water.

The proposed ground floor level has been set between 8.050m AOD and 8.400m AOD and are both above the 600mm freeboard figure above the determined sea levels.

External levels will be locally 'ramped' upwards adjacent to the entrance doors from the surrounding external levels.

The introduction of thresholds drains are proposed to each of the entrance doors to the buildings residential and commercial doors.

To mitigate damage to the substation and internal plant rooms accessed from street level, an internally raised plinth can be introduced to raise equipment above the average external levels providing additional protection from residual flood risks.

Additionally, services entries to the plant rooms would be at high level.

Assuming that the proposed drainage system is designed to provide adequate capacity, and that the private and adopted sewers will be maintained by their adopted authority, it can be assumed risk of flood from blockage or overloading is minimal.

The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Liverpool City Council and United Utilities.

Any new drainage for the development should be designed in accordance with the non-statutory technical guidance for the design of sustainable drainage systems.

The disposal of surface water should be considered in the following order of priority;

- Infiltration into the subsoil via soakaways or permeable paving.
- Discharge to a water course or the sea.
- Discharge to a surface water sewer.
- Discharge to a combined sewer.

If it is not possible to discharge to a soakaway, then surface water should be controlled with the use of Sustainable Drainage Systems (SuDS) and considered using the SuDS Hierarchy.

### 12.5.7 Infiltration

All soakaways must be situated at least 5m away from the building footprint as per building regulations which may limit the location of such soakaways.

In addition, although there are areas on this development subject to dock infill and this is likely to be by imported aggregates, the permeability at the base of the fill is likely to be minimal with its previous history as a water retaining dock.

### 12.5.8 Water Couse

The nearest water course is the River Mersey located approximately 20m to the west of the site. While this would be a potential discharge point for the surface water, it is unlikely that this would be acceptable to Environment Agency and would also mean crossing third party land to do so.

A feasible option is to discharge directly into West Waterloo Dock. From initial discussions with both The Canal and Rivers Trust and Peel Land and Property Group Management Limited (Dock Operators), there have been no objections to this proposal. The only consideration Peel have advised is with regard to achieving a flow velocity into the dock of 0.5m/s.

However, this is outside the limit advised for best practice construction and within Sewers for Adoption in order to achieve self-cleansing within the surface water drainage network.

To achieve this, the energy generated within the flow of water along the surface water network must be disrupted to dissipate the energy and subsequently its velocity. This can be achieved in a number of ways such as including orifice plates or flow controls with the effective volume of water behind this stored in storage in order to remain within the design requirements. Conversations are currently ongoing.

The outfall of the drainage into the dock should be located at a level above the maximum canal level to ensure surface water can discharge from the development but not too high to minimise any potential for turbulence in the water.

### 12.5.9 Surface Water Sewer

The nearest surface water drainage system will be below the new access road to the Isle of Man Ferry Terminal. The proposed drawings show no branches onto this development and it appears it may have been designed for the road drainage only. This drainage run does ultimately discharge into West Waterloo Dock.

### 12.5.10 Combined Sewer

No combined sewer exists as part of the new road development – foul and surface water drainage systems are kept separate.

While the surface water discharge point may be into West Waterloo Dock, it will be necessary to ensure that no flooding occurs on the development during the peak storm events.

There are opportunities for the use of green roof systems on roofs to control water at source and store water above ground level. This can prove to be an effective way to control run-off on fully developed sites to avoid clashes with proposed foundations and services.

### 12.5.11 Foul Water

The foul drainage will be collected from the blocks before entering a pumping station located on site before entering a rising main which follows the line of the Northern Link Road and over the canal bridge before entering the United Utilities gravity fed system.

The proposed foul water for the upper residential floors will be collected via soil vent pipes which will be hidden within the risers for the apartments along corridor lines.

Floor gullies from Plant rooms and cycle stores will be collected into the wider site foul drainage network.

The drainage for the ground floor commercial units will be routed via stub stacks and will be collected into the wide development foul drainage network. These will connect with the residential drainage runs before discharging off site.

The proposed floor layouts for the proposed scheme has been assessed and based on the discharge unit method. A total peak flow rate of approximately 43.6 l/s will be achieved from the proposed scheme. This will be split further to avoid the discharge flowing through one pipe.

It is currently understood that Section 106 agreements will not be required for the connections onto the new sewer in the link road. This will be covered by the Section 104 agreement that will be undertaken by others for the sewer under the link road. However, this should be confirmed at detailed design stage.

### 12.5.12 Surface Water

The site currently has an impermeable area of 800m2. Based upon a 15 minute storm event, the 1 in 2 year storm event has a peak flow of 8l/s. It is likely that this currently drains straight into West Waterloo Dock.

In accordance with the SUDS hierarchy, the FRA has established that filtration via a soakaway is not practical on site but connection to West Waterloo Dock is practical and feasible.

Following discussions with Liverpool City Council, no betterment on the current flow is required and an unrestricted flow into the dock is permissible along with ensuring the requirements for the peak storms is achieved.

Following discussions with The Canal and River Trust, they have not imposed any further restrictions on the discharge into West Waterloo Dock.

Following discussions with Peel Land and Property Group Management Limited, the only restriction imposed is that discharge from the site into West Waterloo Dock should be at 0.5 m/s. This is outside the limit advised for best practice construction and within Sewers for Adoption in order to achieve self cleansing within the surface water drainage network.

To achieve this, the energy generated within the flow of water along the surface water network must be disrupted to dissipate the energy and subsequently its velocity. This can be achieved in a number of ways such as including orifice plates or flow controls with the effective volume of water behind this stored in storage in order to remain within the design requirements. Conversations are currently ongoing.

The FRA has established that the attenuation requirements for the 30 year and 100 year (including 30% climate change) rainfall events can be accommodated by allowing the water level in the dock to raise temporarily.

This is subject to agreement from the Canal and Rivers Trust and the dock operators and is detailed below.

Any new development’s drainage must be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30 year storm event and flood water generated for the 1 in 100 year plus climate change storm event shall be controlled with the area of the development so as not to cause damage to buildings, essential services or adjoining developments and services.

The FRA has confirmed the 1 in 2 year storm event will also be analysed to ensure no access chambers/ manholes surcharge during this event.

A surface water drainage model has been designed using MicroDrainage design software by WinDes for the following storm events;

The 1 in 2 year storm event with a free outfall.

The 1 in 30 year storm event with a surcharged outfall set to 6.000m AOD.

The 1 in 100 year storm event, including an allowance of 30% for climate change, with a surcharged outfall set at 6.000m AOD.

The 1 in 100 year storm event, including an allowance of 40% for climate change with a surcharged outfall set at 7.150m AOD.

The surcharged outfall level of 6.000m AOD corresponds to the estimated flood level for the 1 in 100 year storm event as noted within the FRA.

The surcharged outfall level of 7.15m AOD corresponds to the estimated flood level for the 1 in 200 year River Mersey Level for the year 2115. This is the level on which floor levels have been set against.

The results from the initial drainage models are as follows:

**Table 12.1: Initial Drainage Model Results**

| Event | Maximum Discharge Rate (l/s) | Design Requirement | Result |
|---|---|---|---|
| 1: 2 Year | 124 | No Surcharge | Pass |
| 1 in 30 Year Event (Surcharged Outfall 6.00m AOD) | 64.4 | No Flooding | Pass |
| 1 in 100 Year Event + 30% Climate Change (Surcharged Outfall 6.00m AOD) | 111.6 | Flooding Contained on Site | Pass – Total Flood Volume 300m$^3$ – to be contained and kept away from buildings with level management during detailed design. |
| 1 in 100 Year Event + 40% Climate Change (Surcharged Outfall 7.150m AOD) | 92.2 | Flooding Contained on Site | Pass – Total Flood Volume 369m$^3$ – to be contained and kept away from buildings with level management during detailed design. |

The finished habitable floor levels of the buildings are set at a minimum of 8.050m AOD, as specified in the FRA – giving in excess of the 600mm freeboard above the 1 in 200 year River Mersey level up to the tear 2115.

Correspondence with all relevant parties with vested interest is ongoing.

In accordance with the FRA, West Waterloo dock will provide the attenuation storage for the 30 year storm event, by allowing the water level to temporarily rise in storm events and will be controlled outside of the scope of this development.

A brief estimation has been undertaken to assess the additional volume of water entering the dock, assuming a 30% betterment has been applied to the 1 in 2 year storm event on the current site (8l/s x 0.7 = 5.6l/s).

Using a figure of 5600m2 as the revised area of West Waterloo Dock (post development), the volume entering the dock and estimated rise in water level is as follows;

- The 1 in 30 year storm event: 490m3 giving a 88mm raise in water level.
- The 1 in 100 year storm event, including 30% climate change allowance: 820m3 giving a 146mm raise in water level.

These estimates give no consideration to any other developments discharging into West Waterloo Dock, no consideration to the larger area of the docks as in reality the docks are not seldom closed along the Leeds-Liverpool Canal route, no consideration to evaporation.

These level changes would not cause a significant issue; even when applied to the 1 in 200 Mersey level for 2115 (7.15m AOD), this would not cause flooding to the surrounding area.

The proposed drainage strategy drawing 001 is enclosed in Appendix 12B along with areas susceptible to flooding under the initial drainage arrangement (Drawing 002).

A minimum of one stage of water quality treatment is provided for all areas within the site and a two-stage treatment has been proposed for all areas subject to vehicles.

The measures to implement this, include for vehicular areas subject to surface water runoff are to pass through a Class 1, Full Retention Petrol Interceptor prior to connecting to the drainage picked up from roofs.

Further measures to be assessed during detailed design include silt traps located within the drainage system to prevent silt passing to the dock waters, green roofs, permeable paving and tree pits to reduce the volume of water leaving the development.

The surface water drainage system will remain separate from the foul water drainage system whilst on the development.

All proposed flow rates and connection points will be subject to agreement and approval from relevant and interested parties.

The surface water drainage strategy is summarised as follows:

Building rooftops – to be drained under gravity before entering the onsite public surface water system discharging directly into West Waterloo Dock.

Areas of external hardstanding– to be drained via gravity using falls within the external works and collected in gullies and linear drainage before entering the onsite public surface water system and discharging directly into West Waterloo Dock.

Areas of external car parking – to be drained via gravity using falls within the external works and collected in gullies and linear drainage before entering the onsite public surface water system via a petrol interceptor and discharged directly into West Waterloo Dock.

No surcharging of access chambers/ manholes during the 1 in 2 year storm event.

No surface flooding will occur for all storm events up to and including the 1 in 30 year storm event.

Under the 1 in 100 year storm event plus 30% climate change allowance, on site flooding is acceptable. Site levels will be designed to ensure flood water remains on site whilst also not effecting the residents.

The FRA has established that the attenuation requirements for the 30 year and 100 year (including 30% climate change) rainfall events can be accommodated by allowing the water level in the dock to raise temporarily.

The volume range for the 30 year and 100 year storm events entering West Waterloo Dock ranges between 490m3 and 820m3. This gives a theoretical water level increase in West Waterloo Dock from this development of 88mm and 146mm respectively.

Consideration of the 1 in 100 year storm event plus 40% climate change allowance.

Detailed design will look at using green roofs, permeable paving and tree pits to reduce the volume entering West Waterloo Dock where possible.

Approval of flows entering the drainage system by relevant and interest parties will be required to proceed with detailed design.

## 12.6 Environmental Impacts and Significance of Effects

### 12.6.1 Construction Phase

This section identifies the possible temporary impacts that this site may have on water quality or resources, these are as follows:

The movement of vehicles causing soil erosion, possible increased sediment load in runoff; (**impact: moderate**)

The removal of existing groundcover leading to increased erosion and sediment movement; (**impact: moderate**) and

Potential contaminants including fuel oils from mechanical plant, dirty water runoff from the site, cement, and general debris from the construction site (**impact: moderate**).

The effect of construction on the local water environment will vary depending on the operating standards of the contractor. Accidents and unforeseen circumstances can, however, affect every site i.e. oil spillage, burst water main etc. (**impact: moderate)**.

This large construction site will normally require the storage of chemicals including oils and fuel. The spillage of chemicals through accident or vandalism is a possibility but the likelihood and consequences of any such incident can be minimised by good site practices and management systems. The significance of effect is therefore assumed to be **negligible**.

It is considered that there will be no significant increases in flood risk at the site during the construction phase. The significance of effect is therefore assumed to be **negligible**.

Potential site strip of any existing materials will create a potential increase in surface water run-off to lower lying level areas of the Site and silt build-ups.

Following construction of the new buildings slabs, water will run off to permeable areas. The significance of effect is therefore assumed to be **negligible** during construction.

The construction sequence of the surface water drainage system will be carefully considered at the detailed design stage to ensure the route of the surface water is directed away from the proposed and existing developments. The significance of effect is therefore assumed to be **negligible** during construction.

### 12.6.2 Operation Phase

Alteration of runoff patterns and a possible decrease in infiltration to groundwater may occur due to the construction of hard paving, buildings and drainage infrastructure on greenfield land (**impact: high**).

The Proposed scheme have a potential affect to water quality, with increased sediment load to aquifers and pollution from household activity, as well as increased flows to the existing foul water drainage network (**impact: moderate**).

The new development will have the potential to increase the intensity of storm runoff due to increased impervious areas. Without mitigation methods offsite infrastructure would likely flood causing major disruption to the surrounding areas and onsite (**impact: moderate**).

# 12.7 Mitigation Measures

## 12.7.1 Construction Phase

The risk of pollution can be significantly reduced by the adoption of good working practices and strict adherence to the Environment Agency's Pollution Prevention Guidelines. The key guidelines are as follows:

- PPG 1 General guide to the prevention of water pollution;
- PPG 2 Above ground oil storage tanks;
- PPG 5 Work in, near or liable to affect a watercourse;
- PPG 6 Working at demolition and construction sites; and
- Guidelines on silt pollution and how to avoid it. (Control of Pollution Regulations 2001 S1 2954).

Mitigation measures that will be followed include:

PPG 6 states that all fuel, oil and chemical storage will be sited on an impervious base within a bund and secured. The base and bund walls must be impermeable to the material stored and of an adequate capacity. Detailed guidelines concerning above ground oil storage tanks are available in PPG 2.

Leaking or empty oil drums must be removed from the Site immediately and disposed of via a licensed waste disposal contractor.

In the event of oil spill or leak there will be adequate on-site availability of oil spill cleanup equipment including absorbent material and inflatable booms.

Drip trays under mobile plant will be employed to prevent pollution from leaking oils or liquids.

Sediment trap matting will be installed down-gradient of any construction activities adjacent to or over watercourses.

Preparation of incident response plans are to be made prior to construction. The action plan will be present on Site throughout construction to inform contractors of required interventions in the event of a pollution incident.

Oils, Chemicals and Liquids stored on site should be positioned where the risk is minimal. Suitable locations are flat areas of ground, located on material with low permeability, such as existing hardstanding, where any runoff can be easily contained and controlled.

All more vulnerable residential properties are located approximately 600mm above the required minimum levels for residential use as defined in Appendix 12C.

Less vulnerable uses, such as commercial and storage are located at lower ground floor level are set below the minimum required for commercial use as defined in

Appendix 12C and will require flood resilient construction methods in accordance with current standards and guidance.

The Emergency Access Route level of a minimum 7.250m AOD level is not infringed with this development.

Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.

The surface water network has been designed to accommodate the 1 in 100 year storm rainfall event plus an allowance for climate change particular to the requirements of the development.

Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.

Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.

The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer, must be of a suitable nature and quality for their intended use.

The detailed design of the system and product selection for the storage and pipe solution will be made at the detailed design stage when all the site constraints can be considered. There are numerous products available for storage of water below ground and care will be needed to ensure that the right product is chosen for the final loading conditions.

A Section 106 application will be required for the connection to the public sewer. United Utilities will provide details of how the connection be allowed to be made to their assets.

### 12.7.2 Operation Phase

It may be that the exceedance flows above the 1 in 30 year storm rainfall event are stored within the site partially above ground, on non-habitable external landscaping, parking or other space.

As the flows are generally being attenuated on site and within SuDS features there will be a period after storm events where the network is still partially or fully surcharged and is draining down.

Where this surcharging is still present after 48hrs appropriate action should be taken.

A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

It is assumed that the maintenance of the drainage network will be the responsibility of an on-site facilities management team.

A copy of the final construction drainage layout should be provided in the final Operations and Maintenance Manual.

It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.

Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.

Long-term management practices include monthly sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.

During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris or litter

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the filter drains and the upstream/downstream chambers.

Pumping should only be used to facilitate drainage for those parts of the site

Mitigation measures can relate to design, construction or the activities associated with the completed development.

## 12.8 Residual Effects

The proposed scheme will result in an effect on the Site's surface water run-off which will have a moderate effect on the existing site post-mitigation.

The current design of the drainage and hardstanding and open-space areas within the development makes use of recommendations given under the SUDS guidance. This will reduce surface runoff volumes and intensities which will have a negligible effect post-mitigation.

The temporary mitigation measures proposed for the construction stage largely relate to good site working practices which will have a negligible effect post-mitigation.

Overall the development should have a negligible impact on the water environment.

The new foul drainage system can be connected to the new separate foul sewer system being constructed below the Link Road, where a 50,000L storage tank has been designed for.

The pre-mitigation significance of effect without the mitigation methods employed will result in an increase in flooding on the site and surrounding areas. The impact would therefore be major.

## 12.9 Cumulative Impacts

When assessing the site for the likely significant effects of the proposed scheme it has also been necessary to consider the following schemes in a cumulative assessment for the site as referenced in Table 3.3 of this ES.

- Plot CO4
- Plot CO6
- Northern Link Road
- Isle of Man Ferry Terminal
- Liverpool Waters Outline Consent

The above developments, as does this proposed scheme follow the principles set out in Appendix 12C and from the governing bodies (i.e. EA and LLFA).

It is noted that there is sufficient capacity within West Waterloo Dock to temporarily raise the dock water levels if all developments are discharging into this.

The surface water strategy for the proposed scheme will incorporate the use of SUDS systems were possible and feasible to reduce the volume discharging into West Waterloo Dock. The proposed scheme will therefore not have any significant effect when reviewed as a cumulative impact.

## 12.10 Assessment Summary and Conclusion

The site is part of the historic dock network on Liverpool's waterfront and had remained derelict and unused for some time. As such, surface water runoff is believed to drain directly into West Waterloo Dock, as there are no existing public sewers to connect to.

The development is predominantly within Flood Zone 1 as defined by the Environment Agency, with less than 4% within a Flood Zone 3. The risk of flooding from rivers, seas and surface water is generally low subject to suitable design and maintenance of the proposed drainage systems.

The proposed scheme has been designed to take flood risk into account where possible.

All more vulnerable residential properties are located approximately 600mm above the required minimum levels for residential use as defined in Appendix 12C.

Less vulnerable uses, such as commercial and storage are located at lower ground floor level are set below the minimum required for commercial use as defined in

Appendix 12C and will require flood resilient construction methods in accordance with current standards and guidance.

The Emergency Access Route level of a minimum 7.250m AOD level is not infringed with this development.

This Flood Risk Assessment has demonstrated that the development is generally at low risk from all forms of flooding applicable to this development and would not increase the risk of flooding elsewhere.

A flood management plan is recommended for the proposed scheme and general advice is given with the FRA. This can be developed at the detailed design stage and following completion with the buildings managers and residents.

The development provides the opportunity to reduce flood risk overall with the use of sustainable drainage systems to attenuate surface water run-off from the site.

The proposed scheme will collect rainfall from roofs, hardstanding and car parking and discharge this volume directly into West Waterloo Dock. Following discussions with the LLFA, no betterment is required, and the FRA has established that the volume of surface water from the peak storms can be accommodated within the dock itself.

As the flow will discharge directly into West Waterloo Dock, consideration has been given in the event flood water levels as noted in the FRA are above the outfall and prevent flow from the development.

The development will be designed to avoid surcharging access chambers/ manholes during the 1 in 2-year storm event, avoid flooding on the development during the 1 in 30 year storm event and ensure flooding within the 1 in 100 year storm event (plus climate change) is managed on site away from people and property.

Although not used for filtration, other SUDs options may be viable to store peak flow volume on site. These include green roofs, permeable paving and tree pits.

Foul water will be collected from the buildings in a separate foul drainage network before discharging into the main Liverpool Waters drainage network to be constructed as part of the Link Road.

Approval of flows entering the drainage system by relevant and interest parties will be required to proceed with detailed design.

The surface water drainage strategy is summarised as follows:

Building rooftops – to be drained under gravity before entering the onsite public surface water system discharging directly into West Waterloo Dock.

Areas of external hardstanding– to be drained via gravity using falls within the external works and collected in gullies and linear drainage before entering the onsite public surface water system and discharging directly into West Waterloo Dock.

Areas of external car parking – to be drained via gravity using falls within the external works and collected in gullies and linear drainage before entering the onsite public surface water system via a petrol interceptor and discharged directly into West Waterloo Dock.

No surcharging of access chambers/ manholes during the 1 in 2 year storm event.

No surface flooding will occur for all storm events up to and including the 1 in 30 year storm event.

Under the 1 in 100 year storm event plus 30% climate change allowance, on site flooding is acceptable. Site levels will be designed to ensure flood water remains on site whilst also not effecting the residents.

The FRA has established that the attenuation requirements for the 30 year and 100 year (including 30% climate change) rainfall events can be accommodated by allowing the water level in the dock to raise temporarily.

The volume range for the 30 year and 100 year storm events entering West Waterloo Dock ranges between 215m3 and 425m3. This gives a theoretical water level increase in West Waterloo Dock from this development of 38mm and 76mm respectively.

Consideration of the 1 in 100 year storm event plus 40% climate change allowance.

Detailed design will look at using green roofs, permeable paving and tree pits to reduce the volume entering West Waterloo Dock where possible.

Approval of flows entering the drainage system by relevant and interest parties will be required to proceed with detailed design.

## Table 12.2: Summary of Effects

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Movement of soils into drainage and watercourses | **Negligible** | Consideration of Environment Agency pollution prevention guidelines as outlines in statement. Testing of waters | **Negligible** |
| Leaks and spills from oils or liquids stored on site. | **Moderate – Major Adverse** | Consideration of Environment Agency pollution prevention guidelines as outlines in statement. Testing of waters | **Negligible** |
| Site strip | **Moderate Adverse** | Consideration of Environment Agency pollution prevention guidelines as outlines in statement. Testing of waters | **Negligible** |
| Increased impermeability of the development | **Moderate Adverse** | Drainage designed in accordance with FRA and drainage strategy findings. | **Negligible** |
| Water quality | **Moderate Adverse** | Drainage designed in accordance with FRA and drainage strategy findings. | **Negligible** |

# 13 Wind

## 13.1 Introduction

This chapter presents an assessment of potential impacts on Wind associated with the proposals, described in Chapter 2: Scheme Description.

This chapter details the wind microclimate assessment undertaken for the proposed development. The purpose of the study is to consider the impact of the proposed buildings upon local wind patterns within and around the site, with the emphasis of the analysis being on the impact of wind on the comfort and safety of users at ground level.

This chapter provides full details of the methodologies, assumptions and limitations of this study. It also contains a full discussion of the predicted impacts and subsequent effects.

This chapter is supported by the following figures:

- Figure 13.1: Annual wind rose for the development site
- Figure 13.2: Site location and surrounding buildings
- Figure 13.3: CFD model – existing site with existing surroundings
- Figure 13.4: CFD model – proposed development (red) with existing surroundings
- Figure 13.5: CFD model – proposed development (red) with mitigation measures (porous wind screens and canopies) and existing surroundings
- Figure 13.6: CFD model – proposed development (red) with existing surroundings and future development (yellow)
- Figure 13.7: Existing site with existing surroundings – annual composite comfort map (12 directions)
- Figure 13.8: Existing site with existing surroundings – winter composite comfort map (12 directions)
- Figure 13.9: Existing site with existing surroundings – annual composite safety map (12 directions)
- Figure 13.10: Proposed development with existing surroundings – annual composite comfort map (12 directions)
- Figure 13.11: Proposed development with existing surroundings – winter composite comfort map (12 directions)
- Figure 13.12: Proposed development with existing surroundings – annual composite safety map (12 directions)
- Figure 13.13: Proposed development with mitigation – annual comfort map (12 directions)

- Figure 13.14: Proposed development with mitigation –winter composite map (12 directions)
- Figure 13.15: Proposed development with mitigation –annual comfort map (12 directions)
- Figure 13.16: Proposed development with future consented developments – annual composite comfort map (12 directions)
- Figure 13.17: Proposed development with future consented developments – winter composite comfort map (12 directions)
- Figure 13.18: Proposed development with future consent developments – annual composite safety map (12 directions)
- Figure 13.19: Proposed landscape strategy

## 13.2 Methodology, Scope and Significance Criteria

A CFD (Computational Fluid Dynamics) model of the proposed development buildings has been constructed to allow the wind environment around the development to be simulated and analysed.

The present study assesses the following scenarios:

- Existing site with existing surroundings;
- Proposed development with existing surroundings;
- Proposed development with mitigation measures and existing surroundings;
- Proposed development with mitigation measures and cumulative future surroundings.

The cases described above have been undertaken using quantitative studies, and are presented in Figure 13.3 to Figure 13-6.

The geometries and layouts of the C02 buildings investigated in this report are finalised designs. A quantitative assessment of the likely wind environment has been performed based on the design scheme, and quantitative judgements made in order to identify areas of potential concern. This is a robust assessment based on the experience of the consultant engineer and supported by additional information provided by CFD studies.

### 13.2.1 Legislative and Policy Framework

#### 13.2.1.1 National Planning Policy

There are no national codes of practice or legislative policies relating to the assessment of environmental wind flows in the built environment.

The UK wide National Planning Policy Framework (NPPF) came into force in March 2012. There are no national planning policies directly relating to wind microclimate issues; however, the benefits of a high quality built environment are emphasised in the NPPF. An example of this is presented in section 12: "…using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;"

The impact of environmental wind on pedestrian spaces and the subsequent suitability of these spaces for planned usage are described by the Lawson Comfort Criteria (LCC) (Lawson 2001), which are recognised by Local Planning Authorities (LPAs) as a suitable benchmark for wind assessments. LCC has been applied in the wind assessment of the Application Site.

#### 13.2.1.2 Regional Planning Policy

There is no specific national or regional legislation or policy guidance for the assessment of the local wind microclimate impact that a new development has on the comfort and safety of users.

#### 13.2.1.3 Local Planning Policy

The Pre-submission Draft Liverpool Local Plan January 2018 describes in the Policy UD5 New Buildings: "All new buildings should be designed to the highest design standards, based on a clear rationale, and aesthetic based on the characteristics of the area. Design proposals for new buildings should demonstrate that:

*"Orientation and micro-climate, overlooking and interface issues that may impact on existing structures or neighbouring plots have been considered."*

Policy UD2 Development Layout and Form states that: "Development proposals should demonstrate that the layout and form of the proposal ensures that:

*"The design has been considered from both a macro and a micro-scale, with adequate responses to issues of skyline impact, scale, relationship to existing structures, function, amenity, and its relationship to the public realm"*

### 13.2.2 Design Criteria (standards)

In order to assess the wind comfort around the site, comfort maps have been created. The maps cover the whole site on a plane 1.5 m above ground level, with wind speeds measured for 12 wind directions in 30° increments measured clockwise from north at 0°. A composite map is created by analysing the results of the 12 wind direction wind speeds and the long-term weather wind database translated to the development site.

Microclimate comfort strongly depends on an individual's activity and so has been defined separately for each activity in terms of an average (mean) wind speed exceeded for a certain percentage of the year.

The pedestrian comfort criteria (Lawson 2001 [1]) have been developed around the Beaufort scale, extending its applicability to environments in and around buildings and can be seen in Figure 13.1. The Beaufort scale has been included for reference only and can be seen in 13.2

It is considered that impacts that breach the "uncomfortable" threshold could be significant and it is these impacts that are considered further.

**Table 13.1: Urban Pedestrian Activities for Sensitivity Evaluation**

| Lawson Comfort Criteria Classification | Use of Space | Maximum acceptable combination of wind speed and occurrence | | |
|---|---|---|---|---|
| | | Beaufort Scale | (m/s) | Allowable occurrence |
| Safety (Distress) | General public | B7 | 15 | 0.025% |
| Uncomfortable | General public | B6 | 14.1 | 0.01% |
| 10 | Pedestrian Business Walking | B5 | 10.95 | 6% |
| 9 | Pedestrian Walking around Buildings | B5 | 10.95 | 2% |
| 8, 7 | Pedestrian Walk through | B4 | 8.25 | 4% |
| 6 | Entrances/ Standing | B3 | 5.6 | 6% |
| 5 | Sitting | B3 | 5.6 | 3% |

**Table 13.2: The Beaufort scale for wind on land**

| Beaufort Force | Hourly-average wind speed (m/s) | Description of wind | Noticeable wind effect |
|---|---|---|---|
| B0 | < 0.45 | Calm | Smoke rises vertically |
| B1 | 0.45 - 1.55 | Light air | Direction shown by smoke drift but not by vanes |
| B2 | 1.55 - 3.35 | Gentle breeze | Wind felt on face; leaves rustle; wind vane moves |
| B3 | 3.35 - 5.60 | Light breeze | Leaves & twigs in motion; wind extends a flag |
| B4 | 5.60 - 8.25 | Moderate breeze | Raises dust and loose paper; small branches move |

| Beaufort Force | Hourly-average wind speed (m/s) | Description of wind | Noticeable wind effect |
|---|---|---|---|
| B5 | 8.25 – 10.95 | Fresh breeze | Small trees, in leaf, sway |
| B6 | 10.95 - 14.10 | Strong breeze | Large branches begin to move; telephone wires whistle |
| B7 | 14.10 - 17.20 | Near gale | Whole trees in motion |
| B8 | 17.20 - 20.80 | Gale | Twigs break off; personal progress impeded |
| B9 | 20.80 - 24.35 | Strong gale | Slight structural damage; chimney pots removed |
| B10 | 24.35 - 28.40 | Storm | Trees uprooted; considerable structural damage |
| B11 | 28.40 - 32.40 | Violent storm | Damage is widespread; unusual in the U.K |
| B12 | > 32.40 | Hurricane | Countryside is devastated; only occurs in tropical countries |

Uncomfortable conditions are experienced at wind speeds above Beaufort B6. Additional mitigation for these areas will be of benefit and will improve comfort conditions. Wind speeds above Beaufort B7 indicate that conditions are not suitable for pedestrian activities to be carried out safely, and therefore mitigation will be required in these cases in order to bring conditions to within safety limits.

### 13.2.3 Receptor Sensitivity

Sensitive receptors in respect of wind microclimate are the pedestrians using the site and the occupants of the application site and surrounding buildings. Their sensitivity and the magnitude of any change will determine the significance of impact. Sensitivity to wind is dependent upon the activity undertaken, in line with the LCC, as presented in Table 13.3

**Table 13.3: 3 Urban Pedestrian Activities for Sensitivity Evaluation**

| Receptor Sensitivity | Activity |
|---|---|
| High | Sitting, entrance doors |
| Moderate | Entrance doors, pedestrian standing, walkthrough |
| Low | Pedestrian walkthrough, roads and car parks |
| Negligible | Areas with non-pedestrian activities |

### 13.2.4 Effect Significance

The impact on receptors, i.e. pedestrians, is split into the categories below.

A major impact is one that impacts the safety of the receptors, i.e. that breaches the distress criteria described in 13.1 above, and is considered to be of major significance for the purposes of this assessment. These types of impacts will require detailed and careful mitigation.

Moderate and minor impacts are not considered to cause significant effects. However, in order to reduce the impacts further and improve the comfort of receptors, mitigation measures to reduce the effects from moderate (uncomfortable) to minor (tolerable/negligible) have been specified as appropriate.

The assessment of significance refers to the LCC as set out in Table 13.1. To determine the significance of the impact of the proposed development on the wind environment, comparison can be made with the conditions on the existing site. However, because the pedestrian use of a site can change markedly pre- and post-development, it is considered that assessment based upon the suitability of the site for the desired pedestrian use is the most informative and relevant.

The criteria used to assess the nature of the wind impacts are as follows:

Adverse – detrimental or negative impacts to an environmental resource or receptor compared with the baseline or the intended use of the site;

Beneficial – advantageous or positive impact to an environmental resource or receptor compared with the baseline or the intended use of the site.

Note that major effects are considered to be ‘significant’.

**Table 13.4: Significance criteria**

| | Description |
|---|---|
| Major | Any impact that affects safety (or distress) |
| Moderate | Any impact affecting pedestrian comfort where conditions change from suitable for existing activities to unsuitable for proposed activities is to be considered moderate, and vice versa for positive impacts |
| Minor | Conditions that are marginal with respect to the criteria or criteria are met during key seasons only |
| Negligible | No or minimal impact on conditions that are likely to be experienced |

### 13.2.5 Methodology

This section defines the different aspects of this type of study. Consideration is given to the characteristics of the local area to facilitate assessment. A wind frequency analysis of the site is carried out and from this analysis all wind directions are analysed. The results of this assessment are then available to assist the overall design process.

#### 13.2.5.1 Wind Data Analysis

For analysis of wind behaviour, it is necessary to know the relevant wind data for the case. Velocity fluctuation and directional variance are hard to measure with great accuracy.

Both the wind speed frequency and its direction are required. This data is commonly presented in the form of wind speed and wind frequency distribution diagrams (wind roses). Site information for Liverpool is shown in Figure 13.1. Data is usually provided for average hourly wind speeds at 10m above ground level. This data is monitored and recorded from meteorological stations all over England and reported by the Met Office.

Weather data has been obtained from the Met Office for Speke Airport. The data collected was hourly average wind speeds for the 10-year period from 1 January 2009 to 31 December 2018.

The wind has been translated from Speke Airport to the development site. The wind translation uses the theoretical basis of the method set out in the help file of the BREVe 3.2 software, and in the Designer's Guide to Wind Loading of Building Structures, Part 1 (1985) by Nick Cook. The method accounts for the changes of the terrain roughness between the measured site and the target site; the resultant wind rose is included in this report.

#### 13.2.5.2 Direction Frequency

Figure 13.1 shows the annual directional velocity distribution for the proposed site, once the wind has been translated from Speke Airport.

The wind speed for the site can be established for both comfort and safety analysis based on a frequency of occurrence as indicated in Figure 13.1

As can be seen from Figure 13-1,the wind in Liverpool comes predominantly from the west and southeast, with the strongest winds (indicated by the widest, not the longest, lines) also coming from these directions. Moderate occurrences of north-westerly and south-westerly winds are also observed.

## 13.3 Consultation

No external consultations were undertaken for this assessment.

## 13.4 Limitations and Assumptions

### 13.4.1 Proposed Development

#### 13.4.1.1 Building Geometry

A quantitative assessment of the likely wind environment has been performed via CFD simulations, based on the architectural drawings provided by Ollier Smurthwaite Architects, received on 21/10/19.

The site location is shown in Figure 13-2 and images of the modelled geometry are shown in Figure 13.3 to Figure 13-6.

The site is located to the northwest of Liverpool City centre. The terrain slopes down slightly towards the west. The site is immediately to the east of the River Mersey. To the east of the site is East Waterloo Dock and existing apartment buildings, to the north is empty land and to the south is mostly empty land with some isolated existing buildings.

The current site is empty, and covers part of West Waterloo Dock. Due to this exposure, as well as the proximity of the site to the open water to the west, the site is likely to be exposed to wind from some of the prevailing directions, i.e. westerly winds. To the northeast, east, southeast and south of the site are several existing buildings that may offer some shelter from these wind directions.

#### 13.4.1.2 Intended Usage

Knowledge of the intended usage of the site is required in order to assess the effects of the wind environment on pedestrian comfort. For neighbouring buildings and open spaces, the likely pedestrian activities will be pedestrian walkthrough and business walking to access the surrounding buildings. For the proposed development, information regarding the intended usage of different areas and indicative building plots is taken from the design information provided by the design team. This includes the streets and paths proposed for pedestrians, and additional areas where outdoor activities are likely to take place.

Several building entrances exist along the eastern and western and possibly southern elevations of all blocks. It is expected that the areas around these entrances would be used for pedestrian walkthrough. Car park areas exist at the northern side of the site, as well as in-between the blocks.

### 13.4.2 CFD Modelling Assumptions

#### 13.4.2.1 Approach

The physical layout of the site as described was analysed using a 3D CFD model. CFD modelling involves the solution of the fundamental equations of fluid motion using numerical techniques. The region of interest is divided into numerous small volumes, or cells, and the equations are solved within each cell. Values of the variables that are solved in the model are determined in each cell and so a comprehensive assessment of velocity variation within the calculation domain is obtained. To improve the resolution of the results, the computational cell size has been reduced in the areas of most interest. This ensures that large gradients of velocity at street level are modelled accurately.

Advice from the COST 14 recommendations [2] has been followed for setting up the mesh domain, taking care of the near-wall and blockage ratios.

#### 13.4.2.2 Model Extents and Detail

The drawings and models are described in detail within this section. For buildings outside the development boundary, a 3D context model provided by Virtual Planit was used, and updated to match footprints and building heights from aerial survey data. The proposed buildings themselves were modelled in greater detail, utilising drawings provided by Ollier Smurthwaite Architects.

The CFD model is contained within one single domain. This domain includes the proposed development and the surrounding buildings and features, around which the wind environment is analysed. Surrounding buildings and terrain were included in the model up to a radius of approximately 450m from the proposed buildings. A total simulation domain of radius 750m from the proposed buildings was modelled. This distance is appropriate as it explicitly contains all buildings and structures surrounding the proposed development that are likely to affect the wind flows around it, and it is in line with the recommendations in COST Action C14 [2]. It is also mentioned in the COST Action C14 document that a radius of 300m is sometimes modelled in wind tunnel tests.

The typical edge length of the computational cells in this domain is approximately 1 to 2m, with greater cell sizes at points further from the development buildings. A refined layer of cells exists adjacent to the ground, to allow for an accurate prediction of pedestrian level wind speeds. The total number of computational cells is approximately 26 million for this study.

Roughness has been applied in the outer region beyond the modelled buildings, to account for the presence of buildings and terrain features; corresponding to the urban city-centre terrain with an average building height of 10m and a plan-area density of 30%.

#### 13.4.2.3 Atmospheric Boundary Layer

The upwind boundaries of the CFD model were prescribed with an atmospheric velocity and turbulence profile corresponding to natural winds. The atmospheric velocity profile was modelled using a log-law, based on communications with ANSYS (i.e. the developers of the CFX CFD software used). This log-law is also described in reference [3].

The downwind and upper boundaries were represented as pressure opening boundaries. These are representative of the atmosphere surrounding the proposed development. They allow air to be entrained into the model domain or air to flow out of the domain.

For each of the 12 wind directions, a single, steady-state RANS (Reynolds Averaged Navier-Stokes) calculation was undertaken using the commercial ANSYS CFX software. Turbulence was modelled using a k-ε model, with a production limiter used to ensure realistic flow predictions close to stagnation points. This method allows for the assessment of mean wind speeds for the development.

### 13.4.3 Lawson Comfort Assessment

The Lawson assessment has included a direct comparison between the baseline conditions (existing) and the proposed development. A quantitative assessment of the likely wind environment has been carried out, with any areas of potential concern identified.

## 13.5 Baseline Conditions

This section studies the comfort and safety of pedestrians in the baseline condition, i.e. the existing site with existing surroundings.

The wind conditions have been analysed for the whole year, as well as for all four seasons. Conditions for the whole year and winter are presented and discussed below.

The existing site is empty, closed to pedestrian access and covers part of West Waterloo Dock, therefore there are no current expected pedestrian activities. There are several residential buildings to the east and some isolated existing buildings to the south. The site presents an open fetch to the north and west.

The current wind environment external to the site is predominantly influenced by the existing/occupied surrounding buildings. In addition, there is modest influence from existing walls and terrain features.

The annual comfort map for the existing site is shown in Figure 13.7. Wind speeds are shown to be suitable for pedestrian standing and walking at the existing site location. At the western edge of the site, adjacent to the River Mersey, conditions are more exposed and would be uncomfortable for walking.

Conditions are more exposed during winter, as expected. On windy days the site is likely to feel exposed as there are no other surrounding buildings. The winter comfort map for the existing site is shown in Figure 13.8. Larger areas suitable for pedestrian walkthrough are shown across the site.

Higher winds speeds more suitable for business walking are observed at the western edge of the site, adjacent to the River Mersey.

No other particular areas of wind acceleration are observed, as a result of the site being empty and there being no buildings/structures to create façade downwash or corner accelerations. However, on particularly windy days, the site is likely to feel quite exposed due to its open and empty nature, and occasional wind speeds may be felt above the standing and walking categories.

In terms of safety criteria, it can be seen in Figure 13.9 that there are a few issues existing along the western and eastern sides of the existing site. These results were used for comparison with the safety map for the proposed development.

## 13.6 Environmental Impacts and Significance of Effects

This section studies the comfort and safety of pedestrians in the vicinity of the proposed development, i.e. the proposed development with existing surroundings.

The wind conditions have been analysed for the whole year, as well as for all four seasons. Conditions for the whole year and winter are presented and discussed below.

The annual comfort map, shown in Figure 13.10, shows windier conditions in some areas, when compared with those of the existing site. The introduction of the proposed development has resulted in some increase in wind speeds on and around the site. Wind acceleration is observed in several areas, due to the height and orientation of the buildings. However, some areas of shelter are also created, where conditions are improved compared to the baseline.

Wind acceleration is observed at the location of the entrance canopies of blocks A and B. The conditions at these locations are not suitable for entrances. This is a moderate adverse effect. Therefore, required mitigation would include porous windscreens along the western façades of both buildings.

Wind acceleration is observed in-between blocks A and B, as well as C and D, caused by wind funnelling through these areas despite the existing landscape and windscreens in these areas. Due to the wind creating façade downwash, the conditions at the corners of blocks C and D are not suitable for leisurely walking. These are moderate adverse effects. The mentioned locations coincide with the places where safety issues arise and therefore these require mitigation. This can be achieved through implementation of additional porous windscreens minimum 3 m high at the corners of the buildings and along the western facades of blocks A and B.

The winter comfort map shows more exposed conditions. It can be seen in Figure 13.11 that the areas of wind acceleration are between blocks C and D, at the northwest corner of block C, as well as in-between the two rows of the buildings (within the car park area). These areas are shown not to be suitable for leisurely walking. These are moderate adverse effects. It is recommended that mitigation within these areas is implemented, such as porous screens, landscape or a canopy. Some of the mentioned areas may also exceed the safety threshold and therefore mitigation would be required. It should be noted that as the development is on the waterfront, pedestrians would generally expect conditions to be somewhat windier than in less exposed areas, and therefore would be somewhat more accepting of higher wind speeds.

In terms of safety, issues arise between blocks A and B, as well as between C and D, at the northwest corner of block C, at the location of the canopies for blocks A and B, as well as on the road to the south of the site. For the safety issues between the buildings and at the corners, porous screens are required at the corners, as well as on the western facades of blocks A and B (with screens adjacent to the canopies themselves). In order to help reduce the safety issue across the road to the south of the development, it was proposed to implement a canopy along the entire western façade of blocks C and D, as well as an additional windscreen on the southwest corner of block D between the canopy and existing boundary wall. Safety issues are considered major adverse effects.

During construction, localised wind acceleration is likely to result in a gradual transition to the new conditions. It is possible there will be temporary localised wind acceleration across the site. Since the effects are short-term and local, and the normal sheltering from standard site hoardings is expected to be sufficient, negligible effects are expected.

There is the potential for wind conditions to differ from the completed scheme, due to differing exposures as the proposed development is built relative to prevailing winds. Pedestrian perception of conditions, in the surrounding area, is likely to be as much affected by expectations of conditions around a building site as by the actual wind speeds, with pedestrians more likely to tolerate adverse conditions as they can appreciate it is a temporary situation. The development itself represents a more significant structure with respect to wind than at any stage during construction.

## 13.7 Mitigation Measures

Mitigation measures in the form of porous wind screens and canopies at several specific locations were recommended and implemented into the model. The mitigation measures were refined and remodelled twice in order to successively improve the wind conditions on and around the site. The final results are shown in this chapter.

The annual comfort map for the proposed site after implementation of the required mitigation is presented in Figure 13.3. The previously observed areas of wind acceleration beneath the entrance canopies on blocks A and B have been reduced, and conditions are now suitable for entrances. This is a moderate beneficial effect. Similarly, conditions between blocks A and B and C and D, as well as at the corners of blocks C and D, have also improved and are now suitable for walking. These are also moderate beneficial effects. Two smaller areas around the south of the site are shown to be more suitable for pedestrians walking around buildings, and may therefore feel too exposed for walking.

The winter comfort map shows more exposed conditions (Figure 13.14), although conditions are improved compared to the previous scenario. These are minor beneficial effects. Acceleration is observed in the areas between blocks C and D, as well as within the car park area (between the two rows of the buildings). These areas may feel more exposed during winter and may occasionally feel uncomfortable for walking. However, this should be acceptable for the car park areas.

As seen in the Figure 13.15, most of the safety issues observed within the site have been removed. This is a major beneficial effect. A few small areas remain, however some of these are immediately adjacent to the buildings' facades where people would not be expected to walk. The remaining issues will be resolved as the wind mitigation strategy is refined further throughout the design process.

The safety issue across the road at the south of the development has been shifted away from the pedestrian footpath. This is a major beneficial effect. The conditions in the pedestrian area within the under croft of block B have significantly improved after the implementation of mitigation. Therefore, pedestrians entering the site along the pedestrian pathway from the Ferry Terminal would feel more sheltered as they enter the development.

## 13.8 Residual Effects

With the refinement of the mitigation strategy as the design progresses, the remaining safety issues on the site will be mitigated.

The safety issue observed over the road to the south of the development could be managed using an operational management strategy, this can be agreed with the LPA as part of a suitably worded condition and will allow the proposed scheme to help mitigate effects on windier days. It should be noted that the majority of the area will be used for the Isle of Man Ferry Terminal car queuing lanes, and is therefore not expected to have significant pedestrian activity. Furthermore, the wind acceleration driving this issue is mainly caused by winds from the west of the site, which are likely to flow somewhat parallel to this road, reducing the impact on any high-sided vehicles.

## 13.9 Cumulative Impacts

From the annual comfort map in Figure 13.6, the site conditions around the site are suitable for walking, with some areas suitable for sitting and standing. There are a few smaller areas where the conditions may feel uncomfortable and these include the area southwest to block D, as well as south of block A. These are likely to improve as refinement of the mitigation strategy continues throughout the design process to resolve the remaining safety conditions.

For the winter comfort map, it can be seen in Figure 13.7 that as expected, the conditions are less comfortable. The areas of higher acceleration are between the two rows of buildings, as well as between blocks C and D, and small areas on the north of the site where the conditions are not suitable for leisurely walking.

In terms of the safety, as seen in Figure 13.8 the future Ferry Terminal Building has no negative impact on the safety conditions compared to the scenario with the proposed building with mitigation.

Plot C03 is located next to plot C02, however the final design of this building will dictate the final wind patterns around it, and between it and plot C02, this has not been finalised yet due to it's outline status. It is likely that façade downwash off the western façade will result in corner accelerations around the north-western and south-western corners of the building. Acceleration around the south-western corner will also likely result in wind acceleration between the building and block C03 of plot C02. As with any other development in this area, plot C03 should be designed to mitigate any resulting significant wind acceleration around it.

## 13.10 Assessment Summary and Conclusion

A wind microclimate analysis has been undertaken for the proposed C02 buildings for the Liverpool Waters development in Liverpool.

When compared to the baseline, the proposed development is generally likely to increase the wind conditions as well as create some areas of shelter around the site under certain wind conditions/directions. However, there are some areas where minor to moderate adverse effects may be experienced, mainly caused by increased façade downwash and corner accelerations around the proposed buildings, as well as wind funnelling. These identified impacts may occasionally cause discomfort to pedestrians and users of the site.

Some small areas exceeding the safety threshold were identified within the site, however these will be resolved as the mitigation strategy is refinement further throughout the design process. A larger area exceeding the safety threshold was observed at the south of the development. This can be resolved through agreeing an operational management strategy with the LPA through a suitably worded condition.

Mitigation is recommended to resolve the safety issues at the northeast corner of block C, between blocks C and D, on the western elevation and northeast corner of block A and south to the development.

With the addition of the above mitigation measures, all areas of the development are considered fit for purpose.

**Table 13.5: Summary of Effects**

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Area of wind acceleration beneath the entrance canopies on blocks A and B | Moderate | Porous wind screens | Negligible |
| Areas of wind acceleration between blocks A and B and C and D, as well as at the corners of blocks C and D | Moderate | Porous wind screens and canopies across the western elevation of blocks A and B | Negligible |
| Wind acceleration leading to safety issues at the northwest corner of block D, between blocks A and B and beneath the entrances canopies on blocks A and B | Major | Porous wind screens | Negligible |
| Remaining area of wind acceleration between blocks C and D in winter | Moderate | Local ground level porous screens | Negligible |
| Remaining area of wind acceleration between block C and D leading to a safety issue | Major | Local ground level porous screens | Negligible |
| Remaining area of wind acceleration to the northeast corner of block A leading to a safety issue | Major | Local ground level porous screens and/or evergreen landscape | Negligible |
| Remaining small area of wind acceleration immediately on the west elevation of block A leading to a safety issue | Major | Not required, as pedestrians are not expected to walk immediately against the facade | Negligible |
| Remaining small area of wind acceleration on the northeast corner of block C leading to a safety issue | Major | Increase in the size of existing porous screen | Negligible |
| Remaining area of wind acceleration to the south of development leading to a safety issue | Major | Implementation of an operational management strategy | Minor adverse |

# 14 Daylight and Sunlight

## 14.1 Introduction

This chapter presents an assessment of potential impacts on Daylight and Sunlight associated with the proposals, described in Chapter 2: Scheme Description.

The methodology adopted for the assessment, detailed in section 14.2, is in accordance with the guidance contained in the BRE report BR209, "Site Layout Planning for Daylight and Sunlight", 2011 (BR209).

This chapter is supported by the following figures:

- Figure 14.1: BR209 obstruction angle corresponding to a VSC of 27% at adjacent windows
- Figure 14.2: Model view, indicating existing, proposed and committed developments
- Figure 14.3: VSC on existing dwellings pre and post-proposed development
- Figure 14.4: APSH on existing dwellings pre and post-proposed development
- Figure 14.5: WPSH on existing dwellings pre and post-proposed development
- Figure 14.6: Hours of sunlight on existing amenity spaces pre and post-proposed development
- Figure 14.7: VSC within the proposed development
- Figure 14.8: APSH and WPSH within the proposed development
- Figure 14.9: Hours of sunlight on proposed amenity spaces

## 14.2 Methodology, Scope and Significance Criteria

There is no legislation that directly affects the assessment contained within this chapter.

There is no specific guidance on daylight access to new buildings within the National Planning Policy Framework (NPPF), however, it is suggested that designers should consider using design codes to achieve well-designed places. In this instance, BR209 (2011) and BS 8206-02 are the relevant guides for reference.

The NPPF (February, 2019) section 12, 'Achieving well-designed places', paragraph 126, advises that, with respect to the use of design guides and codes, *'…their level of detail and degree of prescription should be tailored to the circumstances in each place, and should allow a suitable degree of variety where this would be justified.'*

### 14.2.1 Scope

The scope of the daylight, sunlight and overshadowing study is to:

- Estimate the impact of proposed and future developments on levels of daylight and sunlight experienced by adjacent buildings and amenity spaces;
- Examine the levels of daylight and sunlight within the proposed scheme; and
- Assess/propose potential mitigation features.

The proposed massing used for this assessment was the 3D model, 221118_LiverpoolWaters_AR, which illustrates the height and footprint of the proposed scheme. Window locations on existing buildings were determined from photographs of the Site, however room uses could not necessarily be determined. Existing windows affected by the proposed scheme were qualitatively assessed against BR209 guidance. It should be noted that rooms normally considered to have a need for light from the sky are residential kitchens, living rooms and bedrooms and only residential living rooms and conservatories are considered to have a need for direct sunlight.

### 14.2.2 Methodology

The assessment has been carried out in the context of BR209 which sets out sensible design guidance with the aim to provide sufficient daylight and sunlight access in appropriate rooms of new and existing buildings and open spaces.

The design criteria described in BR209 are intended to provide guidance for designers rather than a regulatory requirement. Designers are encouraged to apply the guidance so that it is sensitive to the development being assessed. The proposed scheme is in a high density, urban environment and as such, numerical targets should be interpreted flexibly, as advised in BR209. Dense urban areas and city centre developments may often experience greater site constraints when compared to low-rise suburban areas, and thus a high degree of obstruction which leads to non-compliance with BRE guidance (as is the case for some receptors as outlined in this report) is often unavoidable.

The impact of the proposed scheme on daylight and sunlight access at surrounding residential properties and daylight and sunlight access within the proposed development site were assessed in the context of BR209 guidance to determine:

- Access to light from the sky to existing and proposed buildings;
- Access to direct sunlight to existing and proposed buildings; and
- Access to direct sunlight to existing and proposed open amenity spaces.

The proposed massing used for this assessment was the 3D model, 221118_LiverpoolWaters_AR, which illustrates the height and footprint of the proposed scheme. Window locations on existing buildings were determined from photographs of the Site, however room uses could not necessarily be determined. It should be noted that rooms normally considered to have a need for light from the sky are residential kitchens, living rooms and bedrooms and only residential living rooms and conservatories are considered to have a need for direct sunlight.

### 14.2.2.1 Light from the sky – existing buildings

The excerpt from BR209 below summarises the methodology for assessing access to sky light for existing buildings.

*"If any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse daylight of the existing building may be adversely affected. This will be the case if either:*

- *The VSC measured at the centre of an existing window is less than 27, and less than 0.8 times its former value*
- *The area of the working plane in a room which can receive direct skylight is reduced to less than 0.8 times its former value."*

### 14.2.2.2 Light from the sky – new buildings

The excerpt from BR209 below summarises the methodology for assessing access to sky light for new buildings.

*"Obstructions can limit access to light from the sky. This can be checked by measuring or calculating the angle of visible sky Θ, angle of obstruction or vertical sky component (VSC) at the centre of the lowest window where daylight is required. If VSC is:*

- *at least 27% (Θ is greater than 65°, obstruction angle less than 25°) conventional window design will usually give reasonable results.*
- *between 15% and 27% (Θ is between 45° and 65°, obstruction angle between 25° and 45°) special measures (larger windows, changes to room layout) are usually needed to provide adequate daylight.*
- *between 5% and 15% (Θ is between 25° and 45°, obstruction angle between 45° and 65°) it is very difficult to provide adequate daylight unless very large windows are used.*
- *less than 5% (Θ less than 25°, obstruction angle more than 65°) it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed."*

### 14.2.2.3 Direct sunlight – existing buildings

The excerpt from BR209 below summarises the methodology for assessing access to direct sunlight for existing buildings.

*"If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window in a vertical section perpendicular to the window, then the sunlighting of the existing window may be adversely affected. This will be the case if the centre of the window:*

- *receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March and*
- *receives less than 0.8 times its former sunlight hours during either period and*
- *has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours."*

#### 14.2.2.4 Direct sunlight – new buildings

The excerpt from BR209 below summarises the methodology for assessing access to direct sunlight for new buildings.

*"In general a dwelling, or non-domestic building which has a particular requirement for sunlight, will appear reasonably sunlit provided:*

- *at least one main window wall faces within 90° of due south and*
- *the centre of at least one window to a main living room can receive 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in the winter months between 21 September and 21 March.*

*Where groups of dwellings are planned, site layout design should aim to maximise the number of dwellings with a main living room that meets the above recommendations."*

#### 14.2.2.5 Direct sunlight – open spaces

The excerpt from BR209 below summarises the methodology for assessing access to direct sunlight for gardens and open spaces.

> *"It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of a new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March."*

### 14.2.3 Identification of sensitive receptors

Sensitive receptors, having a requirement for daylight or sunlight, identified for this assessment consist of:

- Existing residential facades having an obstruction angle of less than 25° (see Figure 14.1 for an illustration of this principle). All relevant facade orientations are assessed for daylight access and only those facing within 90° of south are assessed for sunlight access;

- Existing open spaces adjacent to the proposed development site, e.g. gardens, public realm amenity areas; and
- Residential facades and open spaces within the proposed development site.

### 14.2.4 Impacts and effects significance

BR209 Appendix I describes the impact of a development on its surroundings as 'Beneficial', Negligible' or 'Adverse' in terms of the change in the amount of skylight and sunlight reaching an existing building where it is required, or the amount of sunlight reaching an open space. It also states that, 'The assessment of impact will depend on a combination of factors, and there is no simple rule of thumb that can be applied', however guidance is provided on quantifying the significance of relative adverse changes as minor, moderate or major, as follows:

Factors tending towards a minor adverse impact include:

- Only a small number of windows or limited area of open space are affected;
- The loss of light is only marginally outside the guidelines;
- An affected room has other sources of skylight or sunlight; and
- The affected building or open space only has a low level of requirement for skylight or sunlight.

Factors tending towards a major adverse impact include:

- A large number of windows or large area of open space are affected;
- The loss of light is substantially outside the guidelines;
- All the windows in a particular property are affected; and
- The affected indoor or outdoor spaces have a particular strong requirement for skylight or sunlight, e.g. a living room in a dwelling or a children's playground".

The impact is considered to be negligible if the guidance of BR209 is met. The further categories include major, moderate and minor impact significance, mapped to the impact criteria defined in Table 14.1.

An element of professional judgement is required to establish threshold values for the level of impact. Based on relevant numerical values provided in BR209 and industry-accepted typical values, the significance criteria adopted for this assessment are detailed in Table 14.1. Where an impact is identified as 'Beneficial', the same significance criteria are adopted as recommended in BR209 Appendix I.

**Table 14.1: Impact assessment effects significance criteria**

| Significance | Magnitude of change in VSC or PSH |
|---|---|
| Major | >40% |
| Moderate | >30% and ≤40% |

| Significance | Magnitude of change in VSC or PSH |
|---|---|
| Minor | >20% and ≤30% |
| Negligible | ≤20% |

## 14.3 Consultation

No specific consultations were undertaken or required for this assessment.

## 14.4 Limitations and Assumptions

### 14.4.1 Accuracy of information

The methodology applied is based upon the 3D model 221118_LiverpoolWaters AR, containing contextual geometry for existing and future buildings, and the proposed scheme to which this report pertains. Heights and locations of surrounding buildings were used to determine impact from the proposed scheme and future developments, incorporating the topographical information contained within the model. This information is understood to accurately describe the site being assessed.

### 14.4.2 Methodological limitations

The method used to estimate impact on available light to the windows on the proposed and surrounding buildings and site surroundings imposes a rule of thumb limit on the impact of new developments, where from the geometry of proposed, existing and planned buildings' facades are used to determine the likely impact on each other.

## 14.5 Baseline Conditions

The existing residential buildings (Figure 14.2) are bounded to the east and west by East and West Waterloo Docks, respectively. Adjacent to the residential buildings on the west side are car parking areas. To the north of the existing context are more car parking spaces and access roads; these areas are not assessable. Amenity spaces for assessment lie to the east of these residential buildings.

The only assessable facades of the residential buildings are the northernmost five dwellings of West Waterloo Dock, having an obstruction angle of less than 25°. These facades all demonstrate a baseline VSC of 39%, APSH of 56% and WPSH of 11%.

Assessable amenity spaces are on the dock side of the residences, meaning the predominant source of overshadowing is from the residences they serve rather than the proposed scheme. Both assessed spaces demonstrate baseline solar exposure of 100% of their area receiving at least 2 hours of sunlight on the March equinox.

The future context does not need to be assessed as the obstruction angle from a BR209 default window centre height, 1.6m above ground, is greater than 25°.

# 14.6 Environmental Impacts and Significance of Effects

## 14.6.1 Construction Phase

The level of daylight and sunlight will evolve during the construction phase. Therefore, it is not possible to determine what the effect of this will be on the receptors at any given time. The use of scaffolding, hoardings and site plant, will temporarily increase the obstruction to daylight and beyond the baseline conditions. During construction, the scheme will transition from the baseline to the fully operational state; the fully-built scenario represents the worst case, so construction effects have been scoped out of this assessment.

## 14.6.2 Operation Phase

### 14.6.2.1 Impact of the proposed scheme on existing surroundings

#### Access to daylight at buildings

Existing adjacent residential facades achieve a baseline VSC of 39%. The addition of the proposed scheme reduces this to between 29% and 35%, illustrated in Figure 14.3. No areas of existing facades fall below a VSC value of 27%, meaning a **negligible** reduction in available daylight will be experienced.

#### Access to sunlight at buildings

Existing adjacent residential facades achieve a baseline APSH of 55% to 56% and WPSH of 16% to 17% .The addition of the proposed scheme reduces APSH to 40% to 52% and WPSH of 11% to 16%, illustrated in Figures 14.4 and 14.5. No areas of existing facades fall below an APSH value of 25% or a WPSH value of 5%, meaning a **negligible** reduction in available sunlight will be experienced.

#### Access to sunlight on open amenity spaces

The location of the proposed scheme relative to adjacent open amenity spaces will result in little impact on sunlight received by amenity areas to the east of existing buildings, as these are dominantly shaded by the existing residential buildings. With reference to Figure 14.6, all amenity areas will continue to receive in excess of BR209 recommended sunlight exposure of at least 2 hours of sunlight on at least 50% of the area on the March equinox. The impact of the proposed scheme on adjacent open amenity spaces is, therefore, **negligible**.

#### 14.6.2.2 Daylight and sunlight within the proposed scheme

**Access to daylight at buildings**

In accordance with BR209 guidance, where the VSC on inward-facing proposed facades is between 5% and 15% (the minimum calculated value within the proposed scheme is 10%, see Figure 14.7) it is difficult to provide adequate daylight unless large windows are used or attention is paid to room depth. It is recommended that these areas are used for spaces that do not require good daylight, e.g. lift shafts, plantrooms, stairwells, etc. It is recommended that facades with VSC between 15% and 27% at mid/low level have sufficiently large windows to provide adequate daylight. Outwards facing and upper level inward facing facades have VSC values above 27% and therefore will receive a good level of daylight.

**Access to sunlight at buildings**

Proposed facades facing within 90° of south receiving below BR209 recommended levels of 25% APSH and 5% WPSH are limited to the lower levels of inward facing elevations of the two eastern blocks (Figures 14.7 and 14.8). A significant reduction in the massing of the western blocks would be required to meet or exceed BR209 guidance at a relatively small number of dwellings, all or which will receive at least 20% of APSH and 1% of WPSH.

**Access to sunlight on open amenity spaces**

With reference to Figure 14.9, all proposed areas will receive in excess of BR209 recommended sunlight exposure of at least 2 hours of sunlight on at least 50% of the area on the March equinox.

## 14.7 Mitigation Measures

Given the negligible level of impact of the proposed scheme on existing buildings and amenity areas, no mitigation measures are considered necessary to provide acceptable levels of daylight and sunlight at existing adjacent properties.

It is recommended that areas of the proposed scheme facades falling below BR209 recommendations are used for spaces that do not require good daylight, e.g. lift shafts, plantrooms, stairwells, etc.

## 14.8 Residual Effects

There are no residual effects on existing surrounding buildings and open amenity spaces since the impact of the proposed scheme is negligible.

## 14.9 Cumulative Impacts

The cumulative impact of the proposed and committed developments (see Figure 14.2) on the existing context will be the same as the impact of the proposed scheme on the existing context since there is no direct line of sight from the assessed existing facades to both proposed and future buildings. The cumulative impact of proposed and committed developments on the existing context is therefore **negligible**.

## 14.10 Assessment Summary

### Summary

The impacts on daylight and sunlight access at existing surrounding dwellings from the proposed scheme alone and in combination with future developments was assessed according to the methods defined in BR209, "Site Layout Planning for Daylight and Sunlight", 2011.

Daylight and sunlight access within the proposed scheme was also considered. The following impacts were identified, categorized against the significance criteria of Table 14.2.

As the proposed scheme does not yet exist, it is not possible to compare daylight and sunlight access within the site against a baseline. The results of section 14.6 indicate that areas of facades of the proposed scheme fall below the BR209 recommended VSC of 27%, however, BR209 states that its advice should be interpreted flexibly with consideration for a developments location, e.g. in urban settings, as some breaches of its guidance may be unavoidable due to higher building density and site constraints. With this in mind, daylight and sunlight access within the proposed scheme is considered to be consistent with typical urban developments.

### Conclusions

An assessment of the impact of the proposed scheme on existing surrounding properties showed **negligible impact** to existing buildings and open amenity spaces.

The cumulative impact of the proposed scheme and committed developments is also **negligible** to existing buildings and existing amenity spaces.

The potential impact of committed developments on the proposed scheme is **negligible** due to building separation distances.

Daylight and sunlight access within the proposed scheme is consistent with that typically found in urban settings.

**Table 14.2: Summary of Effects**

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Impact of proposed scheme on existing residential buildings | Negligible | None | Negligible |
| Impact of proposed scheme on existing amenity spaces | Negligible | None | Negligible |
| Cumulative impact of proposed and committed developments on existing residential buildings | Negligible | None | Negligible |
| Cumulative impact of proposed and committed developments on existing amenity spaces | Negligible | None | Negligible |
| Impact of committed developments on proposed scheme | Negligible | None | Negligible |

# 15 Terrestrial Ecology

## 15.1 Introduction

This chapter presents an assessment of potential impacts on Terrestrial Ecology associated with the proposals, described in Chapter 2: Scheme Description.

This chapter is supported by the following figures and appendices:

- Figure 15.1: Middlemarch Environmental Ltd Drawing C151154-ES-01 – Nature Conservation Sites
- Appendix 15A: Middlemarch Environmental Ltd Report RT-MME-128844-01 Rev A – Preliminary Ecological Appraisal
- Appendix 15B: Middlemarch Environmental Ltd Report RT-MME-128844-02 Rev B – Shadow Habitat Regulations Assessment: Stage 2 Appropriate Assessment
- Appendix 15C: Arup Report 0-15-08 – Strategic Ecological Mitigation Plan

## 15.2 Methodology, Scope and Significance Criteria

### 15.2.1 Legislation, Policy and Guidance

The following legislation, policy and guidance is of relevance to this chapter:

- Conservation of Habitats and Species Regulations 2019 (Habitats Regulations 2019) (Ref 15.1);
- The Wildlife and Countryside Act (WCA) 1981 (Ref 15.2);
- Countryside and Rights of Way (CRoW) Act (Ref 15.3);
- The Natural Environment and Rural Communities (NERC) Act 2006 (Ref 15.4);
- National Planning Policy Framework (Ref 15.5);
- UK Biodiversity Action Plan and UK Post-2010 Biodiversity Framework (Ref 15.6);
- Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (Ref 15.7);
- Liverpool Unitary Development Plan (Ref 15.8);
- Emerging Liverpool Local Plan 2013-2033 (Ref 15.9)
- National Planning Policy Guidance (NPPG) (Ref 15.10); and
- Chartered Institute of Ecology and Environmental Management’s (CIEEM) ‘Guidelines for Ecological Impact Assessment in the UK and Ireland’ (2019) (herein referred to as the ‘CIEEM Guidelines’) (Ref 15.11).

### 15.2.2 Ecological Impact Assessment Methodology

The methodology for the assessment is derived from the criteria set out in the CIEEM Guidelines. The methodology comprises the following:

- Determination of the ecological baseline including a desk study, an extended Phase 1 Habitat Survey and, where relevant, further surveys for legally protected species and Species of Principal Importance in England;
- Identification of important ecological receptors within the zone of influence;
- An assessment of the significant effects on important ecological receptors from the construction and operational phases of the proposed scheme;
- A review of the mitigation and assessment of residual effects; and,
- A cumulative assessment with other development proposals in the surrounding area.

#### 15.2.2.1 Establishment of Ecological Baseline

##### Desk Study

An ecological desk study was undertaken as part of the Preliminary Ecological Appraisal (Report RT-MME-128844-01 Rev A, Technical Appendix 15A) completed by Middlemarch Environmental Ltd in 2018. The consultees for the desk study were Natural England (via Multi-Agency Geographic Information for the Countryside website), Biobank Merseyside and Record, the Biodiversity Information System for Cheshire, Halton, Warrington and Wirral. This desk study included:

- A 5 km search radius for European statutory nature conservation sites (Special Protection Areas (SPA), Special Areas of Conservation (SAC) and Ramsar sites), extended to 10 km for any statutory site designated for bats;
- A 2 km search radius for UK statutory nature conservation sites (Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Local Nature Reserves (LNR));
- A 2 km search radius for ancient woodland sites;
- A 2 km search radius for UK non-statutory nature conservation sites (Local Wildlife Sites etc); and
- A 2 km search for protected and notable species.

##### Phase 1 Habitat Survey

A walkover survey was undertaken by Middlemarch Environmental Ltd in 2018, following the Extended Phase 1 Habitat Survey methodology of the Joint Nature Conservation Committee (2010, Ref 15.12). Phase 1 Habitat Survey is a standard technique for classifying and mapping British habitats. The method provides information on habitats present within the application site and assesses the potential for legally protected and notable species to occur in and adjacent to the application site.

##### Breeding Bird Surveys

Breeding Bird Surveys were completed by RSK in 2017 (Ref 15.13), encompassing the 'Northern Link Road' (LPA ref: 17F/2628) proposed development site, which is located immediately north of the application site.

The survey methodology was adapted from the Common Bird Census (CBC) methodology (Gilbert et al. 1998, Ref 15.14). A route was walked incorporating all features that may function as nesting bird habitat within and immediately adjacent to the site. All birds seen or heard were recorded along with notes of behaviour that may indicate breeding. All surveys were undertaken early in the morning at or just after sunrise to coincide with the period of peak bird activity. Three surveys were undertaken once per month between April and June.

As reported in the Liverpool Waters: Strategic Ecological Mitigation Plan (Arup, 2019, Ref 15.15, Technical Appendix 15C), Breeding Bird Surveys of Princes Docks and the Central Docks were undertaken by ADAS between April and July 2019. These comprised vantage point surveys targeted at common tern and surveys for black redstart, peregrine and little ringed plover. Other species using the site were also recorded.

The results of these surveys have been used to inform the likely use of the application site by breeding birds.

### Winter Bird Surveys

Wintering Bird Surveys of the adjacent Northern Link Road (LPA ref: 17F/2628) proposed development site were completed by Amey (Ref 15.16) between 2016 and 2018, comprising:

- Three-hour vantage point surveys timed to coincide with high tide, undertaken by two surveyors from a single location, completed once in November 2016 and once in December 2016; and
- Three to four-hour vantage point surveys, with one survey timed to coincide with high tide and one survey timed to coincide with low tide completed each month between November 2017 and March 2018.

The surveys recorded the location of all species observed within the project site, the surrounding area and flight lines across the area.

As reported in the Liverpool Waters: Strategic Ecological Mitigation Plan (Arup, 2019, Ref 15.15, Technical Appendix 15C), Winter Bird Surveys across the Liverpool Waters site were undertaken by Arup between October 2019 and March 2019.

The results of these surveys have been used to inform the likely use of the application site by wintering birds.

#### 15.2.2.2 Identification of Ecological Receptors within Zone of Influence

##### Zone of Influence

The ‘Zone of Influence’ for this assessment has been defined in accordance with the CIEEM Guidelines. These guidelines state that the Zone of Influence with respect to ecology does not simply relate to the application redline boundary of a site. Activities and effects that occur outside of an application site can still have a negative or positive impact as a result of the construction, operation and potentially decommissioning of a project. The Zone of Influence in this assessment, therefore, considers direct and indirect effects on ecological receptors both within and adjacent to the application site, and potentially associated with other areas that could be affected (e.g. through transportation or excavation).

##### Determining Importance

The CIEEM Guidelines state that ecological features should be considered within a ‘defined geographical context’ (i.e. spatial scale), with International importance being the highest scale, followed by National, Regional and County / Metropolitan / other local authority-wide area scales, with Local importance representing the lowest spatial scale. Local importance can be further broken down, with features assessed in the context of the Borough or the Site. Assigning importance to ecological features is based on professional judgement informed by available guidance and information and expert advice.

#### 15.2.2.3 Assessment of Significant Effects

##### Characterising Effects

Effects arising as a result of development activities are described for all features of ecological importance. When describing effects the assessment refers to characteristics such as the extent; magnitude; duration; frequency; and, reversibility of the effect in order to provide justification for any conclusions about the nature and likelihood of the effect described.

##### Determining Significant Effects

The CIEEM Guidelines define a significant effect in the context of an Ecological Impact Assessment as ‘an effect that either supports or undermines biodiversity conservation objectives for important ecological features or for biodiversity in general’. A significant effect is therefore an effect that is ‘sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of a project’.

Significant effects are determined by assessing any deviation in the baseline conditions of a feature of ecological importance that may occur as a result of individual and cumulative effects during the construction and operational phases of the proposed scheme. These effects are expressed in terms of the geographical scale, however the geographical scale at which an effect is significant can vary from the geographical importance of the ecological feature being assessed. This assessment uses the above methodology to describe all significant effects on features of ecological importance within the zone of influence.

### Conformity with ES

The impact assessment has been carried out in accordance with the CIEEM Guidelines and therefore all conclusions about significant impacts in this chapter are consistent with the above methodology. However, the geographical scale for determining significance in the CIEEM Guidelines differs from the approach for determining significance in the remainder of this ES.

The CIEEM guidelines state the following regarding alternative approaches for determining the significance of effects on ecological features, including 'methods for scoring and ranking impacts on the basis of subjective criteria':

> *Results are often presented in the form of a matrix in which ecological value/importance and magnitude of impact are combined into a significance score. A matrix approach is commonly used in EIA by disciplines other than ecology to assign significant residual effects to categories (e.g. major, moderate, minor). In many cases, its use is required to provide consistency across all the topics of an Environmental Statement. If using this approach, it is very important to make a clear distinction between evidence-based and value-based judgements so that decision makers and other stakeholders are aware of the level of subjective evaluation that has been used. Spurious quantification should be avoided in which numerical scores or significance rankings/categories are used without a clear definition of the criteria and thresholds that underpin them. These Guidelines avoid and discourage use of the matrix approach and categorisation.*

However, reference is made to alternative approach which is not based on a matrix of importance (or value) and 'magnitude' (Box et al, 2017, Ref 15.17) but can be used for categorising significant residual effects if specifically required within an ES. Where residual ecological effects are identified within this chapter, the significance of these effects at the geographical scale (in accordance with the CIEEM Guidelines) is converted into effects deemed to be significant at the minor, moderate and major level, which is consistent with the remainder of this ES. This approach is outlined in Table 15.1, and has been used to outline what may be considered a minor, moderate or major effect in the summary section.

**Table 15.1: Categories of Significant Residual Effects in Accordance with CIEEM and Conversion for Consistency with ES**

| Geographical scale at which the residual effect is assessed as being significant following the CIEEM EcIA guidelines | Equivalent category of significant residual effect used in ES |
|---|---|
| International, national or regional | Major |
| Regional, metropolitan, county, vice-county or other local authority-wide area (e.g. city) | Moderate |
| Local (Borough or Site) | Minor |

Effects that are considered to be of significance below the Local (Site) scale would be categorised as ‘Negligible’. These are effects that result in very little change from baseline conditions, approximating to a ‘no change’ situation.

For the purpose of this ES chapter, ‘Major’ and ‘Moderate’ residual effects are considered to be ‘significant’ in accordance with the EIA Regulations. Residual effects which have been assessed as being ‘Minor’ or below are not considered to represent ‘significant harm’. These ‘Minor’ effects should instead be taken into account by the local planning authority as part of the planning balance when assessing the application.

### Cumulative Effects

In addition to the cumulative impacts of the proposed scheme (intra-development effects), the assessment includes a consideration of cumulative effects of the development and any other recently completed, ongoing and proposed developments within close proximity to the application site.

## 15.3 Consultation

A summary of consultation carried out for this EIA is provided in Table 15.2.

**Table 15.2: Consultation Summary**

| Consultee and date | Issue raised | Summary of response |
|---|---|---|
| MEAS, 15th February 2019 | Shadow HRA submitted in December 2018 cannot be accepted, due to reference to cormorant mitigation being provided in North Salisbury Dock. This dock has not been subject to surveys to assess current use and may become unsuitable for qualifying species due to adjacent developments. | Revised Shadow HRA submitted with current application. Measures in accordance with Liverpool Waters: Strategic Ecological Mitigation Plan and Central Dock: Neighbourhood and Ecological Biodiversity Strategy. |

## 15.4 Limitations and Assumptions

The purpose of the Phase 1 Habitat Survey is not to produce a comprehensive list of flora and fauna for the application site, as any ecological surveys will be limited by factors which affect their presence. These factors include weather, time of year, migration patterns and behaviour. However, it is considered that the results of the survey, together with the information from the data gathering exercise, have enabled an assessment of the nature conservation interest of the site to be made in sufficient detail for the potential effects of the proposed scheme on features of nature conservation importance to be adequately defined.

The Breeding and Wintering Bird Surveys were completed at the appropriate times of year and in accordance with best practice. Although these surveys were not focussed on the application site, the wider survey area within which birds were recorded encompasses much of the application site, including the West Waterloo Dock. As such, these surveys are considered to provide sufficient data to allow the potential effects of the proposed scheme on breeding and wintering birds to be adequately defined.

## 15.5 Baseline Conditions

The site is occupied by a mosaic of hardstanding, short perennial vegetation on recently disturbed ground and standing water forming part of the West Waterloo Dock. It is abutted to the west by the River Mersey, to the north by a combination of recently cleared land and an ongoing development, to the east by the East Waterloo Dock residential complex, and to the south by the remainder of the West Waterloo Dock and Princes Half Tide Dock.

### 15.5.1 Designated Sites

The desk study search using Multi-Agency Geographical Information for the Countryside (MAGIC) identified six European statutory nature conservation sites within a 5 km radius of the application site:

- Liverpool Bay SPA, located adjacent to the application site;
- Mersey Narrows and North Wirral Foreshore SPA and Ramsar site, located 960 m west;
- Dee Estuary SAC, located 3,680 m north-west; and
- Mersey Estuary SPA and Ramsar site, located 4,280 m south (which also overlaps with New Ferry SSSI).

One UK statutory site was identified within a 2 km radius of the application site: Mersey Narrows SSSI, located 960 m west.

Data received from Biobank Merseyside and Record, the Biodiversity Information System for Cheshire, Halton, Warrington and Wirral, revealed the presence of three non-statutory nature conservation sites within a 2 km radius of the application site:

- Mersey Estuary Nature Improvement Area (NIA), located adjacent to the site;
- Leeds-Liverpool Canal and adjacent sites Local Wildlife Site (LWS), located 950 m north-east; and
- Everton Park and Nature Garden LWS, located 1,890 m north-east.

Due to the large intervening distance between the application site and Everton Park and Nature Garden LWS and the lack of connectivity due to the built environment, no impacts on this non-statutory nature conservation site are anticipated as a result of the proposed scheme. Everton Park and Nature Garden LWS has been scoped out of further assessment.

### 15.5.2 Habitats

Three habitats were identified within the application site during the Phase 1 Habitat Survey: ephemeral / short perennial, hardstanding and standing water.

#### Ephemeral / Short Perennial

The ephemeral / short perennial habitat comprised pioneer plant species which had colonised recently disturbed ground. This habitat occupied an area of less than 0.25 ha and as such does not meet the criteria to be classed as 'Open Mosaic on Previously Developed Land'. However, it contributes to the overall structural and ecological diversity of the site, and is likely to support a range of terrestrial invertebrates.

#### Hardstanding

A linear concrete jetty structure is present within the southern region of the application site. The hardstanding habitat on site supports minimal vegetation, is heavily disturbed and offers negligible habitat for faunal species. This habitat is not a notable consideration with respect to the proposed scheme and is not considered further within this chapter.

#### Standing Water

The application site footprint is dominated by standing water, which forms the western half of West Waterloo Dock and is bounded by engineered concrete walls. The presence of extensive algal bloom on and beneath the surface indicates that this body of water is subject to very limited disturbance, such as by boat traffic. Although considered to be of low ecological value in its own right, the West Waterloo Dock has the potential to provide supporting habitat for qualifying bird species of nearby Natura 2000 sites. European statutory sites are listed above.

### 15.5.3 Species

#### Bats

The desk study provided 43 records of at least four bat species within a 2 km radius of the application site, with the nearest records attributable to common pipistrelle and noctule, located 640 m north. One result for a European Protected Species Mitigation Licence (EPSML) was identified within a 2 km radius of the application site, associated with the destruction of a resting place for common pipistrelle and noctule.

There are no suitable roosting opportunities for bats within the site, which is relatively isolated by the built environment to the east and the expanse of the River Mersey to the west. However, the site has the potential for use as a foraging resource by more light-tolerant species such as pipistrelles. Overall, the value of the site to bats is likely to be low.

#### Terrestrial mammals

The site is isolated by the built environment and the River Mersey, and provides very limited foraging opportunities. With the exception of red fox, most notable terrestrial mammal species are likely to be absent. No evidence of any fox earths was noted on or adjacent to site. Terrestrial mammals are not considered to be a notable consideration with respect to the proposed scheme and are not discussed further within this chapter.

### Otter and water vole

No records of otter were provided in the desk study. This species has the potential to use any linear waterway and is likely to occur within the Mersey and adjacent canal. However, the industrial nature of the dockland area means that there is no real opportunity for the construction of holts within or adjacent to the site. No evidence of this species was recorded on or adjacent to site.

Two records of water vole were identified within the desk study, potentially within a 2 km radius. However, the concrete walls which form the dock are considered unsuitable to support this species. No evidence of this species was recorded on or adjacent to site.

Otter and water vole are not considered to be notable considerations with respect to the proposed scheme and are not discussed further within this chapter.

### Birds

The desk study identified records of three Schedule 1 species within a 2 km radius of the application site: little ringed plover, black redstart and peregrine. In addition, records for six species listed as Species of Principal Importance in England were provided, comprising herring gull, house sparrow, lapwing, linnet, skylark and starling.

During the Phase 1 Habitat Survey, eight species of bird were recorded on site, including starling (a Species of Principal Importance in England and Birds of Conservation Concern Red List species) and lesser black-backed gull and black headed gull, both Birds of Conservation Concern Amber List species. The site was considered to offer very limited suitable nesting habitat, although evidence of past nesting by Canada goose was recorded in close proximity to the site. This is not a species of conservation concern.

Nearby statutory nature conservation sites, particularly the Mersey Narrows and North Wirral Foreshore SPA/Ramsar, located 960 m west on the opposite bank of the River Mersey, are designated for their value primarily to passage and wintering wildfowl and waders which utilise the intertidal habitats for roosting and feeding.

During the Winter Bird Surveys of the adjacent Northern Link Road (LPA ref: 17F/2628) proposed development site, completed by Amey between 2016 and 2018, eight bird species which are qualifying features or part of the assemblage of qualifying species of the nearby statutory designated sites were recorded. Of these, three species were recorded utilising habitats on or immediately adjacent to the application site: oystercatcher, which forms part of the assemblage of qualifying species of the Mersey Narrows and North Wirral Foreshore SPA; cormorant, which forms part of the assemblage of qualifying species of the Liverpool Bay SPA and the Mersey Narrows and North Wirral Foreshore SPA; and shelduck, a qualifying species of the Mersey Estuary SPA. Peak counts of 40 oystercatcher, 12 cormorant and two shelduck were recorded during the 2018 surveys.

Other notable species recorded utilising habitats within or immediately adjacent to the site, or frequently flying over the site, included herring gull and linnet, both Birds of Conservation Concern Red List species and Species of Principal Importance in England; and mute swan and great black-backed gull, both Birds of Conservation Concern Amber List species.

During the Winter Bird Surveys of the wider Liverpool Waters site, completed by Arup between October 2018 and March 2019, several bird species which are qualifying features or part of the assemblage of qualifying species of the nearby statutory designated sites were recorded. Of these, at least three species were recorded utilising habitats within the Central Docks area: redshank, which forms part of the assemblage of qualifying species of the Mersey Narrows and North Wirral Foreshore SPA and is a qualifying species of the Mersey Estuary SPA; oystercatcher, which forms part of the assemblage of qualifying species of the Mersey Narrows and North Wirral Foreshore SPA; and, cormorant, which forms part of the assemblage of qualifying species of the Liverpool Bay SPA and the Mersey Narrows and North Wirral Foreshore SPA. Peak counts of three redshank, 36 oystercatcher and 33 cormorant were recorded during the surveys. It should be noted that these peak counts cover the entire Liverpool Waters site, from Princes Dock in the south to Bramley-Moore Dock in the north. The highest concentrations of oystercatcher were recorded to the west of Princes Half Tide Dock (located to the south of the application site) and to the south-west of Trafalgar Dock (located to the north of the application site). The highest concentration of cormorant was recorded to the west of Nelson Dock (located to the north of the application site), with a reasonably high concentration of cormorants also recorded to the west of West Waterloo Dock.

Other notable species recorded utilising habitats within the wider Liverpool Waters site but not specifically within the Central Docks area included: red-breasted merganser, a qualifying species of the Liverpool Bay SPA; ringed plover, a qualifying species of the Mersey Estuary SPA; and, shelduck, a qualifying species of the Mersey Estuary SPA.

The Breeding Bird Surveys of the adjacent Northern Link Road (LPA ref: 17F/2628) proposed development site, completed by RSK in 2017, identified a total of 29 bird species, three of which were confirmed as breeding. A further 11 species were considered to be probably or possibly breeding. Lapwing, which forms part of the assemblage of qualifying species of the Mersey Estuary SPA/Ramsar and ringed plover, a qualifying species of the Mersey Estuary SPA/Ramsar, were confirmed to be breeding within habitats to the north, and outside of, the application site. Oystercatcher, which forms part of the assemblage of qualifying species of the Mersey Narrows and North Wirral Foreshore SPA, and shelduck, a qualifying feature of the Mersey Estuary SPA/Ramsar, were considered to probably be breeding adjacent to the application site.

A number of other notable species, including Birds of Conservation Concern Red and Amber list species, were also recorded during the surveys, although none were confirmed to be breeding within the application site.

The Breeding Bird Surveys of the Princes Dock and Central Docks, completed by ADAS in 2019, identified a total of 31 bird species, less than half of which were considered likely to be breeding within the site. This included the following species listed as qualifying features or on the winter assemblage of nearby European designated sites: lapwing, lesser-black backed gull, oystercatcher, mallard, ringed plover and shelduck. These species were generally recorded around Trafalgar Dock, located to the north of the application site (and outside the Central Docks area) and/or around Princes Half Tide Dock, located to the south of West Waterloo Dock.

#### Herpetofauna

The desk study provided records of common frog and smooth newt located over 1.5 km from the application site. No records of reptiles were identified. The ephemeral/short perennial vegetation within the site provides some very limited suitable habitat for amphibians and reptiles, however this has developed relatively recently and the site is isolated by the built environment and the River Mersey. There are no obvious pathways through which amphibian or reptile species could have colonised the site. Herpetofauna are not a notable consideration with respect to the proposed scheme and are not discussed further within this chapter.

#### Terrestrial invertebrates

The desk study provided records of small heath butterfly, wall butterfly and white-letter hairstreak butterfly, all listed as Species of Principal Importance in England, although the site supports limited or no suitable habitat for these species. The assemblage of pioneer species in the ephemeral/short perennial habitat is likely to be of some value to terrestrial invertebrates.

#### Marine Species

Ecological features associated within the marine environment are discussed in Chapter 16 of this ES.

### 15.5.4 Evaluation of Ecological Features

Table 15.3 identifies the important ecological features on and surrounding the site and the geographical frame of reference for which they are considered to be important. Features which have been scoped out due their negligible ecological value (e.g. hardstanding), as well as species that are not considered to occur on or adjacent to the site, are not included in this table, and are not discussed further within this assessment.

**Table 15.3: Summary of Nature Conservation Value of Ecological Features**

| Ecological Feature | Nature Conservation Value | Explanation |
|---|---|---|
| *Nature Conservation Sites* | | |
| Liverpool Bay SPA | International | This site is designated as a SPA under the Wild Birds Directive due to its international importance to an assemblage of non-breeding waterbirds. |
| Mersey Narrows and North Wirral Foreshore SPA and Ramsar | International | This site is designated as a SPA under the Wild Birds Directive due to its international importance to an assemblage of breeding, wintering and passage wildfowl and wading birds. These notable bird populations are also the primary reason for selection of the site as a Ramsar wetland of international importance. |
| Dee Estuary SAC | International | This site is designated as a SAC under the Habitats Directive due to the assemblage of internationally rare habitat types that it supports. These are generally intertidal and marine habitats that have a limited distribution within Europe. |
| Mersey Estuary SPA and Ramsar | International | This site is designated as a SPA under the Wild Birds Directive due to its international importance to an assemblage of wintering and passage wildfowl and wading birds. These notable bird populations are also the primary reason for selection of the site as a Ramsar wetland of international importance. |
| Mersey Narrows SSSI | National | This site forms part of the wider Mersey Narrows and North Wirral Foreshore SPA and Ramsar site. It is designated for its intertidal habitats and the diverse array of wildfowl and waders that they support, in particular during the passage and wintering seasons. |
| Mersey Estuary NIA | Regional | This site forms an integral part of the Liverpool City Region Ecological Network, and contributes to the strategic delivery of biodiversity conservation across the Liverpool region. |
| Leeds-Liverpool Canal and adjacent sites LWS | County | This extensive site supports notable habitats including swamp, grassland and running water, in additional to populations of notable species including water vole. The wider site is considered to be of county value, however the stretch adjacent to the site that forms a potential receptor for impacts associated with the proposed scheme is more urbanised and therefore of lower intrinsic value. |
| *Habitats* | | |
| Ephemeral / short perennial | Local (Site) | Although of limited ecological value, this habitat adds structural diversity to the site and is likely to support terrestrial invertebrate species. |

| Ecological Feature | Nature Conservation Value | Explanation |
|---|---|---|
| Standing water | Local (Site) | Considered in isolation, this habitat is of low ecological value, and is of no more than Local (site) importance. However, the standing water within the site is functionally connected to the River Mersey and a range of Natura 2000 sites, and provides potential supporting habitat for a low number of bird species for which these sites are designated. This context is taken into consideration within the assessment. |
| *Species* | | |
| Bats (foraging / commuting) | Local (Site) | The lack of roosting habitat, and relative isolation of the site by the urban environment and the River Mersey, means that it is likely to be of very low value to bat species. The West Waterloo Dock and connected canal may provide a commuting feature for less light-sensitive species such as pipistrelles. |
| Birds (breeding) | Local (Site) | The site provides some limited suitable habitat for breeding birds, but more valuable breeding habitat (suitable for a number of qualifying species of nearby designated sites) is present adjacent to the site and in the surrounding area. The only species confirmed to have bred in close proximity to the site is Canada goose, a species that is not of conservation concern. |
| Birds (wintering) | Local (Borough) | The site provides potential foraging habitat for a range of notable bird species over winter.<br><br>Oystercatcher, cormorant, redshank and shelduck, which are qualifying features or part of the assemblage of qualifying species of nearby European designated sites, have been recorded utilising the habitats within and adjacent to the site over winter, although the site itself is considered to form only a very small part of a much wider foraging resource for these species. |
| Terrestrial invertebrates | Local (Site) | Although the ephemeral / short perennial vegetation within the site is likely to support terrestrial invertebrates, this habitat is limited, and further suitable habitat is present within the surrounding area. |

## 15.6 Environmental Impacts and Significance of Effects

The following sections describe predicted impacts upon the identified ecological features during construction and on completion of the proposed scheme. Mitigation that has been built into the masterplan proposals (e.g. soft landscaping) is taken into account in this chapter, however beyond this, effects are evaluated in terms of their significance in the absence of additional mitigation.

The activities likely to have an impact on ecological features can be split into construction impacts and operational impacts. During the construction phase of the scheme, the main activities on the application site will include site clearance, partial infilling of West Waterloo Dock, construction activities including ground works, the use of operational plant and machinery and associated vehicle movements. Impacts likely to arise from these activities could include loss, fragmentation and physical damage of habitat, pollution, direct mortality of species and disturbance (physical disturbance, lighting and air pollution) of sites, habitats and species.

During the operational phase of the scheme, there will be an increase in people and vehicle movements within the application site, increases in street lighting and illumination and site maintenance activities. Potential impacts from these activities include disturbance (recreational and lighting) and potentially the direct mortality of species.

## 15.6.1 Mitigation by Design

A Strategic Ecological Mitigation Plan (Arup, 2019, Ref 15.15, Technical Appendix 15C) has been prepared to address impacts on ecological features as a result of developments across the Liverpool Waters. This plan includes measures to address the combined habitat loss and disturbance impacts on cormorants, stating that permanent floating pontoons for cormorant will be installed as follows:

- Central Docks - four pontoons in Princes Half Tide Dock;
- Northern Docks – two pontoons in Nelson Dock; and
- Clarence Docks – four pontoons at Salisbury Dock and two pontoons at Collingwood Dock.

This approach has been agreed by both Natural England and MEAS, and addresses both construction phase and operational phase displacement impacts on cormorants. Further information is provided in the 'Cumulative Impacts' section of this chapter (see Section 15.9).

## 15.6.2 Construction Phase

### 15.6.2.1 European Statutory Sites

Middlemarch Environmental Ltd has completed a Shadow Habitat Regulations Assessment: Stage 2 Appropriate Assessment (Report RT-MME-128844-02 Rev B, Technical Appendix 15B) to accompany this chapter, which focuses on Liverpool Bay SPA, Mersey Narrows and North Wirral Foreshore SPA and Ramsar site, and Mersey Estuary SPA and Ramsar site. The assessment is based on the known areas of vulnerability for each site, and, with respect to the construction phase of the development, considers potential impact types including surface and marine water pollution and the spread of invasive species. Where potential impacts are identified, appropriate mitigation measures are outlined.

The report concludes that although the Dee Estuary SAC is located within a 5 km radius of the application site, based on the information presented in the Habitat Regulations Assessment Final Report for Liverpool Waters (Liverpool City Council/MEAS, 2012, Ref. 15.18), no significant adverse effects are predicted for this nature conservation site and it is therefore scoped out of further assessment.

The report explains that the majority of potential impacts (such as pollution, spread of invasive species, light and noise disturbance) on the European designated sites identified can be avoided during the construction phase of the proposed scheme, subject to the implementation of mitigation measures in accordance with a Construction Environmental Management Plan (CEMP) and an Ecological Conservation Management Plan (ECMP) for the scheme, which will come forward through the pre-commencement conditions process. Further information is provided in the 'Mitigation Measures' section of this chapter.

However, the construction phase of the proposed scheme, and specifically the partial infilling of the West Waterloo Dock, has the potential to result in a reduction of supporting habitat for qualifying bird species of nearby Natura 2000 sites, the closest of which is the Liverpool Bay SPA. Changes to the boundaries of the Liverpool Bay SPA in October 2017 included an extension further inshore along the River Mersey, to offer protection to foraging common tern and little tern. In addition, cormorant and red-breasted merganser were included as additional named components of the water bird assemblage. Of the qualifying individual and assemblage species of the Liverpool Bay SPA, cormorant is the only species that was recorded in proximity to the application site during the Winter Bird Surveys completed by Amey (Ref 15.16) between 2016 and 2018 and Arup (Ref 15.15, Technical Appendix 15C) between 2018 and 2019.

Reference to the Wetland Bird Survey (WeBS) data (Frost et al, 2019, Ref 15.19) confirms that cormorant numbers have steadily been increasing in Great Britain, and this trend is reflected within the Mersey Estuary, where the annual peak has increased from 90 in 2012/13 to 420 in 2016/17, although the 2017/18 annual peak dropped to 379. Reporting on an increase in cormorant numbers on the Dee and Ribble and Alt Estuaries between 2005/06 and 2009/10, the Habitat Regulations Assessment Final Report for Liverpool Waters (Liverpool City Council/MEAS, 2012, Ref. 15.18) states that *'The mechanisms fuelling these trends are not fully understood. In order to safeguard the current cormorant population, and retain it in a favourable conservation status, the population on Liverpool Waters will need to remain viable'*.

Cormorants utilising coastal habitats *'generally feed on bottom-dwelling fish, but can also take fish from the surface and main water column as well as crustaceans'* (Natural England, 2012, Ref 17.20). Fish surveys were completed by Ecospan Environmental (2018, Ref 17.21) within the West Waterloo Dock, and the following results were obtained:

> *…the number and diversity of fish species within the dock when sampled was low. No mullet or flounder were caught which species which might have been expected given the docks position and the brackish nature of the water. However, the dock obviously supports a good population of stickleback. Additionally a few sand smelt were caught and two gobies*

*which indicate that these species are present but probably in relatively low numbers.*

Although these results indicate that the West Waterloo Dock is unlikely to provide a particularly valuable foraging resource for birds, the peak count of 12 cormorant recorded in this area during the 2018 winter bird surveys (Ref 15.16) and the peak count of 33 cormorant recorded across the Liverpool Waters site (with a reasonably high proportion recorded in proximity to West Waterloo Dock) during the 2018/19 winter bird surveys (Ref 15.15, Technical Appendix 15C) suggests that this waterbody and adjacent habitats provide at least a minor foraging resource for this species, and are likely to be of value to roosting and preening birds.

The West Waterloo Dock is connected to the Princes Half Tide Dock to the south. As such, although the proposed scheme would result in a reduction in size of the West Waterloo Dock, following the completion of the infilling works, this waterbody is considered likely to continue to support a similar assemblage of prey species for cormorant. However, pollution of this waterbody could occur during construction/infilling works, leading to a decline in the water quality within the dock and connected waterbodies, potentially resulting in a subsequent decline in fish stocks, forcing birds to forage elsewhere. In addition, it is considered likely that noise and visual disturbance during the construction phase of the development, and particularly disturbance associated with the partial infilling of West Waterloo Dock, will result in the temporary displacement of foraging and roosting cormorants from this area. Given the relatively small number of individual cormorants recorded within the application site, as well as the availability of suitable habitat surrounding the site and in the wider area, any displacement of cormorants from the application site as a result of the proposed scheme in isolation is anticipated to result in only very small shifts in the distribution of cormorant within the local area, an adverse effect, significant at the Local (Site) scale which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a minor adverse effect. These small localised shifts are considered unlikely to result in any noticeable changes in the overall distribution of cormorant within the adjacent Liverpool Bay SPA. However, the displacement of cormorants as a result of the proposed scheme, combined with the displacement of cormorants as a result of other nearby developments, has the potential to result in noticeable changes in cormorant distribution at a wider scale within the Liverpool Bay SPA. As detailed in the 'Mitigation by Design' section above, a Strategic Ecological Mitigation Plan for Liverpool Waters (Arup, 2019, Ref 15.15, Technical Appendix 15C) has been prepared, which provides details regarding the installation of permanent floating pontoons for cormorant within docks across the Liverpool Waters site. This is discussed further in the 'Cumulative Impacts' section of this chapter, and in the Shadow Habitat Regulations Assessment: Stage 2 Appropriate Assessment (Report RT-MME-128844-02 Rev B, Technical Appendix 15B).

As previously stated, three additional species which are qualifying features or part of the assemblage of qualifying species of other nearby European designated sites have been recorded utilising the habitats within and adjacent to the site over winter: oystercatcher, shelduck and redshank.

Oystercatcher forms part of the assemblage of qualifying species of the Mersey Narrows and North Wirral Foreshore SPA, located 960 m west of the application site, and is a qualifying species of the Ribble and Alt Estuary SPA and Ramsar, located over 6 km from the application site. A peak count of 40 was recorded during one of the 2018 winter bird surveys (at high tide). All birds were recorded on land located between the West Waterloo Dock and the River Mersey. The Habitat Regulations Assessment Final Report for Liverpool Waters (Liverpool City Council/MEAS, 2012, Ref 17.18) states that the wider Liverpool Waters site *'provides no foraging habitat for oystercatcher'* and that oystercatchers recorded within Liverpool Waters during surveys completed in 2008/2009 *'were likely to be using the site as a high tide roost'*. The report continues: *'the number of oystercatcher on Liverpool Waters are a small proportion of the total population in the area relative to the variability of numbers year on year'*. Reference to the Wetland Bird Survey (WeBS) data (Frost et al, 2019, Ref 17.19) confirms that annual peaks of oystercatcher have fluctuated significantly within the Merseyside Region. For example, annual peaks of oystercatcher in the Mersey Estuary increased from 65 to 1,339 between 2008/09 and 2015/15, before falling to 823 in 2015/16 and to 689 in 2016/17. Between 2015/16 and 2016/17 annual peaks increased from 14,206 to 20,857 in the Dee Estuary, and from 1,037 to 5,445 in the Alt Estuary, whilst in the same time period, annual peaks in the Ribble Estuary decreased from 16,496 to 13,898. These large fluctuations suggest that the importance of particular locations for oystercatcher within the estuarine habitats of the Merseyside region varies significantly year on year.

Based on the results of the bird surveys completed in proximity to the application site between 2016 and 2018 (Ref 15.16) and between 2018 and 2019 (Ref 15.15, Technical Appendix 15C), the partial infilling of West Waterloo Dock would at most result in only a very minor loss of habitat utilised by oystercatcher. During the 2018/19 surveys, the greatest concentrations of this species were recorded around Trafalgar Dock (to the north of West Waterloo Dock) and to the west of Princes Half Tide Dock. Nevertheless, it is considered likely that wider construction works associated with the proposed scheme will result in the loss of suitable high-tide roosting habitat for oystercatcher within and immediately adjacent to the application site. However, given the presence of suitable habitats in the wider area and the large variations in the distribution of this species across the estuarine habitats of the Merseyside region, this is not considered to have a noticeable effect on the favourable conservation status of oystercatcher populations, or the assemblage designation of the Mersey Narrows and North Wirral Foreshore SPA. Overall, no significant adverse effects are anticipated on any European statutory sites as a result of displacement of oystercatcher from the application site during the construction phase of the proposed scheme.

A peak count of two shelduck, a qualifying species of the Mersey Estuary SPA, was recorded during the 2018 winter bird surveys (Ref 15.16) and a peak count of three redshank, which forms part of the assemblage of qualifying species of the Mersey Narrows and North Wirral Foreshore SPA and is a qualifying species of the Mersey Estuary SPA, was recorded during the 2018/19 winter bird surveys (Ref 15.15, Technical Appendix 15C). Annual peaks for shelduck in the Mersey Estuary have increased from 2,969 in 2012/13 to 10,867 in 2016/17, only dropping slightly to 10,558 in 2017/18 (Frost et al, 2019. Ref 17.19), whilst annual peaks for redshank in the Mersey Estuary have increased from 2,576 in 2012/13 to 4,158 in 2017/18 (Frost et al, 2019. Ref 17.19). As such, it is considered that the application site (including West Waterloo Dock) does not provide an important foraging resource for these species. No significant adverse effects on the favourable conservation status of shelduck or redshank populations (or the designation statuses of the Mersey Estuary SPA or Mersey Narrows and North Wirral Foreshore SPA) are anticipated as a result of the construction phase of the proposed scheme.

No qualifying bird species of nearby designated sites were confirmed to be breeding within the application site during the 2017 or 2019 breeding bird surveys, although shelduck, a qualifying feature of Mersey Estuary SPA / Ramsar, and oystercatcher, which forms part of the qualifying assemblage for Mersey Narrows and North Wirral Foreshore SPA, were recorded as probably breeding adjacent to the application site. Lapwing, which forms part of the qualifying assemblage for Mersey Estuary SPA / Ramsar and ringed plover, a qualifying feature of Mersey Estuary SPA / Ramsar, were confirmed to be breeding within areas to the north, and outside of, the application site.

No breeding habitat for qualifying bird species of nearby designated sites will be directly lost as a result of the proposed scheme. Noise and visual disturbance during the construction phase of the proposed scheme has the potential to result in the displacement of breeding birds from habitats immediately adjacent to the application site, although given the presence of suitable habitats in the wider area, this is not considered to have a noticeable effect on the favourable conservation status of populations of qualifying bird species for which nearby Natura 2000 sites are designated. Overall, no significant adverse effects are anticipated on any European statutory sites as a result of disturbance of qualifying breeding bird species.

### 15.6.3 UK Statutory Sites

Mersey Narrows SSSI is located 960 m west of the application site and North Wirral Foreshore SSSI is located over 3.5 km to the west of the application site, on the banks of the River Mersey, and around the northern edge of the Wirral landmass, respectively. They form the Mersey Narrows and North Wirral Foreshore SPA and Ramsar site, and therefore for the reasons stated above and in the Shadow Habitat Regulations Assessment: Stage 2 Appropriate Assessment (Report RT-MME-128844-02 Rev B, Technical Appendix 15B), **no significant adverse effects** are predicted.

### 15.6.4 Non-Statutory Sites

#### 15.6.4.1 Mersey Estuary NIA

The main priority for the Mersey Estuary NIA is the management of designated sites. European statutory sites and UK statutory sites are discussed in the above sections. Other ecological priorities for the NIA are grassland and woodland creation around existing areas of these habitats. The application site is located within a built-up area, and no grassland or woodland will be lost as a result of the proposals. The NIA covers an area of over 6,400 ha. Given the small size of the application site, the construction phase of the proposed scheme is not considered to have any noticeable impact on the integrity of this non-statutory network. No significant adverse effects are predicted.

#### 15.6.4.2 Leeds-Liverpool Canal LWS

The nearest part of the Leeds-Liverpool Canal LWS to the application site is 950 m north-east, although part of the canal not designated as an LWS is connected to the West Waterloo Dock, which forms part of the application site. This part of the canal is, however, heavily engineered and is not one of the more ecologically rich sections.

There will be no direct land take from the LWS as part of the developments proposals, and due to the large intervening distance no indirect impacts are considered likely. There is a very small chance that any pollution entering West Waterloo Dock could reach the LWS area, although it would be highly diluted by this point. This would result in a temporary and reversible impact on a receptor of county value, which is considered to be an effect of negligible significance.

### 15.6.5 Habitats

#### 15.6.5.1 Ephemeral / short perennial

The current proposals indicate that all areas of ephemeral/short perennial vegetation within the application site will be lost to the development. This habitat is of limited intrinsic ecological value, but contributes to the structural and ecological diversity within the application site. The direct loss of this habitat is a permanent and irreversible impact on a feature of Local (site) nature conservation value. This will result in an adverse effect, significant at the Local (Site) scale, which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a minor adverse effect.

#### 15.6.5.2 Standing water

During construction works, there is the potential for pollutants (e.g. oil, fuel, dust) to enter the standing water within West Waterloo Dock, leading to a temporary and reversible decline in water quality. The infilling of part of West Waterloo Dock will also result in a reduction in the area of standing water habitat within the application site. Given that this habitat is only of Local (Site) importance for nature conservation, when considered in isolation, this would be an adverse effect, significant at the Local (Site) scale, which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a minor adverse effect.

However, the partial infilling of West Waterloo Dock will result in the loss and disturbance of supporting habitat for qualifying species for which nearby Natura 2000 sites are designated. Pollution of this waterbody during construction works, leading to a decline in the water quality within the dock, could also result in a subsequent decline in fish stocks and an indirect impact on bird species foraging within this area. This is discussed within the 'European Statutory Sites' section above.

### 15.6.6 Species

#### Bats

The application site is considered to offer very limited foraging and commuting opportunities for bats, and as such any loss of potentially suitable habitat during the construction phase of the proposed scheme is unlikely to have any noticeable effect on local bat populations. The details of the construction process are not known at this stage, however any construction phase lighting has the potential to disturb bats using more suitable habitat areas to the west and north, such as the canal or river corridors. This may result in minor alterations of the use of the site by foraging and commuting species, which constitutes an adverse effect, significant at no greater than the Local (Site) scale, which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a minor adverse effect.

#### Birds (wintering)

The loss and disturbance of suitable wintering habitat for qualifying bird species of nearby designated sites is discussed within the 'European Statutory Sites' section above.

The West Waterloo Dock and surrounding habitats also provide suitable foraging habitat for a range of other notable bird species, including several Birds of Conservation Concern Red and Amber List species. The loss of standing water within the application site and disturbance during the construction phase is likely to result in the displacement of these bird species into suitable surrounding habitat. This is deemed to be an adverse effect, significant at the Local (Site) scale, which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a minor adverse effect.

#### Birds (breeding)

The potential loss or disturbance of breeding habitat for qualifying bird species of nearby designated sites is discussed within the 'European Statutory Sites' section above.

Canada goose is the only bird species for which breeding in close proximity to the application site has been confirmed. This species is not of conservation concern and is not a notable consideration with respect to the proposed scheme. The loss/distrubance of potentially suitable habitat for this species during the construction phase of the proposed scheme is considered to result in an effect of negligible significance.

The damage or destruction of an active bird's nest would be an offence under the Wildlife and Countryside Act 1981.

#### Terrestrial invertebrates

The construction phase of the proposed scheme will result in the permanent loss of the ephemeral/short perennial vegetation within the site, which is considered to provide some limited suitable habitat for terrestrial invertebrates. However, further suitable habitat for terrestrial invertebrates is present within the surrounding landscape, and the loss of a small quantity of habitat is not considered to affect the favourable conservation status of this group. In the absence of avoidance or mitigation, the loss of habitat for terrestrial invertebrates during the construction phase of the proposed scheme is considered to result in an effect of negligible significance.

## 15.6.7 Operation Phase

### 15.6.7.1 European Statutory Sites

Increased human presence within the site as a result of the proposed scheme has the potential to cause disturbance to qualifying bird species of nearby Natura 2000 sites. During the surveys for breeding and wintering birds completed between 2016 and 2019, several bird species were recorded using habitats within and adjacent to the application site.

Of particular note are oystercatcher, a qualifying assemblage bird species of the Mersey Narrows and North Wirral Foreshore SPA and cormorant, a qualifying assemblage bird species of the Liverpool Bay SPA and Mersey Narrows and North Wirral Foreshore SPA. Both species were relatively frequently recorded during the surveys.

Oystercatcher are considered to be probably breeding in small numbers outside of the application site along the River Mersey and using terrestrial habitats within and adjacent to the site for high tide roosts over winter. As previously detailed in the 'Construction Phase' section, oystercatcher numbers within the estuaries of the Merseyside region vary significantly year on year. Although an increased human presence / increased visual disturbance associated with the operational use of the proposed scheme is likely to deter oystercatchers from using habitats in close proximity to the application site for roosting at high-tide, given the presence of suitable habitats in the wider area and the large variations in the distribution of this species across the estuarine habitats of the Merseyside region, this is not considered to have a noticeable effect on the favourable conservation status of oystercatcher populations, or the assemblage designation of the Mersey Narrows and North Wirral Foreshore SPA. Overall, no adverse effects are anticipated on any European statutory sites as a result of a minor reduction in suitable high-tide roosting habitat for oystercatcher in proximity to the application site during the operational life of the proposed scheme.

Cormorant are considered to be using the site for foraging and resting purposes. In the absence of mitigation, there is the potential for retained standing water habitat within West Waterloo Dock to be subject to contamination from run-off or foul water during the operational phase of the proposed scheme. This could result in a decline in the water quality, leading to a decline in the water quality within the dock and connected waterbodies, potentially resulting in a subsequent decline in fish stocks, forcing birds to forage elsewhere. In addition, although cormorants are likely to be habituated to a certain level of disturbance due to the urban nature of the surrounding area, it is possible that visual disturbance during the operational phases of the development has the potential to result in the displacement of a small number of individual cormorants from potential supporting habitat within and adjacent to the application site. Given the relatively small number of individual cormorants recorded within the application site, as well as the availability of suitable habitat surrounding the site and in the wider area, any displacement of cormorants from the application site as a result of the proposed scheme in isolation is anticipated to result in only very small shifts in the distribution of cormorant within the local area, an adverse effect, significant at the Local (Site) scale which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a minor adverse effect. These small localised shifts are considered unlikely to result in any noticeable changes in the overall distribution of cormorant within the adjacent Liverpool Bay SPA. However, the displacement of cormorants as a result of the proposed scheme, combined with the displacement of cormorants as a result of other nearby developments, has the potential to result in noticeable changes in cormorant distribution at a wider scale within the Liverpool Bay SPA. As detailed in the ‘Mitigation by Design’ section above, a Strategic Ecological Mitigation Plan for Liverpool Waters (Arup, 2019, Ref 15.15, Technical Appendix 15C) has been prepared, which provides details regarding the installation of permanent floating pontoons for cormorant within docks across the Liverpool Waters site. This is discussed further in the ‘Cumulative Impacts’ section of this chapter, and in the Shadow Habitat Regulations Assessment: Stage 2 Appropriate Assessment (Report RT-MME-128844-02 Rev B, Technical Appendix 15B).

The potential for recreational impacts on the Mersey Estuary SPA and Ramsar arising during the operational phase of the proposed scheme is considered in the Shadow Habitat Regulations Assessment: Stage 2 Appropriate Assessment (Report RT-MME-128844-02 Rev B, Technical Appendix 15B), and is ruled out due to a combination of distance and the presence of more appealing everyday recreational facilities in closer proximity to the application site.

Sefton Coast SAC and Ribble and Alt Estuaries SPA/Ramsar are both located in excess of 6 km from the application site, with the vast majority of these two large sites located well over 10 km distant. A small-scale increase in visitor pressure as a result of the proposed scheme is inevitable, as these are both desirable visitor attractions, however the vast proportion of visitors will most likely travel to managed recreation areas such as the Sefton Coastal Path. Reference to respective JNCC data sheets for these sites does not highlight recreational pressure as a key threat or area of vulnerability. Overall, the potential for recreational impacts from the proposed scheme in isolation is considered to be negligible, and no adverse operational effects on Natura 2000 sites are predicted.

Due to the scale of the proposed scheme in the context of the surrounding area, the number of additional visitors accessing surrounding Natura 2000 sites as a percentage of all visitors from Liverpool is anticipated to be low. Any increases in recreational pressure from the development alone are not considered to have any likely significant effects on Natura 2000 sites. However, it is acknowledged that when considered in combination with future developments brought forward as part of the wider Liverpool Waters Project, there may be a significant effect on Natura 2000 sites as a result of increased recreational pressure. This is discussed further within the 'Cumulative Impacts' section of this chapter.

## 15.6.8 UK Statutory Sites

### 15.6.8.1 Mersey Narrows SSSI

Mersey Narrows SSSI and North Wirral Foreshore SSSI form the Mersey Narrows and North Wirral Foreshore SPA and Ramsar site, and therefore no operational phase effects are predicted for the reasons stated above and within the Shadow Habitat Regulations Assessment: Stage 2 Appropriate Assessment (Report RT-MME-128844-02 Rev B, Technical Appendix 15B).

### 15.6.8.2 Non-Statutory Sites

#### Mersey Estuary NIA

The main priority for the Mersey Estuary NIA is the management of designated sites. European statutory sites and UK statutory sites are discussed in the above sections. Other ecological priorities for the NIA are grassland and woodland creation around existing areas of these habitats. The application site is located within a built-up area, where there is no existing grassland or woodland, and creation of these habitats would not be suitable or feasible. The NIA covers an area of over 6,400 ha, and the operational use of the completed development is not considered to have any noticeable impact on the integrity of this non-statutory network. No significant adverse effects are predicted.

#### Leeds-Liverpool Canal LWS

During the operational phase of the proposed scheme there will be an increased human presence within the remaining West Waterloo Dock, located to the south of an undesignated section of canal, however the potential for indirect impacts on the more distant LWS canal section is considered to be negligible. No significant adverse effects are predicted.

## 15.6.9 Habitats

In the absence of mitigation, there is the potential for retained standing water habitat within West Waterloo Dock to be subject to contamination from run-off or foul water during the operational phase of the proposed scheme, leading to a temporary and reversible decline in water quality. Given that this habitat is only of Local (Site) importance for nature conservation, when considered in isolation, this would be an adverse effect, significant at the Local (Site) scale, which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a minor adverse effect.

Pollution of this waterbody during the operational phase of the proposed scheme, leading to a decline in water quality, could also result in a subsequent decline in fish stocks and an indirect impact on bird species foraging within this area. This is discussed within the 'European Statutory Sites' section above.

In the absence of appropriate management, new habitats could fail to achieve good condition and therefore be of limited value to biodiversity. Given the relatively small areas of landscaping proposed, this would be a temporary and reversible effect of negligible significance.

### 15.6.10 Species

#### Bats

No operational phase impacts on roosting bats are predicted, however the lighting strategy for the proposed scheme has the potential to increase illumination of potential commuting and foraging habitats to the west and north of the application site, such as the canal or river corridors. In the absence of a sensitive lighting strategy this may result in minor alterations of the use of the site by foraging and commuting species, which constitutes an adverse effect, significant at no greater than the Local (Site) scale, which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a minor adverse effect.

#### Birds

Increased human presence within the site as a result of the proposed scheme has the potential to cause disturbance to bird species using surrounding habitats. Disturbance of qualifying species of nearby Natura 2000 sites is discussed in the 'European Statutory Sites' section above.

Due to the built-up nature of the surrounding environment, it is anticipated that most bird species which currently utilise habitats within and adjacent to the application site (including the West Waterloo Dock) are habituated to some level of disturbance. During the surveys for breeding and wintering birds completed between 2016 and 2018, several bird species were recorded using habitats within the adjacent East Waterloo Dock, despite the fact that this waterbody is surrounded by residential buildings and is highly likely to be subject to noise and visual disturbance from residents. Increased human presence / increased visual disturbance during the operational life of the proposed scheme may deter a small number of bird species from utilising habitats within and immediately adjacent to the site, although this is not considered to result in any noticeable changes in the favourable conservation status of populations of bird species at a borough level. Overall, the permanent and irreversible impact of operational disturbance on breeding and wintering birds, receptors of Local (Site) importance and Local (Borough) importance, respectively, is considered to be an adverse effect, significant at the Local (Site) scale, which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a minor adverse effect.

## 15.7 Mitigation Measures

The following section describes the mitigation measures that will be provided as part of the proposals to minimise the identified adverse construction and operational effects of the proposed scheme. The mitigation provided has been designed in accordance with the mitigation hierarchy outlined in paragraph 175 of the National Planning Policy Framework and BS42020:2013 and so has aimed to avoid effects in the first instance, provide mitigation to reduce and abate adverse effects and finally provide compensation for any residual effects.

### 15.7.1 Mitigation for Cormorants

As previously detailed in the 'Mitigation by Design' section, a Strategic Ecological Mitigation Plan for the entire Liverpool Waters site (Arup, 2019, Ref 15.15, Technical Appendix 15C) has been produced, to address cumulative habitat loss and disturbance impacts on cormorants. Within the Central Docks neighbourhood, four permanent floating pontoons will be established in Princes Half Tide Dock, which is located to the south of the West Waterloo Dock. These pontoons are to be installed in 2019, prior to winter, and would therefore be in place prior to the commencement of any works within the application site. This approach has been agreed by both Natural England and MEAS, and addresses both construction phase and operational phase displacement impacts.

Further information is provided in the 'Cumulative Impacts' section of this chapter.

### 15.7.2 Ecological Conservation Management Plan (ECMP)

Prior to the commencement of the development, an ECMP will be produced. This will outline measures to ensure that there are no significant effects on ecological features, particularly Natura 2000 sites, for the lifetime of the proposed scheme. These measures will include:

- Avoidance/mitigation measures for aerial and water emissions;
- Avoidance/mitigation measures for increased noise and light disturbance; and,
- Mitigation for, and monitoring of, bird species likely to be impacted by the development, particularly cormorant.
- Building design and lighting measures to reduce the risk of bird strike; and
- Measures to avoid/mitigate for increased recreational pressure on Natura 2000 sites.

Subject to prior agreement with the local authority, the ECMP will be implemented in full throughout the lifetime of the development.

Subject to the provision of the proposed floating pontoons, it is considered that the displacement of cormorants from the application site can be mitigated for, and no significant effects are anticipated.

### 15.7.3 Construction Environmental Management Plan (CEMP)

Prior to the commencement of construction works, a CEMP will be produced. The CEMP will be informed by any required updated ecological survey work and will set out the necessary timings and safe working practices that will be implemented to minimise disturbance and impacts on habitats and species during the construction phase of the proposed scheme. As a minimum, the CEMP will include the following measures:

- Details of materials and working methodology for the proposed dock infill works to ensure adverse impacts on habitats and species within the West Waterloo Dock (and connected waterbodies/watercourses) are avoided;
- Details of protective fencing installed prior to construction to demarcate works areas and to safeguard sensitive ecological features to be retained, such as the River Mersey to the west;
- Any pre-construction checks required before the commencement of the construction phases (i.e. for nesting birds);
- Relevant pollution prevention guidelines and working practices to be adopted to prevent silt and contamination entering watercourses or waterbodies;
- Adherence to best practice guidelines to minimise noise disturbance, supress dust and limit disturbance to retained areas of habitat; and
- Outline of construction phase lighting measures to minimise light spill on sensitive habitat areas.

Subject to prior agreement with the local authority, the CEMP will be implemented in full throughout the construction phase.

### 15.7.4 Landscape and Ecological Management Plan

A Landscape and Ecological Management Plan (LEMP) will be produced setting out how areas of created habitat will be managed to ensure that the intended biodiversity value is achieved and maintained in the long-term. The LEMP will also set out the appropriate timings for habitat management, so that relevant management activities are principally undertaken outside of sensitive periods such as the bird nesting season.

The LEMP could be subject to prior agreement with the local authority through the use of planning conditions and will be implemented in full upon completion of the proposed scheme.

### 15.7.5 Lighting Strategy

Middlemarch Environmental Ltd will complete a review of the site lighting proposals to ensure that they are sensitive to biodiversity. Key principles for sensitive lighting include:

- The provision of dark areas along adjacent waterbodies/watercourses where possible;
- The minimisation of lighting throughout the application site;

- The use of narrow spectrum bulbs with a low UV content, such as LED lighting, which are less disruptive to foraging/commuting bats;
- Reducing horizontal light spill by use of optically effective luminaires and appropriate mounting heights; and
- Adopting a dimming regime between midnight and 6 am so that light intensity is reduced by 50 %.

### 15.7.6 Monitoring

A suitably qualified ecologist should be engaged to monitor the works and ensure that they are compliant with the ecological mitigation proposals described above. The scope of monitoring required will be detailed in the proposed ECMP and LEMP.

## 15.8 Residual Effects

The following section describes residual ecological effects and outstanding legislative considerations upon implementation of mitigation measures outlined in the preceding section.

### 15.8.1 Construction Effects

#### European Statutory Sites

Noise and visual disturbance during the construction period are anticipated to result in unavoidable localised small shifts in the distribution of cormorant, an **adverse residual effect, significant at the Local (Site) scale** which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a **minor adverse effect**. However, the provision of four permanent floating pontoons within Princes Half Tide Dock (located to the south of West Waterloo Dock) in accordance with the Liverpool Waters: Strategic Ecological Mitigation Plan (Arup, 2019, Ref 15.15, Technical Appendix 15C) will ensure that suitable supporting habitat for cormorant is maintained within the wider Liverpool Waters area and that adverse effects on the population at a wider scale are avoided. Refer to the 'Cumulative Impacts' section of this chapter for further details.

The proposed ECMP and CEMP will include construction phase controls to minimise the risk of issues such as pollution, and also to minimise potential disturbance to adjacent habitat areas that may be used by qualifying bird species from nearby Natura 2000 sites. Provided that these control measures are successfully implemented, **no residual adverse effects** are anticipated.

#### UK Statutory Sites

As the Mersey Narrows SSSI forms part of the wider Mersey Narrows and North Wirral Foreshore SPA/Ramsar considered above, provided that the measures within the ECMP and CEMP are successfully implemented, then **no residual effects** are predicted.

### Non-Statutory Sites

The proposed CEMP will include measures to minimise the potential for direct and indirect impacts on the adjacent part of the Leeds-Liverpool Canal. Given the distance between the site and the LWS section of the canal, **no residual effects** are predicted.

## 15.8.2 Habitats

The proposed ECMP and LEMP will ensure that the landscaping proposals for the site are designed to be of value to biodiversity and that, if possible, existing loose aggregate material and its associated seedbank is utilised within the landscaped areas. Should this be achievable, the residual effect of the loss of ephemeral / short perennial habitat will decreased to an **effect of negligible significance.**

The proposed CEMP will include construction phase controls to minimise the risk of issues such as pollution of retained areas of standing water within West Waterloo Dock. Provided that these control measures are successfully implemented, **no residual adverse effects** are anticipated.

## 15.8.3 Species

### Bats

Provided that the CEMP includes proposals for controlling construction phase lighting, potential disturbance impacts to bats using off-site habitat will be reduced to a level that is not significant. **No residual adverse effects** are anticipated.

### Birds

The loss of habitat for qualifying bird species is discussed in the 'European Statutory Sites' section.

The ECMP and CEMP will include information regarding the most appropriate timings and working methods to minimise potential disturbance to birds using off-site habitat, and the LEMP will include enhancements proposals for urban bird species including black redstart. Provided that both documents are implemented, the predicted residual effect for remaining bird species will reduce to an **effect of negligible significance**.

## 15.8.4 Operational Effects

### European Statutory Sites

An increased human presence and increased visual disturbance once the development is in operational use are anticipated to result in unavoidable localised small shifts in the distribution of cormorant, an **adverse residual effect, significant at the Local (Site) scale** which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a **minor adverse effect**. However, the provision of four permanent floating pontoons within Princes Half Tide Dock (located to the south of West Waterloo Dock) in accordance with the

Liverpool Waters: Strategic Ecological Mitigation Plan (Arup, 2019, Ref 15.15, Technical Appendix 15C) will ensure that suitable supporting habitat for cormorant is maintained within the wider Liverpool Waters area and that adverse effects on the population at a wider scale are avoided. Refer to the 'Cumulative Impacts' section of this chapter for further details.

The proposed ECMP will outline how operational phase pollution of retained areas of standing water within West Waterloo Dock (and connected waterbodies) will be avoided. Provided that these control measures are successfully implemented, **no residual adverse effects** are anticipated.

As detailed in Section 15.6.2, the proposed scheme in isolation is considered unlikely to result in significant effects on Natura 2000 sites as a result of increased recreational pressure. However, it is acknowledged that when the proposed scheme is considered in combination with other development, there may be a significant effect. This is discussed further within the 'Cumulative Impacts' section of this chapter.

#### UK Statutory Sites

**No residual effects** are predicted for any UK nature conservation sites.

#### Non-Statutory Sites

**No residual effects** are predicted for any non-statutory nature conservation sites.

### 15.8.5 Habitats

#### Standing water

The proposed ECMP and LEMP will include operational phase controls to minimise the risk of issues such as operational pollution of retained areas of standing water within West Waterloo Dock. Provided that these control measures are successfully implemented, **no residual adverse effects** are anticipated.

#### Created habitats

The proposed LEMP will ensure that the biodiversity value of newly created habitats is maximised.

### 15.8.6 Species

#### Bats

Provided that the lighting strategy is designed to be sensitive to biodiversity, potential disturbance impacts to bats using off-site habitat will be reduced to a level that is not significant. **No residual adverse effects** are anticipated.

#### Birds

Increased human presence within the site is an inevitable consequence of a new residential development. Overall, the permanent and irreversible impact of operational disturbance on breeding and wintering birds (that have not previously been discussed in relation to European statutory sites) is considered to be a

**residual adverse effect, significant at the Local (Site) scale**, which, when converted in accordance with the methodology outlined in Table 15.1, constitutes a **residual minor adverse effect**.

## 15.9 Cumulative Impacts

There are generally two types of cumulative effect that are considered as part of the EIA process. These are intra-development effects (ie the cumulative effects of all the different aspects of the proposed scheme) and inter-development effects (ie potential cumulative effects with other consented and proposed schemes). Within this chapter, intra-development effects have been considered as an inherent part of the pre-mitigation impact assessment.

In addition to the cumulative impacts of the proposed scheme (intra-development effects), the assessment includes a consideration of cumulative effects of the development and any other recently completed, ongoing and proposed schemes within close proximity to the application site (inter-development effects). For the purpose of this assessment, the cumulative schemes listed in Chapter 3 are considered. These are:

- The entire Liverpool Waters scheme (10O/2424);
- Five developments associated with Princes Dock (within the Liverpool Waters scheme):
  - William Jessop House, A-03 (15F/0560)
  - The Lexington, A-04 (17F/2056)
  - Plaza 1821, A-05 (17F/0913)
  - Hive City Docks, A-06 (17F/0456)
  - Cruise Liner Terminal, A-07 (17O/3230)
- Three schemes associated with the Central Docks (within the Liverpool Waters scheme):
  - Isle of Man Ferry Terminal, C-01 (18F/3231)
  - Park Central, C-04 and C-06 (17F/1628)
  - Northern Link Road (17F/2628)
- Five other nearby developments:
  - Site bounded by Waterloo Road / Paisley Street / Roberts Street / Greenock Street (19F/1290)
  - Ovatus, Leeds Street (17F/0042)
  - Infinity, Leeds Street (17F/0340)
  - 30-36 Pall Mall (16F/2634)
  - North Point, 70-90 Pall Mall (14F/2543)

### 15.9.1 Liverpool Waters

The Liverpool Waters project is the overall regeneration project of which the Princes Dock schemes and the Central Dock schemes (Isle of Man Ferry Terminal, Park Central, the Northern Link Road and the current application site) form a part.

### 15.9.2 Construction Phase Effects

The ecology ES chapter for the Liverpool Waters project (Ref 15.22) concludes the following for the construction phase of the development:

- No residual effects on European, UK or non-statutory nature conservation sites.
- Effects of habitat loss significant within the zone of influence of the site only.
- No significant residual effects on foraging and commuting bats.
- No significant residual effects on roosting bats.
- No significant disturbance effects on breeding birds.
- Local level significant effects on breeding birds as a result of habitat change.
- No significant residual effects on wintering birds.
- No significant residual effects on marine mammals.
- No significant residual effects on fish species.

Avoidance and mitigation measures described in the Liverpool Waters ES of relevant to the construction phase include:

- Appropriate surveys to be completed for each application.
- Production of a CEMP for each development, including construction phase controls such as determination of fixed haul routes and control of dust, noise and vibration.

In addition, the Habitat Regulations Assessment Final Report for Liverpool Waters (Liverpool City Council/MEAS, 2012, Ref 15.18) concludes that, provided that a series of recommendations are taken forward and implemented, the wider Liverpool Waters project:

a) is not directly connected with or necessary to the management of the Natura 2000 sites;
b) does not intrude into the Natura 2000 sites listed below;
c) is not considered to have a likely significant effect on each of the following sites:
    - Mersey Narrows and North Wirral Foreshore potential Special Protection Area (pSPA);

- Mersey Narrows and North Wirral Foreshore proposed Ramsar site (pRamsar);
- Mersey Estuary Special Protection Area (SPA);
- Mersey Estuary Ramsar;
- Dee Estuary Special Area of Conservation (SAC);
- Dee Estuary SPA;
- Dee Estuary Ramsar Site;
- Ribble and Alt Estuaries SPA;
- Ribble and Alt Estuaries Ramsar;
- Sefton Coast SAC;
- Martin Mere SPA;
- Martin Mere Ramsar; and
- Liverpool Bay SPA.

either alone or in-combination with other plans or projects.

The recommendations of relevance to the construction phase provided in the Habitat Regulations Assessment Final Report for Liverpool Waters (Liverpool City Council/MEAS, 2012, Ref 15.18) to ensure that there are no likely significant effects are:

a) Aerial emissions will be subject to mitigation measures as set out in a detailed Construction Environment Management Plan (CEMP) and Ecological Conservation Management Plan (ECMP);
b) Water emissions will be subject to mitigation measures as set out in a detailed CEMP and ECMP;
c) Noise emissions will be subject to mitigation measures as set out in a detailed CEMP and ECMP;
d) Light emissions will be subject to mitigation measures as set out in a detailed CEMP and ECMP;
e) Cormorant disturbance will be minimised by mitigation measures and a monitoring protocol that will be set out and detailed in an ECMP; and,
f) Tall buildings will be designed in a way to limit the risk of bird strike. This will be set out in a detailed CEMP and ECMP.

Following amendments to the Local Plan, Aecom (2017, Ref 15.23) produced a revised version of the Liverpool Local Plan Habitats Regulations Assessment for Liverpool City Council in December 2017. This assessment focused on individual and in-combination effects on Natura 2000 sites arising from proposed local plan policies. The main conclusions of relevance to the construction phase of the proposed project was a potential for water quality effects on Mersey Estuary SPA/Ramsar, Liverpool Bay SPA, Mersey Narrows and North Wirral Foreshore SPA/Ramsar and Dee Estuary SAC/SPA/Ramsar. However, it was concluded that provided that best practice construction methods are implemented and measures are put in place to prevent pollution, no adverse water quality impacts on any of these sites are predicted as a result of the construction phase of the proposed scheme:

> *It should be noted that the majority of the processes that could result in a deterioration of water quality (unregulated waste water discharges, surface water runoff and pollution from construction activities) are either regulated through statutory requirements or can be mitigated through standard construction techniques and environmental good practice. These impacts are therefore unlikely.*

Provided that the avoidance and mitigation measures proposed in the Liverpool Waters ES chapter and the Habitat Regulations Assessments for Liverpool Waters and the Local Plan are implemented, given that these documents consider Plot C02 as an inherent part of the overall Liverpool Waters development, the majority of potentially significant construction phase cumulative effects can be avoided.

Nevertheless, the partial infilling of West Waterloo Dock would result in the proposed mitigation for the Northern Link Road (LPA ref: 17F/2628) and Cruise Liner Terminal (LPA ref: 17O/3230) schemes no longer being feasible. The proposed mitigation for the Northern Link Road (LPA ref: 17F/2628) scheme comprised the installation of three permanent floating pontoons within West Waterloo Dock, in order to provide suitable winter resting and roosting sites for cormorants. In the absence of alternative locations for the permanent pontoons being identified, the construction phase of the proposed scheme (and partial infilling of West Waterloo Dock) has the potential to result in a cumulative loss of habitat for cormorants within the West Waterloo Dock area. This, combined with further loss of suitable cormorant habitat and disturbance as a result of other developments within the Liverpool Waters scheme, has the potential to significantly alter the distribution of cormorant within the Liverpool Bay SPA, leading to a subsequent change to its designation status. However, as previously detailed in the 'Mitigation by Design' and 'Mitigation Measures' sections of this chapter, in accordance with the Liverpool Waters: Strategic Ecological Mitigation Plan (Arup, 2019, Ref 15.15, Technical Appendix 15C), four permanent floating pontoons will be installed within Princes Half Tide Dock, which is located to the south of West Waterloo Dock, which will address disturbance and habitat loss impacts on cormorants during both the construction phase and the operational phase of developments within the Central Docks area and the cumulative loss of habitat from the proposed scheme in combination with the Northern Link Road (LPA ref: 17F/2628) scheme. In addition, a series of pontoons are to be installed within three other docks across the Liverpool Waters site, to address the combined effect on cormorant of all developments brought forward as part of the scheme.

Subject to the provision of the proposed floating pontoons, it is considered that the cumulative loss of supporting habitat for cormorant can be mitigated for, and **no significant effects** are anticipated.

### 15.9.3 Operational Phase Effects

The ecology ES chapter for the Liverpool Waters project (**Ref 15.22**) concluded that there would be no significant residual operational phase effects on any ecological receptors.

Avoidance and mitigation measures described in the Liverpool Waters ES of relevance to the operational phase of the scheme include:

- Provision of replacement habitat as part of the detailed landscape scheme for individual developments.
- Appropriate surveys to be completed for each application.
- Provision of nesting and roosting features for bats and birds.
- Design of sensitive lighting schemes to reduce impacts on bats.
- Appropriate post-development habitat management and maintenance.

The Habitat Regulations Assessment Final Report for Liverpool Waters (Liverpool City Council/MEAS, 2012, Ref 15.18) acknowledges that *'Eighteen migratory waterbird species have been recorded on Liverpool Waters. A number of these bird species are also qualifying features of the Natura 2000 sites, either in their own right or as part of the waterbird assemblage.'* Following an assessment of the numbers of these waterbird species using the Liverpool Waters site as a percentage of the Natura 2000 site populations, the HRA concludes that no likely significant effects upon the populations of qualifying species of the Natura 2000 sites will occur as a result of human disturbance arising from the Liverpool Waters development, with the exception of cormorant.

As such, a recommendation is made in the report regarding the production of an ECMP, detailing mitigation measures and a monitoring protocol in order to minimise cormorant disturbance. Further detail regarding the production of an ECMP for the proposed scheme is provided in the 'Mitigation Measures' section of this chapter.

In terms of off-site effects on Natura 2000 sites arising from recreational disturbance, the Habitat Regulations Assessment Final Report for Liverpool Waters (Liverpool City Council/MEAS, 2012, Ref 15.18) states that:

> *The Sefton, Liverpool and Wirral coasts provide a recreational experience that cannot be gained within Liverpool Waters. These areas are easily accessible to Liverpool Waters residents, either by public transport or private car. However, some of the SSSI Units that make up these areas are in "unfavourable, declining" conservation status for various reasons…Should visitors choose to access these areas they could add unnecessary disturbance pressures.*
>
> *The movement of visitors from Liverpool Waters is difficult to predict and the precautionary approach must therefore be adopted. Likely significant effects upon the qualifying features of the Natura 2000 sites on-land could occur as a result of increases in recreational pressure. These recreational disturbance issues will need to be addressed via a commitment to a mechanism to reduce the effect of increases in recreational disturbance on the Natura 2000 sites considered within this screening.*

Measures to address potential adverse effects arising from public access / disturbance to surrounding Natura 2000 sites will be included within the ECMP for the proposed scheme, and will be written in accordance with the Liverpool Waters: Strategic Ecological Mitigation Plan (Arup, 2019, Ref 15.15, Technical Appendix 15C) and will be agreed with Natural England, MEAS and Liverpool City Council.

Subject to the production and implementation of the ECMP for the proposed scheme, and equivalent commitments by all other developments in the Liverpool Waters scheme, it may be possible to reduce the cumulative effect of increased recreational pressure on qualifying features of Natura 2000 sites to a scale that is **not significant**.

Additional recommendations of relevance to the operational phases of developments provided in the HRA Screening report for the full Liverpool Waters development to ensure that there are no likely significant effects are:

a) Aerial emissions will be subject to mitigation measures as set out in a detailed Construction Environment Management Plan (CEMP) and Ecological Conservation Management Plan (ECMP);
b) Water emissions will be subject to mitigation measures as set out in a detailed CEMP and ECMP;
c) Noise emissions will be subject to mitigation measures as set out in a detailed CEMP and ECMP;
d) Light emissions will be subject to mitigation measures as set out in a detailed CEMP and ECMP;
e) A Travel Plan will provide a mechanism to address issues relating to aerial emissions on Sefton Coast SAC.
f) Fish populations within the dock waters will be monitored and mitigation measures will be applied as required to enable fish populations to remain at a level that continues to provide functional supporting habitat to qualifying Natura 2000 bird species. This will be set out in a detailed CEMP and ECMP;
g) The Energy Centre will be subject to assessment against the Habitats Regulations once details are finalised at the Reserved Matters Stage; and
h) Tall buildings will be designed in a way to limit the risk of bird strike. This will be set out in a detailed CEMP and ECMP.

The Liverpool Waters: Strategic Ecological Mitigation Plan (Arup, 2019, **Ref 15.15**, **Technical Appendix 15C**) reiterates that a CEMP will be required for each development within Liverpool Waters.

### 15.9.4 Princes Dock Schemes

Waterman (2017, Ref 15.24) produced 'Information to inform a Habitat Regulations Assessment (HRA) Screening Report: Assessment of Likely Significant Effects (ALSE)' for the Liverpool Cruise Liner Terminal (17O/3230). With respect to in-combination effects, the following was stated:

> *The following schemes have been identified by the Environmental Statement (ES) as possibly resulting in cumulative or 'in-combination' effects:*

- *Liverpool Waters (10O/2424) – approved July 2013*
- *The Hive, William Jessop Way (17F/0456) – approved subject to S106*
- *The Lexington, William Jessop Way (16F/1370) – permission granted Sep 2016*
- *William Jessop House (15F/0560) – registered March 2015*
- *Ovatus 1, Leeds Street (17F/0042) – permission granted April 2017*
- *Infinity, Leeds Street (17F/0340) – application submitted Feb 2017*
- *30-36 Pall Mall (16F/2634) – application submitted Nov 2016*
- *North Point, 70-90 Pall Mall (14F/2543) – on site, completion spring/summer 2018*
- *Land to west of Waterloo Road Plot C04 and C06 Central Docks Liverpool Waters (17F/1628) – registered Sept 2017*
- *Vacant Land William Jessop Way Liverpool (17F/0913) – approved subject to S106*

*Of the above schemes, only Liverpool Waters borders the Mersey Estuary and is addressed below. For the remaining schemes, there is not considered to be any pathways to impact that could combine with residual or other impacts from the Cruise Liner Terminal Development that could result in likely significant effects to the Mersey Estuary.*

*In terms of Liverpool Waters which includes the north of the Development site and land extending further northwards, the key receptor which is likely to experience a potential in-combination effect is the wintering water bird populations which utilise the Mersey Estuary and are mobile around the estuary. Only low numbers of water birds were found to be present at Liverpool Waters (maximum numbers 5 redshank, 15 oystercatcher and 8 cormorant) and potentially impacted by the proposed Liverpool Waters scheme. These birds are considered likely to potentially form part of the Mersey Narrows & North Wirral Foreshore pSPA / pRamsar populations*

*The Princes Dock supports very few water birds during any season across the calendar year. This is evidenced through the desk study for the APEM bird report that examined site-specific survey data, national survey databases and grey literature within County bird reports and County avifauna. The Princes Dock was found to not be of importance for any particular water bird species as a breeding location or non-breeding location to nest, forage, loaf or roost. It is largely void of water birds, though some relatively common species do reside on it on occasion. Therefore, any in-combination effect with Liverpool Waters is also considered negligible.*

## Central Docks Schemes

A Neighbourhood Ecological and Biodiversity Strategy (Arup, 2019, Ref 15.25) has been prepared for the Central Docks Neighbourhood, to *'summarise the means of safeguarding all protected species of relevance and supporting habitats during construction and operation within the respective neighbourhood including consideration of pathways to protected European sites'*.

The strategy *'is intended to provide guidance in relation to ecology and biodiversity for all reserved matters applications within the neighbourhood'*.

The strategy outlines requirements for the following:

- Pre-construction / construction phase surveys (annual passage/winter bird surveys, bat surveys where structures are to be demolished, aquatic species surveys, water quality surveys);
- Mitigation through scheme design (bird strike mitigation, control of gulls and pigeons, control of leisure boat activity, provision of HRA information regarding recreational disturbance on Natura 2000 sites);
- Construction phase mitigation (removal of buildings/vegetation outside bird nesting season, implementation of speed limits for construction vehicles, consideration of measures to avoid impacts on wintering and passage bird species);
- Habitat creation (inclusion of green/brown roofs/walls and nest boxes for black redstart, consideration of provision of peregrine nest boxes within suitable plots, inclusion of swallow/swift nest boxes, strategic provision of replacement roosting habitat for water birds, provision of bat boxes on buildings within suitable plots, landscape planting designed for biodiversity); and,
- Post-construction monitoring and management (aquatic monitoring, bird strike monitoring, monitoring of gull/pigeon control measures if required, monitoring of green/brown roofs and black redstart boxes, monitoring of swallow, swift and bat boxes, provision of Landscape Management Plan for each reserved matters application).

For the proposed scheme, suitable ecological surveys have been completed. The other requirements listed above can be addressed through the implementation of measures within a CEMP, ECMP and LEMP.

Provided that each development within the Liverpool Waters scheme complies with the Liverpool Waters ES, HRA and Strategic Ecological Mitigation Plan and relevant Neighbourhood Ecological and Biodiversity Strategies, and appropriate documents (i.e. CEMP / ECMP) are prepared and measures implemented, potentially significant operational phase **cumulative effects can be avoided, or appropriately mitigated for**.

### 15.9.5 Other Nearby Schemes

#### Construction Phase Effects

The scheme on the 'Site bounded by Waterloo Road / Paisley Street / Roberts Street / Greenock Street', the two Leeds Street schemes and the two Pall Mall schemes are all located over 250 m east/south-east of the application site, are dominated by hardstanding and/or buildings, are surrounded by built development and are not located in close proximity to any statutory or non-statutory sites designated for nature conservation.

The Case Officer Report for the 'Site bounded by Waterloo Road / Paisley Street / Roberts Street / Greenock Street' scheme (19F/1290) states that:

> *The site is of very limited ecological value, being predominately built or hard surfaced. Nevertheless, the proposal involves demolition of and existing building, and construction works and introduction of a residential population in proximity to designated habitat areas. As such, the applicant provided additional information at the request of the Merseyside Environmental Advisory Service...*

Additional information provided to MEAS included a Bat Survey Report which confirmed that no evidence of roosting bats had been identified, and a Construction Noise Report, which confirmed that *'there wouldn't be adverse impacts, and that the noisiest construction activities (piling) would be at levels below the 70dB at Princes Dock. Mitigation measures are recommended that could reduce impacts further.'*

In relation to statutory nature conservation sites, the Ecological Appraisal completed by WSP in 2016 (Ref 15.26) for the Ovatus scheme (17F/0042) concluded that the *'Proposed Development was considered unlikely to impact any sites off-site as it does not form complimentary or connected habitat to any sites identified.'*

Regarding qualifying bird species of nearby statutory sites, the Ecological Assessment completed by Penny Anderson Associates Ltd in 2016 (Ref 15.27) for the Infinity scheme (17F/0340) states that *'the site…has none of the supporting habitat features required for any of the species recorded.'*

Regarding Mersey Narrows and North Mersey Foreshore SPA, RAMSAR and SSSI, The Preliminary Ecological Appraisal prepared by Wardell Armstrong in 2016 (Ref 15.28) for the 30-36 Pall Mall scheme (16F/2634) concluded that *'The proposed development is unlikely to affect the habitats and species for which this site is designated – namely wading birds and intertidal habitats. The site is already surrounded on all sides by built development including other tall buildings.'*

No specific information regarding construction-phase effects on ecological features as a result of the North Point, 70-90 Pall Mall scheme (14F/2543) was provided on the Liverpool City Council Planning Portal.

Given the location of these proposed schemes over 250 m from the application site within built up areas, subject to the implementation of best practice construction measures, **no cumulative construction phase effects** on any ecological features are anticipated.

## Operational Phase Effects

The Case Officer Report for the 'Site bounded by Waterloo Road / Paisley Street / Roberts Street / Greenock Street' scheme (19F/1290) confirms that MEAS had no objection to the development, subject to the submission of additional information including *'avoidance of recreational pressure on European designated sites'*. The applicant subsequently provided *'A Strategy Document regarding protected habitat areas, advising how the occupants of the building will be informed to avoid harm to European designated sites from any increase in visits ("recreational pressure").'*

The report goes on to state that:

> *Merseyside Environmental Advisory Service has undertaken a Habitats Regulations Assessment and subsequent Appropriate Assessment and concluded that, with mitigation/preventative measures secured through the appropriate planning mechanisms, there will be no adverse effect upon the integrity of European sites. Planning conditions to secure the noise mitigation measures assessed and the provision of Information Packs to inform residents of the importance of the European sites, and responsible user code and the location of Suitable Alternative Natural Greenspaces (SANGS), are duly included.*

The Case Officer Report for the Ovatus scheme (17F/0042) outlines the consultation responses received from Natural England and MEAS, confirmed that neither object to the proposals, and that no significant impacts on statutory designated sites or protected species are anticipated.

The Case Officer Report for the Infinity scheme (17F/0340) states the following:

> *The Council's ecological advisor, Merseyside Environmental Advisory Service (MEAS), does not consider a Habitats Regulation Assessment necessary and does not consider the development will be harmful to ecology or the environment, subject to appropriate planning conditions being imposed relating to construction environmental management, bird protection, removal of invasive species and sustainable waste management.*
>
> *Natural England raises no objection to the application and does not consider the development likely to have a significant effect on the interest features for which the Mersey Narrows & North Wirral Foreshore (SPA & Ramsar) has been classified. Hence, it is not necessary to undertake an Appropriate Assessment to assess implications of the development on this SSSI.*

The Case Officer Report for the North Point, 70-90 Pall Mall (14F/2543) scheme provides the following information regarding the consultation response from Natural England:

> *Natural England has identified that the development is situated in close proximity of Mersey Narrows and North Wirral foreshore Special*

*Protection Area and Site of Special Scientific Interest. They advise that the Local Planning Authority, as "competent authority", should determine whether the development, specifically the helipad proposal, will have a significant effect on these European protected sites through a Habitats Regulation Assessment. This will require the applicant to submit details of flight paths, height and frequency of helicopters expected to use the helipad as they have potential to cause disturbance to bird species supported by these European protected sites. Natural England advises that the LPA make an assessment of any protected species on site, in accordance with Natural England's Standard Advice on deciding if there is a 'reasonable likelihood' of protected species being present.*

However, the report confirms that the rooftop helipad was omitted from the proposals.

Based on the information presented above, it is concluded that there will be **no cumulative operational phase effects** on ecological features as a result of the proposed scheme combined with the other nearby schemes.

Where required, such as for the 'Site bounded by Waterloo Road / Paisley Street / Roberts Street / Greenock Street' scheme (19F/1290), appropriate avoidance and mitigation measures have been secured to minimise potential cumulative recreational impacts on Natura 2000 sites.

## 15.10 Assessment Summary

This Terrestrial Ecology chapter has been compiled based on the best practice guidance described by CIEEM (2019). It comprises a review of relevant legislation and planning policy, a summary of baseline ecological data and an evaluation of the potential ecological receptors in a geographical context. Potential impacts arising from the development proposals are then assessed in the absence of mitigation, after which proposed mitigation measures are described. Predicted residual effects upon implementation of mitigation are then stated, and an assessment of potential in-combination effects with other consented and proposed schemes is provided.

The ecological baseline data for the site was sourced from a Preliminary Ecological Appraisal, including both a desk study exercise and Phase 1 Habitat Survey, completed by Middlemarch Environmental Ltd in 2018, as well as breeding and wintering bird surveys completed by Amey and RSK between 2016 and 2018, Arup between 2018 and 2019 and ADAS in 2019. This baseline data, in addition to a consultation response received from MEAS, allowed the following key ecological receptors to be identified:

- European statutory nature conservation sites: Liverpool Bay SPA, Mersey Narrows and North Wirral Foreshore SPA/Ramsar, Dee Estuary SAC, Mersey Estuary SPA/Ramsar, Sefton Coast SAC and Ribble and Alt Estuaries SPA/Ramsar.

- UK statutory nature conservation sites: Mersey Narrows SSSI and North Wirral Foreshore SSSI.
- Non-statutory nature conservation sites: River Mersey NIA and Leeds-Liverpool Canal LWS.
- Habitats: standing water and ephemeral/short perennial vegetation.
- Species: birds, bats and terrestrial invertebrates.

Potential impacts on Liverpool Bay SPA, Mersey Narrows and North Wirral Foreshore SPA/Ramsar and Mersey Estuary SPA/Ramsar are considered in detail in a separate Shadow Habitat Regulations Assessment: Stage 2 Appropriate Assessment (Report RT-MME-128844-02 Rev B, **Technical Appendix 15B**), which identified a number of potential impact pathways on Natura 2000 sites, arising as a result of the proposed scheme in isolation. These comprised: loss of supporting habitat for cormorants as a result of the partial infilling of West Waterloo Dock; disturbance of cormorants, during both the construction phase and the operational phase of the proposed scheme; and, pollution of West Waterloo Dock, during both the construction phase and the operational phase of the proposed scheme, leading to a potential decline in the availability of prey resources for cormorant.

Potential impact pathways on Natura 2000 sites arising as a result of the proposed scheme in combination with other plans and projects comprised: the loss of supporting habitat for cormorants as a result of the partial infilling of West Waterloo Dock and the subsequent prevention of proposed mitigation for the adjacent Northern Link Road development; and, cumulative recreational impacts on Natura 2000 sites. However, the report concludes that, provided a series of mitigation and monitoring measures are implemented, **no likely significant effects** on the conservation objectives of any Natura 2000 sites are anticipated, when the development is considered alone or when considered in combination with other plans or projects.

This chapter further concludes that **no likely significant effects** are predicted for any other statutory or non-statutory nature conservation sites during either the construction or operational phases. All existing habitat on site will be lost, which, in the absence of mitigation, represents a minor adverse effect in terms of the loss of ephemeral / short perennial habitat. Disturbance effects on birds (non-qualifying species) and bats during the construction phase are considered to be of minor adverse significance, in the absence of mitigation. During the operational phase minor adverse effects are predicted on populations of bird species due to human disturbance and populations of bats due to operational phase lighting.

Mitigation proposals for predicted construction phase impacts comprise the design and implementation of an Ecological Conservation Management Plan (ECMP) and a Construction Environmental Management Plan (CEMP). Predicted residual effects after these documents have been agreed and implemented are of negligible significance for the Leeds-Liverpool Canal LWS, ephemeral / short perennial habitat, non-qualifying bird species and bats.

Mitigation proposals for predicted operational phase impacts comprise the implementation of the ECMP for the lifetime of the development, and the design and implementation of a Landscape and Ecological Management Plan (LEMP) to ensure created habitats are managed for biodiversity value, and also the completion of an ecological lighting review to minimise potential disturbance impacts on fauna that could arise from operational phase lighting. Predicted residual effects after these documents have been agreed and implemented are of negligible significance for bats, and of minor adverse significance for any (non-qualifying) bird species using adjacent habitat areas.

Overall none of the predicted impacts are considered to be **significant** from a favourable conservation status perspective.

## Table 15.4: Summary of Effects

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Construction Phase Impacts | | | |
| Displacement of cormorants from site during construction / dock infilling works, small shift in distribution of species. | To address impacts on cormorant across the Liverpool Waters site, a Strategic Ecological Mitigation Plan has been prepared, which includes details regarding the provision of permanent floating pontoons for cormorant. This is considered to be 'mitigation by design'.<br>The localised shift in cormorant distribution is an unavoidable adverse effect, significant at the Local (Site) scale / Minor adverse effect. | See previous column. | Temporary unavoidable localised shift in cormorant distribution. Adverse effect, significant at Local (Site) scale / Minor adverse effect. |
| Loss of ephemeral / short perennial habitat | Adverse effect, significant at Local (Site) scale / Minor adverse effect. | Implementation of measures in ECMP and LEMP to ensure landscaping of value to biodiversity. Use of existing loose aggregate material and its associated seedbank. | Negligible |
| Pollution of standing water (West Waterloo Dock) | Adverse effect, significant at Local (Site) scale / Minor adverse effect. | Implementation of pollution prevention measures in accordance with CEMP. | Negligible |
| Minor alterations of the use of the site by foraging and commuting bat species due to construction phase lighting | Adverse effect, significant at Local (Site) scale / Minor adverse effect. | Implementation of measures to ensure control of construction phase lighting in accordance with CEMP. | Negligible |

| **Potential impact** | **Environmental significant effect without mitigation** | **Mitigation** | **Effect after mitigation (residual effect)** |
|---|---|---|---|
| Displacement of (non-qualifying) wintering birds | Adverse effect, significant at Local (Site) scale / Minor adverse effect. | Implementation of measures in ECMP and LEMP to disturbance impacts on birds are minimised and site is enhanced for urban bird species. | Negligible |
| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
| Operational Phase Impacts | | | |
| Displacement of cormorants from site due to increased human presence and visual disturbance, small shift in distribution of species. | To address impacts on cormorant across the Liverpool Waters site, a Strategic Ecological Mitigation Plan has been prepared, which includes details regarding the provision of permanent floating pontoons for cormorant. This is considered to be 'mitigation by design'.<br><br>The localised shift in cormorant distribution is an unavoidable adverse effect, significant at the Local (Site) scale / Minor adverse effect. | See previous column. | Unavoidable localised shift in cormorant distribution. Adverse effect, significant at Local (Site) scale / Minor adverse effect. |
| Pollution of standing water (West Waterloo Dock) | Adverse effect, significant at Local (Site) scale / Minor adverse effect. | Implementation of measures in ECMP and LEMP to ensure operational pollution is avoided. | Negligible |
| Minor alterations of the use of the site by foraging and commuting | Adverse effect, significant at Local (Site) scale / Minor adverse effect. | Lighting strategy designed to be sensitive to biodiversity. | Negligible |

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| bat species due to operational phase lighting | | | |
| Increased human presence and visual disturbance leading to displacement of (non-qualifying) bird species | Adverse effect, significant at Local (Site) scale / Minor adverse effect. | LEMP will include enhancement measures for urban bird species. However, increased human presence within the site is an inevitable and cannot be fully mitigated for. | Adverse effect, significant at Local (Site) scale / Minor adverse effect. |

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Cumulative Impacts | | | |
| Cumulative loss of habitat for cormorants | To address impacts on cormorant across the Liverpool Waters site, a Strategic Ecological Mitigation Plan has been prepared, which includes details regarding the provision of permanent floating pontoons for cormorant. This is considered to be 'mitigation by design'. | | Negligible |
| Cumulative recreational impacts on Natura 2000 sites | To address cumulative recreational impacts as a result of all schemes across the Liverpool Waters site, a Strategic Ecological Mitigation Plan has been prepared. The ECMP for the proposed scheme will be written in accordance with this document. | | Negligible |

## 15.11 References

Ref 15.1 Conservation of Habitats and Species Regulations 2019

Ref 15.2 Wildlife and Countryside Act 1981

Ref 15.3 Countryside and Rights of Way Act

Ref 15.4 Natural Environment and Rural Communities Act 2006

Ref 15.5 Ministry of Housing, Communities and Local Government (2019). National Planning Policy Framework

Ref 15.6 JNCC and Defra (on behalf of the Four Countries' Biodiversity Group). (2012). UK Post-2010 Biodiversity Framework. July 2012. Available at: http://jncc.defra.gov.uk/page-6189

Ref 15.7 Defra (2011) Biodiversity 2020: A strategy for England's wildlife and ecosystem services. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69446/pb13583-biodiversity-strategy-2020-111111.pdf

Ref 15.8 Liverpool City Council. A Plan for Liverpool – Written Statement. Liverpool Unitary Development Plan. Adopted November 2002.

Ref 15.9 Liverpool City Council (2018) Liverpool Local Plan 2013-2033. Pre-submission draft. January 2018. Emerging Liverpool Local Plan 2013-2033. Available at: https://liverpool.gov.uk/media/1356834/01-local-plan-january-2018-final.pdf

Ref 15.10 Gov.uk. National Planning Practice Guidance. Available from: https://www.gov.uk/government/collections/planning-practice-guidance

Ref 15.11 CIEEM (2019) Guidelines for Ecological Impact Assessment in the UK and Ireland. Version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester

Ref 15.12 Joint Nature Conservation Committee (2010) Handbook for Phase 1 Habitat Survey: A technique for environmental audit (reprint). Joint Nature Conservation Committee, Peterborough

Ref 15.13 RSK (2017) A565 Link Roads – Breeding Bird Survey Report

Ref 15.14 Gilbert, G., Gibbons, D. W. and Evans, J. (1998) Bird Monitoring Methods. Pelagic Publishing.

Ref 15.15 Arup (2019) Liverpool Waters: Strategic Ecological Management Plan. September 2019.

Ref 15.16 Amey (2018) Wintering Bird Survey Report – LCCC P2 – Northern Link Road. CO00205341 /WBR Rev0. July 2018.

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Ref 15.18 Liverpool City Council and MEAS (2012) Habitat Regulations Assessment: Final Report for Liverpool Waters, Liverpool. Planning Application 10O/2424.

Ref 15.19 Frost, T.M., Austin, G.E., Calbrade, N.A., Mellan, H.J., Hearn, R.D., Stroud, D.A., Wotton, S.R. and Balmer, D.E. (2018) Waterbirds in the UK 2016/15: The Wetland Bird Survey. BTO/RSPB/JNCC. Thetford.

Ref 15.20 Natural England (2012) Great cormorant: species information for marine Special Protection Area consultations. Natural England Technical Information Note TIN140. November 2012.

Ref 15.21 Ecospan Environmental (2018) Marine ecological baseline surveys in support of the re-development of West Waterloo Dock: Liverpool. DRAFT. Report Number ER18-379.

Ref 15.22 WYG (2011) Liverpool Waters Environmental Statement. November 2011.

Ref 15.23 Aecom (2017) Liverpool Local Plan Habitats Regulations Assessment (HRA). Prepared for: Liverpool City Council. December 2017

Ref 15.24 Waterman (2017) Liverpool Cruise Ship Terminal – Information to inform a Habitat Regulations Assessment (HRA) Screening Report: Assessment of Likely Significant Effects (ALSE). November 2017.

Ref 15.25 Arup (2019) Central Docks Condition 16: Neighbourhood Ecological and Biodiversity Strategy. May 2019.

Ref 15.25 WSP (2016) 122 Old Hall Street, Liverpool – Ecological Appraisal. Project no 70023367. November 2016.

Ref 15.26 Penny Anderson Associates Ltd (2016) Baltic 1014 Ltd Lanyork Road, Liverpool – Ecological Assessment Version 2. November 2016.

Ref 15.27 Wardell Armstrong (2016). Pall Mall, Liverpool – Preliminary Ecological Appraisal. October 2016.

# 16 Marine Ecology

## 16.1 Introduction

This Marine Ecology chapter has been prepared by Ecospan Environmental Ltd. It is intended to outline any significant effects, either beneficial or adverse, on important ecological receptors, which may result from the construction and operational phases of the proposed scheme (as described in Chapter 2: Scheme Description).

This chapter summarises the significant legislation, guidance and policy relevant to the development in respect of marine ecology and outlines the methods used in the assessment. The marine ecological baseline of the proposed development site (and relevant adjacent areas) has been described and subsequently used to inform the assessment of potential effects of the proposed scheme during both the construction and operational phases. Where significant marine ecological effects have been identified, avoidance and mitigation measures have been developed to reduce of offset these. The nature and significance of any likely residual effects, after avoidance and mitigation has been employed, is then described.

This chapter is accompanied by the following appendices:

Appendix 16A: Marine Ecology Baseline Surveys Report

## 16.2 Methodology, Scope and Significance Criteria

The Ecological Impact Assessment is based on the proposed scheme as detailed in Chapter 2: Scheme description. The assessment considers all activities associated with the construction and operational phases of the proposed scheme that are likely to have direct, indirect or cumulative impacts on important ecological features.

The zone of influence for the Ecological Impact Assessment has been defined in accordance with the 'Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine' (CIEEM, 2018) produced by the Chartered Institute of Ecology and Environmental Management (CIEEM). These guidelines state that the 'zone of influence' is the area over which ecological features may be affected by biophysical changes as a result of a project and its associated activities, and is therefore not limited to the boundary of a project site. The zone of influence in this assessment will therefore consider direct and indirect effects on marine ecological receptors both within and adjacent to the application site.

This assessment has been informed by a marine ecology survey of the marine habitats within West Waterloo Dock and a subsequent Preliminary Ecological Appraisal that was undertaken by Ecospan Environmental Limited in October 2018. The methodology is summarised in Section 16.5 and the full report can be found in Appendix 16A

A desk-based study was undertaken to describe the nature of the existing marine environment of the Development Site. This included a review of information available on cetaceans and seals in the study area.

## 16.2.1 Relevant Legislation and Policy

This section provides a summary of the main legislation, guidance and planning policy which is relevant to the marine ecological aspects of the EIA and which have informed the assessment and conclusions made in this chapter.

### 16.2.1.1 International

#### Bonn Convention

The Convention on the Conservation of Migratory Species of Wild Animals was adopted in Bonn, Germany in 1979 and came into force in 1985. Contracting Parties work together to provide protection for endangered migratory species (listed in Appendix I of the convention) by way of multilateral agreements for the conservation and management of migratory species which require or would benefit from international co-operation (listed in Appendix II of the Convention), and by undertaking co-operative research activities.

#### Marine Licence and the Marine and Coastal Access Act 2009

The Marine and Coastal Access Act received Royal Assent on 12th November 2009. It introduced new planning and management systems for overseeing the marine environment, most notably through the requirement to obtain marine licences for works at sea (including the deposition or removal of any substance or object from the sea below Mean High Water). It created a strategic marine planning system that seeks to promote the efficient, sustainable use and protection of the marine environment, guided by the Marine Policy Statement and a series of Marine Plans.

The Marine and Coastal Access Act 2009 provides the framework for a marine licencing system, which is administered by the Marine Management Organisation (MMO), a statutory consultee within the application process. The Act also amended certain provisions of the Planning Act 2008. It inserts a new Section 149A 'Deemed Consent under a marine licence' in the Planning Act.

The Marine and Coastal Access Act 2009 also enabled the designation of Marine Conservation Zones (MCZs) which seek to protect a range of nationally important marine wildlife, habitats, geology and geomorphology. The designation of MCZs works towards fulfilling some of the UK's obligations under international agreements such as the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention).

It has been advised that West Waterloo Dock is above Mean High Water Springs (MHWS), and as such, the development does not fall within the jurisdiction of the MMO and the consents process.

#### The Habitats Directive

EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (known as the Habitats Directive) is intended to protect biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed in the Annexes to the Directive at a favourable conservation status. It provides for robust protection for those habitats and species of European importance.

EC Directive 2009/147/EC on the conservation of wild birds (known as the Birds Directive) provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. It sets broad objectives for a wide range of activities.

In England and Wales, the Habitats Directive is implemented under the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations) and the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2017. The Marine Habitats Regulations transpose the Habitats Directive and the Birds Directive into national law.

The provisions of the Birds Directive are implemented through the Wildlife and Countryside Act 1981, the Habitats Regulations and the Offshore Marine Conservation (Natural Habitats & c.) Regulations 2017, as well as other legislation related to the uses of land and sea.

Under this legislation a network of protected areas (the Natura 2000 network) has been established. These are Special Areas of Conservation (SACs), for habitats and species, and Special Protection Areas (SPAs), for birds. The Habitats Regulations require that, where the possibility of a likely significant effect on a Natura 2000 site cannot be excluded (either alone or in combination with another plan or project), a competent authority must undertake an Appropriate Assessment as part of the Habitats Regulations Assessment (HRA) process. The Habitats Regulations state that it is the developer's responsibility to provide sufficient information to the competent authority to enable them to assess whether there are likely to be any significant effects and to enable them to carry out the appropriate assessment, where necessary.

### Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention)

The OSPAR Convention entered into force in 1998. OSPAR is the mechanism by which 15 governments of the western coasts, including the UK and the European Union (EU), co-operate to protect the marine environment of the North-East Atlantic. It combines and updates the 1972 Oslo Convention and 1974 Paris Conventions. Contained within the OSPAR Convention are a series of Annexes which deal with the specific areas, Annex IV deals with the assessment of the quality of the marine environment.

### Marine Strategy Framework Directive (2008/56/EC)

The aim of the EU's Marine Strategy Framework Directive (MSFD)(which was adopted in 2008) is to achieve Good Environmental Status in European seas by 2020 and to protect the resources upon which marine related economic and social activities depend. Member states are required to develop strategies for their marine waters, which must contain a detailed assessment of the state of the environment, a detailed description for ‘Good Environmental status’ at regional level and the establishment of clear environmental targets and monitoring programmes. The objectives of the MSFD are in line with the objectives of the Water Framework Directive (WFD), and the UK’s vision for ‘clean, healthy, safe, productive and biologically diverse seas’.

### European Eel Regulation (EC) No 1100/2007

The Council Regulation (EC) No 1100/2007 is implemented in England and Wales by the Eels (England and Wales) Regulations 2009. It focuses on establishing measures for the recovery of the stock of European eel. The requirements of the regulations are to notify the Environment Agency (EA) of the construction, alteration or maintenance of any structure likely to affect the passage of eels.

## 16.2.1.2 National

### Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 (amended by the Countryside and Rights of Way Act (CROW) 2000), is the principal mechanism for the legislative protection of wildlife in Britain. The Act consolidates and amends existing national legislation to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and Council Directive 79/409/EEC on the Conservation of Wild Birds (Birds Directive) in Great Britain.

### Conservation of Habitats and Species Regulations 2017

This Act transposes the EC Habitats Directive into British law. The Regulations cover the designation and protection of Natura 2000 sites including Special Areas of Conservation (SACs) and Special Protection Areas (SPA), and European protected species. The Regulations make it an offence to deliberately capture, kill, or disturb any animals listed in Schedule II or to damage or destroy a breeding site or resting place of any such animal, or to pick, collect, uproot, destroy or trade in any plants listed in schedule IV (though some of these actions can be made lawful through the granting of licences from the appropriate authority).

### Natural Environment and Rural Communities Act 2006

The Natural Environment and Rural Communities (NERC) Act 2006 places a duty on all public bodies to have regard to the conservation of biodiversity (section 40). Section 41 of the Act requires the Secretary of State to publish list of habitats and species which are of principal importance for the conservation of biodiversity in England. This list includes habitats and species which have been identified as requiring action in the UK Biodiversity Action Plan (BAP) now succeeded by the ‘UK Post-2010 Biodiversity Framework’.

### Marine Policy Statement and Marine Plans

In support of the UK Government's vision of 'clean, healthy, safe, productive and biologically diverse oceans and seas', the Marine and Coastal Access Act 2009 introduced a marine planning system. This system comprises the Marine Policy Statement (MPS), a high-level framework for preparing marine plans and taking decisions affecting the marine environment, and marine plans. Marine plans translate the MPS into detailed policy and guidance for particular areas. Marine plans provide guidance for sustainable development in English waters and are intended to inform and guide decisions on marine and coastal development by conserving and enhancing the environment, reducing costs and increasing certainty for developers, and boosting economic and employment benefits.

The Department for Environment, Food and Rural Affairs (DEFRA) has agreed eleven marine plan areas with the aim of completing marine plans by 2021. The North West Inshore Marine Plan is still within the development stages (MMO, 2016). Until the adoption of this plan, the Marine Policy Statement will apply. However, given that West Waterloo Dock sits above MHWS, it does not fall within the jurisdiction of the marine plan policy.

### National Planning Policy Framework (NPPF)

In accordance with NPPF Paragraph 175d, 'opportunities to incorporate biodiversity in and around developments, should be encouraged, especially where this can secure measurable net gains for biodiversity'.

## 16.2.2 Method of assessment

The 'Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine' (CIEEM, 2018) produced by CIEEM have been used as a basis for the marine ecology impact assessment. In accordance with these guidelines the key elements of the EcIA process are as follows:

**Establishing the baseline -** Collecting information and describing the marine ecological communities in the absence of the proposed project, to inform the assessment of impacts

**Identifying important ecological features -** Identifying important ecological features (habitats, species and ecosystems) that may be affected, with reference to a geographical context in which they are considered important.

**Impact assessment -** An assessment of whether important ecological features will be subject to impacts from all relevant phases of the proposed scheme (e.g. construction and operation), and characterisation of these impacts and their effects. Assessment of the significance of the residual ecological effects of the project (those remaining after mitigation), including cumulative effects.

**Mitigation, compensation and enhancement -** Incorporation of measures to avoid, reduce and compensate negative ecological impacts and their effects, and provision of ecological enhancements. Review of mitigation and assessment of residual effects.

**Implications for decision making -** Consideration of the legal and policy framework throughout the process.

#### 16.2.2.1 Establishing a Baseline

##### Desk-based review

To enable an assessment of the potential effects of the proposed scheme to be made in relation to marine ecological receptors it was first necessary to describe the baseline environment. This was achieved by conducting a desk-based review of literature and examination of available data, including previous survey data, in the vicinity of the proposed scheme.

Information obtained from the desk-based review has been collated with the results of site specific marine field surveys. The pertinent information is summarised within the Baseline Conditions section below (Section 16.5).

##### Acquisition by field survey

Marine ecological surveys of west Waterloo Dock were undertaken by Ecospan Environmental Ltd between 31st October and 1st November 2018. The aims of the surveys were to:

Characterise the West Waterloo Dock in terms of the habitats present and the species composition of those habitats.

Determine the presence of any Habitats or Species of Conservation Interest (HOCI or SOCI) within the footprint of the proposed scheme.

Determine the presence and abundance of any Invasive Non Native Species (INNS) within the sediments or hard substrata of the proposed development site.

Provide a baseline from which the fish species that use the dock and their abundance can be described.

Make an assessment of the chemical contamination of the benthic sediments within the footprint of the proposed scheme.

The species composition of the benthic infauna of the West Waterloo Dock sediments was assessed by sampling the sediments with a 0.05 $m^2$ Van Veen Grab. Grabs were taken at 5 locations within the dock. The fauna was separated using a 0.5 mm sieve and enumerated and identified to the lowest possible practicable taxonomic level using appropriate literature, and according to the North East Atlantic Marine Biological Analytical Quality Control Scheme (NMBAQCS) Processing Requirements Protocol (Worsfold and Hall, 2010).

All sampling followed the ISO guidelines for quantitative sampling and sample processing of marine soft-bottom macrofauna (ISO, 2014), as well as the methods outlined in the Marine Monitoring Handbook (Davies et al., 2001). Sampling was also consistent with the Environment Agency's methodology for sampling macrobenthos (MARG, 2007).

Further grab samples were taken to assess the sediment granulometry at each station (by dry sieving and laser diffraction).

At three of the stations additional samples were taken to determine the chemical composition of the sediment. Sediments were tested to MMO standards by SOCOTEC Uk Ltd for PSA, metals, PAHs, organo-tins and total hydrocarbons. Results were compared against the CEFAS Chemical Action Levels (cALs) (Defra, 2003) for the disposal of sediment at sea. Contaminant levels in dredged material below chemical Action Level 1 (cAL1) are assumed to be of no concern. Contaminant levels between Level 1 and 2 generally trigger further investigation of the material proposed for disposal at sea, and contaminants in dredged material above chemical Action Level 2 (cAL2) are generally considered unsuitable for sea disposal. Where cALs were not available for a specific analyte the Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME, 1999) were used.

Full details on survey methods and results are provided in Appendix 16A.

The epi-fauna of the dock walls was assessed using two methods: surface scrapes of the dock wall and video transects. Four transects were sampled along the dock wall at c. 50 m intervals.

Habitat types were assigned according to the EUNIS habitat classification revised descriptions 2012 (European Environment Agency, 2012) and based upon consideration of the species present, their relative abundances, as well as the abiotic characteristics of the habitat.

To provide an understanding of which fish species utilise West Waterloo Dock and to inform an evaluation of the value of the habitat fish surveys were undertaken.

The sediments of the dock were primarily composed of soft mud and sand. This, combined with the relatively small size of the area and the high density of opportunistic macroalgal matt, meant that the use of some standard fish sampling equipment such as beam trawls was not practical. For this reason, two techniques were used: baited fyke nets and seine netting. The fyke netting targeted bottom dwelling fish such as the European eel, gobies and small flatfish. The seine netting targeted more mobile species such as sand smelt, mullet, bass and demersal fish such as whiting.

### 16.2.2.2 Determination of Important Marine Receptors

In order to determine the potential of a significant ecological impact, it is first necessary to identify whether an ecological receptor within the zone of influence is sufficiently 'important' for a significant impact upon it to be material in decision making. The value of species and populations within the application site has been determined using a combination of information on their distribution, rarity and conservation status. Habitats have been evaluated against existing selection criteria, for example, those listed under international or national legislation.

In accordance with the CIEEM guidelines, a geographic scale has been used to determine the importance of ecological receptors within the zone of influence; this is outlined in Table 16.1.

**Table 16.1: Importance criteria for Marine Ecology Assessment**

| Level of importance | Definition |
|---|---|
| International | An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, pSAC, Ramsar site etc.) or an area which the country agency has determined meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified.<br>Internationally significant and viable areas of a habitat type listed in Annex 1 of the Habitats Directive.<br>Globally threatened species (i.e. Critically endangered or endangered on IUCN Red list) or species listed on Annex 1 of the Berne Convention.<br>Regularly occurring populations of internationally important species that are rare or threatened in the UK or of uncertain conservation status.<br>A regularly occurring, nationally significant population/number of any internationally important species. |
| National | A nationally designated site (SSSI, NNR, MNR, MCZ) or a discrete area, which the country conservation agency has determined meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified.<br>Regularly occurring, globally threatened species (i.e. Vulnerable or lower on IUCN Red list) or species listed on Annex 1 of the Berne Convention.<br>Previously UKBAP habitats and species; Section 41 species of NERC Act. |
| Regional/ County | Viable areas of key habitat identified in the Regional/County BAP or smaller areas of such habitat which are essential to maintain the viability of a larger whole.<br>Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile.<br>Water Framework Directive biological element.<br>Any regularly occurring significant population that is listed in a Local Red Data Book.<br>Significant populations of a regionally/county important species. |

| | |
|---|---|
| Local/Borough | Areas of habitat identified in a sub-County (Local/Borough) BAP or in the relevant Natural Area profile.<br>District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on Local/Borough ecological criteria.<br>Sites/features that are scarce within the Local area/Borough or which appreciably enrich the Local area/Borough habitat resource.<br>Species are abundant, common or widely distributed.<br>Habitat/species possess low biodiversity, social/community value and / or economic value. |
| Negligible | There is no site designation for areas of habitat.<br>The area does not offer key habitat for a population.<br>Species present are common and widespread.<br>Habitat/species are not considered particularly important for their biodiversity, social/community or economic value. |

Those ecological features classified below local/borough importance are not considered sufficiently valuable for a significant impact upon them to be material in decision making. Only those ecological receptors equivalent to, or greater than, local/borough value have therefore been included as 'important' ecological receptors within this assessment.

The results of the ecological valuation process are presented in Section 16.5.2.6 (Important Marine Receptors). This section summarises the results of the baseline surveys, and identifies which of the marine habitats and species identified within the application site are 'important' ecological features.

#### 16.2.2.3 Assessment criteria and assignment of significance

The sensitivities of different habitats and species have been classified by the MarLIN on the Marine Evidence based Sensitivity Assessment (MarESA) four-point scale. Such assessments define 'sensitivity' on a four-point scale (high, moderate, low, and not sensitive), taking into account the level of tolerance to change (termed intolerance or resistance), and the rate of recoverability (or resilience) once a pressure has abated or been removed. Specific benchmarks are defined for the different impacts for which sensitivity has been assessed (e.g. smothering, abrasion, physical change to another sediment change etc.). For detailed information on the benchmarks used, and for more information on the definition of tolerance and recoverability, please refer to the MarLIN website.

For the purposes of this chapter of the ES, four sensitivity categories have been defined, each drawing on the four MarLIN/MarESA categories. The MarLIN/MarESA categories are defined by the resistance (tolerance) of a species and resilience (recovery) which are defined in Tables 16.2 and 16.3. A matrix is then used to determine the over sensitivity of the species (Table 16.4).

**Table 16.2: Resistance (tolerance) of important marine ecological receptors**

| Receptor/ Resistance | Description |
|---|---|
| None | Key functional, structural, characterizing species severely decline and/or physicochemical parameters are also affected e.g. removal of habitats causing a change in habitats type. A severe decline/reduction relates to the loss of 75% of the extent, density or abundance of the selected species or habitat component e.g. loss of 75% substratum (where this can be sensibly applied). |
| Low | Significant mortality of key and characterizing species with some effects on the physicochemical character of habitat. A significant decline/reduction relates to the loss of 25-75% of the extent, density, or abundance of the selected species or habitat component e.g. loss of 25-75% of the substratum. |
| Medium | Some mortality of species (can be significant where these are not keystone structural/functional and characterizing species) without change to habitats relates to the loss <25% of the species or habitat |
| High | No significant effects on the physicochemical character of habitat and no effect on population viability of key/characterizing species but may affect feeding, respiration and reproduction rates. |

**Table 16.3: Resilience (recovery) of important marine ecological receptors**

| Receptor Resilience | Description |
|---|---|
| Very Low | Negligible or prolonged recovery possible; at least 25 years to recover structure and function. |
| Low | Full recovery within 10-25 years. |
| Medium | Full recovery within 2-10 years. |
| High | Full recovery within 2 years. |

### Table 16.4: Sensitivity of important marine ecological receptors

| | | **Resistance** | | | |
|---|---|---|---|---|---|
| | | **None** | **High** | **Medium** | **Low** |
| **Resilience** | **Very Low** | *High* | *High* | *Medium* | *Low* |
| | **Low** | *High* | *Medium* | *Low* | *Low* |
| | **Medium** | *Medium* | *Low* | *Low* | *Negligible* |
| | **High** | *Low* | *Low* | *Negligible* | *Negligible* |

Potential marine ecological impacts arising as a result of the proposed scheme are described for all features of ecological importance with reference to characteristics such as the likelihood, extent, magnitude, duration, frequency, timing and reversibility. The definitions of magnitude used within this chapter of the ES are defined in Table 16.5.

### Table 16.5: Magnitude of impact

| **Magnitude of Impact** | **Definition** |
|---|---|
| High | The proposed development would result in a complete change to the baseline conditions and status of conservation features/ ecological functionality.<br><br>**Or**<br><br>The proposed development would result in a change from baseline conditions that would affect the conservation status of the site or feature. |
| Medium | The site feature's conservation status would not be affected, but the impact is likely to be significant in terms of ecological objectives or populations. If, in light of full information, it cannot be clearly demonstrated that the impact will not adversely affect the conservation objectives, then the impact should be assessed as high. |
| Low | Minor shift away from baseline but the impact is of limited temporal or physical extent. |
| Negligible | No change from baseline conditions/ observable impact predicted. |

The interaction of the magnitude of an impact with the sensitivity of the receptor determines the significance of effects. The matrix used for the assessment of significance is shown in Table 16.6.

For the purposes of the marine ecological assessment, an effect that is of major or moderate significance is considered to be significant in EIA terms whether adverse or beneficial. Any effect that is assessed as minor or negligible is not significant.

**Table 16.6: Significance of potential effects**

| | | **Sensitivity** | | | |
|---|---|---|---|---|---|
| | | **High** | **Medium** | **Low** | **Negligible** |
| **Magnitude** | **High** | *Major* | *Major* | *Moderate* | *Minor* |
| | **Medium** | *Major* | *Moderate* | *Minor* | *Minor* |
| | **Low** | *Moderate* | *Minor* | *Minor* | *Negligible* |
| | **Negligible** | *Minor* | *Minor* | *Negligible* | *Negligible* |

Where relevant, measures have been developed to mitigate against impacts associated with those designated habitats and/or protected species for which impacts are not expected to be significant, but which nevertheless merit mitigation. These additional measures have been presented not only to ensure compliance with the legislative and policy requirements and best practice associated with such habitats/species, but also to ensure that the overall nature conservation within the footprint of the proposed scheme is protected and/or enhanced as far as possible.

### 16.2.2.4 Confidence in Predictions

The degree of confidence in the assessment of potential ecological effects is also considered. This confidence is described within the summary tables for each feature of ecological importance, and is based upon high/low categories as defined below.

The confidence level shows the level of certainty that an impact will occur as predicted:

- Low: 0-50% probability, where there has been many assumptions within the assessment;
- High: 51-100% probability, where assessments have been based on satisfactory surveys and baseline information.

## 16.3 Consultation

The consultation process was carried out by Arup. As part of the EIA process, written consultation was conducted and advice sought from Natural England, the Canal and River Trust and the Merseyside Environmental Advisory Service (MEAS).

A summary of consultation carried out for this EIA is provided in Table 16.7.

**Table 16.7: Consultation Summary**

| Consultee and date | Issue raised | Summary of response |
|---|---|---|
| Natural England (21.09.18) | Designated sites | The adjacent designated sites (Liverpool Bay SPA, Mersey Narrows and North Wirral Foreshore SPA and Ramsar and Mersey Narrows Site of Special Scientific Interest (SSSI)) should be considered within any environmental assessments. |
| | Functionally linked land | The docks and waterfront area are likely to provide supporting functional habitat for birds from a number of internationally important sites including Liverpool Bay SPA and Mersey Narrows and North Wirral Foreshore SPA/Ramsar. Therefore consideration of impact to the function of these areas is required. Natural England would expect to see a thorough assessment of the potential impact of dock infilling on ecological receptors. |
| | In combination assessment | All schemes which may impact on the interest features of the designated sites should be considered in combination. This could include plans or projects from neighbouring Local Planning Authorities and the Marine Management Organisation. |
| | Recreational pressure | Recreational disturbance to internationally protected coastal sites is an issue across the Liverpool City Region. This pressure is a particular issue through in-combination effects, for example additional housing may result in additional recreational visits, and therefore increase disturbance at the coastal designated sites. The impact of recreational disturbance resulting from the additional residential dwellings proposed should be considered |
| | Marine environment and dock infill | The impact of potential dock infill on the supporting function of the dock waters in relation to qualifying features of the SPAs should be considered. Potential impacts on |

| Consultee and date | Issue raised | Summary of response |
|---|---|---|
| | | the wider marine environment should also be considered within the Environmental Statement |
| Consultee and date | Issue raised | Summary of response |
| Natural England (21.09.18) | Marine environment and dock infill | Additional survey work to further understand the marine ecology of the West Waterloo dock is required, therefore providing additional supporting information to inform the environmental assessment of the proposal. This should include benthic grabs and wall scrapes. |
| | | *Nematostella vectensis* (starlet sea anemone) is known to occur close to the site. This species should be considered in the design of the survey work. |
| | | Survey work should also aim to identify marine invasive species. Further consideration to any desk-based evidence regarding invasive species would be useful to provide baseline evidence of whether any invasive species are present within West Waterloo dock and further understand if there is a potential risk of spread of invasive species. |
| | | For completeness that additional advice on potential impacts from the proposed works on migratory fish from the Environment Agency should be sought. |
| | Biodiversity enhancement | Wherever possible, any opportunities for biodiversity enhancements should be considered and incorporated into the project design. |
| Canal and River trust (16.08.18) | Marine environment and dock infill | As part of the ecological surveys the infilling of the dock should also be considered. The surveys should determine the fauna and flora of the site and any mitigation measures that may be required |
| Merseyside Environmental Advice Service (MEAS). (04.10.18) | Aquatic Surveys | Surveys for fish and benthic invertebrates are required. These should (i) characterise the aquatic communities / habitats present (ii) enable impact assessment to be completed and (iii) advise on any avoidance measures, mitigation and compensation needed.<br>Potential prey items for any of the designated features of the European sites |

| Consultee and date | Issue raised | Summary of response |
|---|---|---|
| | | which form part of the water bird assemblages should be identified.' <br> The Starlet Sea Amenone [*Nematostella vectensis*] has been recorded in close proximity to the site. <br> The physical and chemical composition of the dock sediments to be removed and/or disturbed by the proposed scheme will need to be known to inform impact assessment and mitigation, re-use potential and disposal options e.g. environmental permit requirements. |

## 16.4 Limitations and Assumptions

Given the size of the survey area, it is considered that the surveys undertaken of the benthic sediments and the dock wall communities provide excellent coverage of these habitats and that the data gives an accurate representation of those species present. The use of baited fyke nets also provides some data on the paucity of the mobile epi-fauna present within the dock.

Employing two different strategies for fish capture should have ensured that any fish that were likely to be in the dock at the time of the survey were sampled. It is possible that some fish (e.g. very small fish and perhaps some benthic flatfish e.g flounder) were under represented in the data. However, since the fyke nets were baited and the ground rope of the seine net was generally in contact with the dock bed, it is thought that flatfish would have been represented in the catch if present within the study area.

The principle limitation to the fish surveys is that they were undertaken over a two day period and are therefore represent a short 'snapshot' in time. The survey was undertaken in autumn which is a good time to survey if sampling cannot be undertaken during different seasons. This is because it is generally considered to be a transitional time when the summer species are still present yet the winter species are also beginning to appear.

It is considered that the results of the marine ecological surveys, together with information gathered during desktop investigations, have enabled an assessment of the nature conservation interest of the site to be made in sufficient detail for the potential effects of the proposed scheme on important ecological features to be adequately defined.

There are limitations inherent within the MarESA sensitivity assessments. The assessments are not site specific and consequently there may be differences in the sensitivity of a given species within different habitats. These limitations area included within the confidence score assigned to the MarESA assessment, for which the full details and rationale are provided on the MarLIN website, and in the assessment summaries.

## 16.5 Baseline Conditions

A wide range of baseline data on the local environmental conditions has been used for the purposes of the assessment. Data has been gathered from a combination of sources, including:

- published documentary information from a variety of sources including historical and contemporary records;
- field surveys specifically for this project and also the results from other nearby projects.

### 16.5.1 Designated Sites

The proposed development site within West Waterloo Dock does not fall within any sites designated for marine ecological interest. The site does however fall within the impact risk zone for Liverpool Bay Special Protection Area (SPA) (JNCC, n.d) which encompasses the intertidal habitats between Rock Ferry and Waterloo. The marine element of the SPA is also designated as a European Marine Site (EMS).

The Mersey Narrows and North Wirral Foreshore SPA and Ramsar, and Mersey Narrows Site of Special Scientific Interest (SSSI) are located on the western bank of the Mersey estuary approximately 1 km from the proposed development site.

### 16.5.2 Marine Ecology

West Waterloo Dock is set apart from the main Mersey estuary both geographically by built dock walls, and in terms of the environmental conditions that exist within the dock system. Therefore, although extensive background data relating to marine subtidal communities and species within the Mersey estuary exists, site specific surveys were conducted in October 2018 (Appendix 16A). These surveys were intended to obtain more relevant localised data with which to inform the marine ecological assessment for the proposed scheme.

#### 16.5.2.1 Abiotic characteristics of West Waterloo Dock

Water depths within the footprint of the proposed scheme were shallow, typically less than 1 m deep with a maximum depth record of 1.7 m at a station closest to the channel. At the time of sampling the dock water was brackish (19 ‰).

The sediment type sampled from within the dock was composed largely of mud and sandy mud with patches of gravel. The sediments of all samples appeared to be anoxic, but this was particularly apparent at one station which had entrained algae. Water current was absent within the study area at the time of survey.

### 16.5.2.2 Marine Macroinvertebrates

A single Habitat type accounted for the sediments of the dock basin. This was EUNIS Habitat type A5.542: angiosperm communities in reduced salinity in association with Pomatogeton pectinatus (now updated to Stuckenia pectinata).

A total of 19 macrofauna taxa were identified within the benthic sediments. Two of these were le epibiota (e.g. hydroids and bryozoans) recorded as present. The communities were characterised by insect larvae, amphipods, polychaetes and molluscs, many of which are considered either lagoon specialists and/or taxa that are extremely tolerant of low dissolved oxygen (DO) and/or polluted sediments.

The amphipod Microdeutopus gryllotalpa was one of the most abundant taxa together with chironomid larvae. Pollution tolerant polychaete worms Capitella capitate agg. (Silva et al., 2012) and Polydora cornuta (Bertasi, 2016), and the non-native gastropod Potamopyrgus antipodarum were also abundant. Microdeutopus gryllotalpa is known to be one of the most abundant amphipods living in saline lagoons in northern Europe (Drake and Arias, 1995). Chironomid larvae are one of the most abundant group of insects in the aquatic environment and are known to be tolerant of pollution and low DO (Al-shami et al, 2010). The New Zealand mud snail Potamopyrgus antipodarum is a non-native species which is also known to be extremely pollution tolerant (GB non native Secretariat, 2012). The lagoon cockle Cerastoderma glaucum was present at all stations, often in abudance.

A large amount of opportunistic macroalgae was present within the dock and included dense columns of the green algae *Chaetomorpha* sp. with the occasional tuft of the sago pondweed *Stuckenia pectinata*. The presence of macroalgae may be a contributory factor to low DO conditions if they occur, particularly as the macroalgal mat appeared to have died back at the time of survey.

Two Habitat types were identified on the dock walls. These were as EUNIS habitat type A3.72 (infralittoral fouling seaweed communities) in the first 20 cm and A3.361 (*Mytilus edulis* beds on reduced salinity infralittoral rock) below this.

Several INNS were recorded during the survey. High abundances of the pollution tolerant New Zealand mud snail *Potamopyrgus antipodarum* were recorded on the weed and within the dock sediments, whilst dense colonies of Australian tube worm *Ficopomatus enigmaticus* and a few individuals of the orange striped anemone *Diadumene lineata* were sampled from the dock walls.

No habitats or species of conservation interest (HOCI/SOCI) were recorded during either the sampling of the fauna within the sediments of the dock or the epi-fauna/flora of the dock wall. Given this, and the poor community structure that was sampled within the footprint of the proposed scheme, subtidal habitats and macroinvertebrate species have been screened out of this assessment.

### 16.5.2.3 Starlet sea anemone (*Nematostella vectensis*)

The starlet sea anemone is a non-native species that was introduced to the UK from the eastern USA (Barfield, 2016; Potts and Swaby, 1993). However, this species also remains classified as Vulnerable on the IUCN Red List, is protected under the Wildlife and Countryside Act, and is a Species of Principal Importance in England under Section 41 list of the NERC Act.

The protected status of the species, was based on the then known distribution of the species being limited to a small number of lagoons in the south-east of England, a potentially vulnerable habitat itself. The starlet anemone has since been recorded from the south coast of England, East Anglia, the Severn estuary and the Cumbria coast (NBN, 2018).

This protected status and its occurrence on the IUCN Red List both pre-date the recognition of the species as a widespread and widely introduced species. Furthermore, the Red List assessment was conducted in 1996 and bares a caveat that the species requires reassessment. Due to the potentially conflicting non-native and protected classifications, there has been discussion about whether the protected status for the species in England should be reconsidered (Ridgeway, et al., 2012 and Carlton, 1996 in Waterman, 2017).

Should the protection remain, it is understood that the primary aim of this protected status, in the UK at least, should be more to protect potentially vulnerable habitats (e.g. saline lagoons) in which it is a specialist rather than the species per se (Ridgeway, et al., 2012 and Carlton, 1996 in Waterman, 2017).

The Starlet sea anemone has been recorded in the Mersey estuary on the seaward side of Princes jetty, which is set immediately to the south and east of West Waterloo Dock and separates the dock waters from the main estuary. Three specimens were captured in benthic grab samples that were taken as part of a baseline study that was used to inform the EIA for the Liverpool Cruise Terminal development (Waterman, 2017). It is thought that the species is likely to be relatively widespread but patchily distributed in the main Mersey estuary (Waterman, 2017).

Significantly, in terms of this assessment, the Starlet sea anemone was not captured in benthic samples that were collected as part of the marine ecological baseline surveys. Given that comprehensive coverage of the development footprint was achieved by the benthic sampling baseline survey, it can be deduced with some certainty that this protected species is not present within the zone of impact of the proposed scheme and has therefore been screened out of the assessment process.

#### 16.5.2.4 Fish

Estuaries, in general, are characterised by relatively few fish species that are well adapted to the fluctuating environmental variables including salinity, temperature, turbidity, nutrient levels and water movement (Potts and Swaby, 1993). That being said, 46 species have been recorded within the Mersey estuary (Langston et al., 2006; ERL, 1992; Hering, 1998; APEM, 2007 and APEM, 2011 in Waterman, 2017). Of particular note are fourteen species of conservation importance:

Atlantic salmon *Salmo salar*, river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* are Annex II species protected under the European Habitat and Species Directive (92/43/EEC). These species are not qualifying species for protection within the Mersey Estuary but they are qualifying features of the Dee

Estuary/Aber Dyfrdwy SAC and there is potential for movement of these species from the Dee Estuary/Aber Dyfrdwy SAC into the Mersey Estuary. River and sea lamprey are also protected under Appendix III of the Convention on the Conservation of European Wildlife and Natural Habitats 1979 (the 'Bern Convention'; 82/72/EEC).

European eel *Anguilla anguilla* are protected under European eel management plan legislation (Eel Recovery Plan, Council Regulation No 110/2007 implemented under The Eels (Wales and England) Regulations 2009. The North West River Basin District Eel Management Plan affords eel protection within the Mersey Estuary. The species is also listed on the IUCN Red List as it is critically endangered.

The following ten species were previously protected at a national level under the UK Biodiversity Action Plan (UKBAP) which has since been superseded and these species are now listed as Species of Principal Importance under Section 41 of the NERC Act:

- Atlantic cod *Gadus morhua*;
- common sole *Solea solea*;
- European smelt *Osmerus eperlanus*;
- herring *Clupea harengus*;
- lesser sandeel *Ammodytes marinus*;
- mackerel *Scomber scombrus*;
- plaice *Pleuronectes platessa*;
- sea trout *Salmo trutta*;
- tope shark *Galeorhinus galeus*;
- whiting *Merlangius merlangus*.

Various developments over recent years have gradually reduced the connectivity of the docks with the Mersey estuary. Currently, the closest point of access from the Mersey estuary to West Waterloo Dock is via the lock gate into Canning dock 1.6 km to the south. At that point a double set of lock gates allow direct access to Canning docks only on high spring tides via prior arrangement (on average the lock is opened four times per spring tide period), but a valve on the gates allows the ingress of water from the Mersey estuary into the dock system during high water when the lock gates are not in operation. Connectivity of Waterloo Dock to Canning Dock is via two sets of locks gates.

Given that the West Waterloo Dock is not well connected to the Mersey estuary, targeted fish surveys were carried out within the dock in October 2018 to provide a baseline description of the fish species present and their abundance.

Despite being left to fish for approximately 19 hours, the deployment of baited fyke nets only caught two fish (one European eel and one three-spined stickleback) together with three large common shore crabs in total. The seine netting caught 59 three-spined sticklebacks, 12 sand smelt and 2 gobies in total from three locations within West Waterloo Dock.

The low catch rate suggests that the subtidal waters within the area of the proposed scheme are of low value for fish communities. The low by-catch of mobile species (such as shrimps, prawns, crabs and molluscs) in the fyke netting also shows that these species were either not present, or only present in very low numbers, and therefore the dock waters are rather poor for these groups of marine organisms also.

The single European eel that was captured during the baseline fish surveys is on the IUCN red list as critically endangered and is protected by international and national legislation. Given the number of baited nets set, the time over which they were deployed, and that European eel are very active foragers, it would be expected that more eels would have been caught if there was a viable population within the docks. However, it can be definitively concluded that West Waterloo Docks do not support high numbers of this species.

No river lamprey, sea lamprey or Atlantic Salmon were recorded during the fish baseline surveys. Although it is feasible that individuals of these species could inadvertently find their way into the dock system, given the very high level of unlikelihood of this scenario, these species have been screened out of this assessment.

With the exception of the European eel, no fish species listed as Species of Principal Importance under Section 41 of the NERC Act were recorded during the fish baseline surveys. Resident populations of these species do not exist within the dock network primarily because of the limited connectivity of the dock with the Mersey estuary, and because the docks do not provide a viable habitat for these species. Given these facts and the receptor selection criteria listed in Table 16.1 Section 16.2.2.2, with the exception of the European eel, all other Section 41 fish species have been screened out of this assessment.

#### 16.5.2.5 Marine Mammals

There are few recorded observations of cetaceans within the Mersey estuary and, as might be expected, records become more sparse with distance up the estuary from the estuary mouth. Those species most likely to be encountered in the reaches adjacent to the study area included the harbour porpoise and the bottlenose dolphin (Evans and Shepherd, 2001; Reid and Evans, 2003).

Two species of pinniped are regularly observed in small numbers in the eastern Irish Sea, they are the grey seal *Halichoerus grypus* and the harbour seal *Phoca vitulina*. A few individuals have been recorded entering the Mersey estuary (Cheshire biodiversity, n.d).

Marine mammals are afforded protection under a range of both national and international legislation and policy including the Bonn and Bern Conventions, EC Habitat Directive, the Wildlife and Countryside Act 1981, the NERC Act 2006, and the Conservation of Seal Act 1970.

There are no records of marine mammals having been observed within the Liverpool dock network. In order for marine mammals to find their way into West waterloo Dock from the Mersey estuary they would have to travel through a double lock system from the Mersey estuary into Canning Dock, and then through a further two lock systems and a network of shallow (c. 1 m deep) canal channels. This scenario is highly unlikely and as such, marine mammals have been screened out of this assessment.

#### 16.5.2.6 Identification of 'Important' Marine Ecological Receptors

The important marine ecological receptors screened into the assessment following the criteria outlined in Section 16.2 are summarised in Table 16.8.

**Table 16.8: Important marine ecological receptors within zone of impact**

| Importance | Receptor | Reasoning |
|---|---|---|
| International | Fish (European eel) | The European eel is:<br>Listed as Critically Endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species<br>On the OSPAR list of threatened and/or declining species and habitats |
| National | Fish (European eel) | The European eel is:<br>A former UKBAP Priority Species<br>A species of principal importance for the purpose of conserving of biodiversity under the Natural Environment and Rural Communities Act 2006<br>Protected under European Eel Regulation (EC) No 1100/2007.<br>A single European eel was captured during the baseline fish surveys within West Waterloo Dock in October 2018. |
| Regional/County | Fish (European eel) | The North West River Basin District Eel Management Plan affords eel protection within the Mersey Estuary.<br>(The WFD protects waters from below Mean Low Water (MLW) up to 1 nautical mile from the shore. Given that the bed of West Waterloo Dock is higher than the MLW mark, the dock and the species and habitats that it encompasses do not fall within the remit of the WFD.) |
| Local/Borough | No receptors fall within this category of importance. | |

The marine communities and species within West Waterloo Dock are considered to fall within the SPA/Ramsar/SSSI impact zone and therefore potentially provide a supporting function in relation to qualifying features (i.e. waterbird species) of the nearby designated sites. Potential impacts upon these features have been addressed fully in Chapter 15.

# 16.6 Environmental Impacts and Significance of Effects

The only important marine ecological receptor that has been identified to be within the zone of impact of the proposed scheme is the European eel. All other marine ecological receptors have been screened out of the EcIA assessment.

Potential effects upon subtidal marine species and communities which are not considered important in terms of the EcIA process have additionally been considered here in terms of possible effects from pollution and spread of non-native species. This is to ensure that the overall nature conservation within the zone of impact of the proposed scheme is protected and/or enhanced as far as possible, and that relevant policy and best practice is complied with during the lifetime of the project.

## 16.6.1 Construction Phase

A full description of the methods of construction of the proposed dock infill is provided in Chapter 11 but are summarised here:

### 16.6.1.1 Construction details

Land reclamation works would be required to accommodate the proposed scheme and would include the infilling of the western side of West Waterloo Dock, an area of approximately 170 m x 70 m.

The reclamation of land would require the construction of a cut-off wall within West Waterloo Dock providing a physical delineation between the reclaimed land and the Leeds-Liverpool canal alignment. Infilling of the former lock basin behind this wall would provide a platform upon which two of the six steel frame blocks would be erected.

The cut-off wall would be constructed by the formation of a combi-wall structure by the installation of steel tubular piles in rock sockets at suitable centres, with sheet piles installed between the steel tubes and seated into the surface of the bedrock at the bottom of the dock. The piles will need to be installed in deep sockets within the bedrock. It is expected that drilling methods will be employed to drill out the rock sockets within a cased borehole before inserting and grouting the tubular piles in position. The cut-off wall will be installed off jack-up barges or floating ‘spud leg’ pontoons.

Following installation of the cut-off wall, approximately 6 m depth of infill will be required to raise the existing dock infill levels to the proposed finished ground levels.

The achievement of sufficient density of the fill is likely to require the dock water levels behind the cut-off wall to be drawn down by approximately 4 m. It is not yet known whether the hydraulic conductivity of the sandstone bedrock may induce rapid upward recharge of the waters within the cut-off wall. It is proposed that the dewatering waters are pumped into the Mersey estuary and that relevant consents from the Environment Agency will be sought.

An alternative but less likely method to drawing down the dock waters levels is also possible. This would require the fill levels of the dock to be raised above existing dock water levels by hydraulically placing dredged sand, which may be available from River Mersey channel dredging operations.

The vibrational effects of groundworks will be a function of the type of piling plant (which is yet to be determined in consultation with specialist piling contractors), the construction method, the ground conditions and the structural characteristics of the Kingsway Road Tunnel. However, piling at the site will not involve dynamic methods and therefore is likely to generate relatively low vibrational effects.

#### 16.6.1.2 Effects Pathways

The main pathways by which the development is considered to potentially have an effect on marine ecology receptors during the construction phase are listed below:

Loss of habitat.

Physical disturbance of benthic sediments

Changes to water quality (including suspension of solids and release of contaminants from sediments).

Underwater noise and vibration.

Pollution (e.g. spills).

Spread of non-native species.

##### Loss of habitat - European eel

The only important marine receptor which could be affected by the loss of the area of marine subtidal habitat within the footprint of the proposed land reclamation is the European eel. Baseline surveys have determined that the relatively small area (170 x 70 m) of dock does not represent key habitat (i.e. physical and biological features essential for the conservation of a species) for the protected species.

Eels are mobile and individuals could swim away and become displaced into very similar adjacent habitats once disturbance from works begins. There is some limited potential for individuals to become trapped behind the cut-off wall or be subject to disturbance/injury/mortality within the footprint of the piles or infill, but the numbers affected would be negligible in relation to wider populations within the remaining dock system and wider Mersey estuary. Any effects of habitat loss would be **local** and **permanent** and the magnitude of effect **Low**. Given the protected status of European eels the importance or ecological value of the species is assessed to be of **international significance**, but the sensitivity of the species to the effect is considered to be **Low**. Overall, the worst-case scenario effects are considered likely to be local, permanent and of **minor adverse significance** for the European eel.

### Physical disturbance of benthic sediments - European eel

It is likely that benthic sediments will be disturbed at a local scale during the installation of the cut-off wall.

Eels are highly mobile and any individuals physically disturbed by the construction works would be able to exhibit avoidance behaviour. Eels are well adapted to changing environmental variables and migrate in dark and often turbid conditions (Adam et al., 2015). The area of habitat that would potentially be disturbed is sub-optimal and widespread within the dock system, so affected individuals would not need to move far to find similar habitat. Any effects would be **local** and **temporary** during the initial construction phase to install the cut-off wall only. The magnitude of the potential effect is considered to be **negligible**. Given the protected status of European eels the importance or ecological value of the species is assessed to be of **international significance**, but the sensitivity of the species to the effect is considered to be **negligible**. Overall the effects have been assessed to be **local**, **temporary** and of **negligible significance** for the European eel.

### Changes to water quality - European eel

Changes to water quality may occur during the construction of the cut-off wall which could lead to resuspension of the benthic sediments within the footprint of the wall. This could lead to a localised increase in suspended solids/turbidity, and the often associated changes in water quality such as a localised decline in DO.

The analysis results for the site specific sampling that was carried out at three stations within West Waterloo Dock to determine the presence of contaminants within the sediments show that the concentrations of metals within the sediments of the dock are relatively high. With the exception of Cr and Cd at one station, all concentrations exceeded the CCME Interim Sediment Quality Guideline (ISQG) levels. Concentrations of Pb and Zn exceeded both the Probable Effect Level (PEL) and Cefas cAL1 at all three stations. The PEL and cAL1 were also exceeded for Cu and Hg at one station. However, no metal concentrations exceeded Cefas cAL2, and the Cefas cAL1 was only exceeded for DBT at one station and TBT at another. Given that the sediments were taken from a dock environment, the levels of organotins (which were used in antifouling paint) were relatively low. Sediments were also highly contaminated with Poly Aromatic Hydrocarbons (PAHs), all of which exceeded cAL1 by a considerable margin and also exceeded the PEL where this exists. The levels of the contaminants are unsurprising given the industrialised nature of the Mersey estuary and the former use of the docks. It is highly likely that the sediments in the immediate receiving waters (i.e. the nearby dock system) are similarly contaminated to those sampled in West Waterloo Dock.

There is potential for the contaminants in the sediments of West Waterloo Dock to be released into the water column during construction works. Although the resuspension of sediments is expected to be extremely localised even without mitigation, consideration will be given to the use of silt skirts during the construction of the cut-off wall to minimise effects of suspended solids and contaminants within the water column within the dock.

To minimise the potential for more widespread changes in water quality, inherent mitigation has been considered and developed within the construction methods. Specifically, the construction design has stipulated the use of jack-up barges or ‘spud-leg’ pontoons to remove the need for importing fill into standing water or employing backhoe methods, which would otherwise result in a larger impact footprint and/or high a level of suspended solids entering the canal and adjoining docks.

Run-off from the construction site during, or following infill, may also occur causing similar localised effects to those described for resuspension of the benthic sediments during the cut-off wall installation.

As part of the works, a Construction Environmental Management Plan (CEMP) will be written and implemented to provide mitigation against potential water quality pollution at the site. The CEMP would include measures such as settlement interceptors for surface drainage. Construction operations other than the initial installation of the cut-off wall would therefore not be expected to contribute to the existing levels of suspended solids in the water column.

As previously discussed, Eels are well adapted turbid conditions (Adam et al., 2015). Even given the levels of contaminants found in the dock sediments, due to the mobility of the species and the temporary and limited nature of any sediment plume produced, it is considered that effects would be local and temporary. The magnitude of the potential effect is considered to be **negligible**. Given the protected status of European eels the importance or ecological value of the species is assessed to be of **international significance**, but the sensitivity of the species to the effect is considered to be **negligible**. Overall the effects have been assessed to be **local, temporary and of negligible significance** for the European eel.

### Underwater noise and vibration - European eel

There is potential for underwater noise and vibration during the construction phase, primarily from the drilling of the rock sockets for the piles and the sheet piling, but also from barges and other boats which could be utilised in the construction process. The precise piling methods have not yet been confirmed. Peak sound levels generated by percussive piling can vary and is dependent upon numerous factors including piling method, substrate type, hammer size and pile type and diameter. The noise and vibration generated by piling is intermittent as opposed to continuous.

Underwater noise and vibration may cause a number of effects in fish. These effects may range from behavioural effects such as changes in swimming behaviour and detection of predators/prey, to potential mortal injury.

The potential effects of noise and vibration from piling, drilling and vessel movements on the European eel have been described for the Liverpool Cruise Terminal project (Waterman, 2017).

When considering vessel noise it is considered that individuals within thousands of metres of source could experience masking effects, and behavioural effects are likely within tens of metres of the source.  There is a moderate risk of behavioural changes within hundreds of meters and a low chance of such changes beyond this distance, however, these effects are unlikely to affect the survival of individuals (Waterman, 2017). The noise levels at which there are risks of recoverable injury could potentially be generated by vessels, however, these effects are associated with continuous exposure for 12 to 48 hours and any vessel noise associated with demolition or construction works would be expected to be far more intermittent.

When considering pile driving there is potential for sound levels to be created that are sufficient to result in recoverable injury to eels, although it would be expected that such noise levels would only be encountered close to the piling source. In order to mitigate this effect, soft-start methods could be adopted within the piling methods to give eels in the close vicinity of works to avoid injurious noise levels. As the piling would be carried out in a restricted area of the dock system, individual eels would be able to move away from the sound source through the dock system. Piling hours would also be restricted as there would be extensive windows of no piling activity. Given the disconnection of West Waterloo Dock from the main Mersey estuary, it is not considered that there would be any time of year during which there could be increased sensitivity of European eel to the effects of noise due to migration, as significant noise effects are not expected to transfer to the waters of the Mersey estuary.

The magnitude of effect of underwater noise and vibration on European eel is considered to be **low**, the value of the receptor is considered to be of **international significance** and sensitivity of these species to underwater noise is **low**. Any effects are considered likely to be **temporary, local and of minor adverse significance**.

### Pollution (e.g. spills) - Subtidal marine species and communities and European eels

A CEMP would be implemented Environmental Clerk of Works will be appointed during the construction phase.  The CEMP would provide inherent mitigation against potential pollution from the construction activities at the proposed development site.

The CEMP would be expected to include the following mitigation measures:

Surface drainage would pass via settlement and oil interception facilities, where required, and discharge arrangements would be agreed with the utility provider;

Stockpiling of contaminated materials would be avoided, wherever possible. Stockpiles would be located on areas of hard standing or on plastic sheeting to prevent mobile contaminants infiltrating into the underlying ground; and

Potentially hazardous liquids on the Site such as fuels and chemicals would be managed and stored in accordance with best practice guidance, such as that published by the Environment Agency. Storage tank and container facilities would be appropriately bunded within designated areas and located away from surface water drains, docks and the Mersey Estuary.

An Incident Response Plan will be developed (as recommended in PPG 5) for inclusion within the CEMP.  This will include measures for spill containment and remediation. Through implementation of the CEMP it will be ensured that construction staff and contractors are trained in the use of spill equipment and legal management and disposal of wastes. Any pollution incidents would be reported immediately to the appropriate regulatory bodies such as the Environment Agency.

Where dewatering activities are necessary the relevant consents to discharge will be sought from the Environment Agency.

With the inherent mitigation design indicated above it is considered that the introduction of pollutants to the water column from the works such as oils would largely be avoided. With the application of an Emergency Incident Plan in any such event any effects would be **local** and **temporary** and the magnitude of on subtidal marine species and communities (with the exception of the European eel) **negligible**. The subtidal habitats and species have already been assessed to be of negligible importance and therefore these effects have been screened out of the ES.

With the application of the mitigation measures outlined above, it is considered that the introduction of pollutants to the subtidal marine waters in, or adjacent to West waterloo Dock would be largely avoided. In addition to these considerations, eels are mobile and individuals would be expected to be able to avoid any areas of pollution. Any effects would be **local** and **temporary** and the magnitude of the effect is considered to be **negligible**. The importance of the European eel is considered to be of **international significance** and the species and sensitivity to the effect is **negligible**. Overall any effects are considered likely to be of **negligible significance**.

### Spread of non-native species - Subtidal marine species and communities and European eels

The main pathways for the transport and introduction of marine INNS in the UK have been identified as recreational boating, aquaculture, fisheries, shipping, and off-shore energy (Marine Pathways Project, 2014). Which pathways contribute the most has been found to be dependent on the coastal region being considered (Defra, 2015).

Once INNS species become established and disperse within a new habitat they can out-compete local species for space and resources, prey directly on local species, or introduce pathogens (Roy et al., 2012). Consequently, the introduction of INNS could potentially affect the ecological functioning of communities in the subtidal habitats of the remaining area of West Waterloo Dock post-construction and the wider connected dock system (Central Docks). There is also potential for the INNS identified during baseline surveys to be transported out of the dock system elsewhere on the site equipment.

Pathways of introduction involving vessel movements represent the single highest potential risk route for the introduction of INNS; this could either be from discharge of ballast water at a site or via transportation on vessel hulls (Carlton, 1992; Pearce et al., 2012).

Several INNS were recorded during the marine baseline surveys. High abundances of the pollution tolerant New Zealand mud snail *Potamopyrgus antipodarum* were recorded on the weed and within the dock sediments, whilst dense colonies of Australian tube worm *Ficopomatus enigmaticus* and a few individuals of the orange striped anemone *Diadumene lineata* were sampled from the dock walls. The Starlet sea anemone *Nematostella vectensis* was absent from benthic grab samples. It is likely that the INNS observed within West waterloo Dock are present throughout much of the Central Dock system.

During the construction phase the main vessels in operation would be the jack-up barge(s) proposed for use during the cut-off wall installation. Numerous inherent mitigation design measures which would be incorporated into construction methods via the CEMP and relevant best practice guidelines (Natural England and Natural ResourcesWales Biosecurity Planning guidance (Cook et al., 2014)). Furthermore, due to access restrictions, the plant used on the water during construction will need to be craned in and out of the water at the dockside. Therefore, the likelihood of the transmission of INNS to/from other waterbodies is lowered as drying of plant between transport will be intrinsic.

INNS sampled from the dock walls include the Australian tube worm *Ficopomatus enigmaticus* and the orange striped anemone *Diadumene lineata*. The infill required as part of the proposed scheme would result in removal of these species. However, these species are likely to be widespread in the Central Dock system and on hard substrates directly adjacent to the site. It is therefore expected that the new cut-off wall to be installed will become colonised by a similar community to that which exists on the current dock wall. Since the total area of wall will remain more or less constant, the infill will not result in any substantial change in available habitat or communities colonising hard substrates (i.e. dock walls).

Any effects of INNS in relation to communities on the hard substrates (dock wall) within the study area would be **local** and **permanent** and the magnitude of effect is expected to be **negligible**. The effects are therefore expected to be **local**, **permanent** and of **negligible significance**. The transport of the species outside of the Central Dock system has been screened out of the assessment because with the implementation of the inherent mitigation outlined above, it is considered that this scenario is highly unlikely.

Within the subtidal sediments, only the New Zealand mud snail *Potamopyrgus antipodarum* was recorded. As with the INNS recorded on hard substrates, it is likely that the New Zealand mud snail is present throughout much of the Central Dock system. The infill of dock proposed would lead to a total and permanent loss of habitat for this species. Any effects of INNS in relation to subtidal sediment communities within the study area would be **local** and **permanent** and the magnitude of effect is expected to be **negligible**. The transport of this species outside of the Central Dock system has also been screened out of the assessment because with the implementation of the inherent mitigation outlined above, it is considered that this scenario is highly unlikely. The overall effects of INNS within subtidal sediments are therefore expected to be **local**, **permanent** and of **negligible significance**.

### 16.6.2 Operation Phase

The only important marine receptor that has been screened into the assessment is the Eurpoean eel. The effects upon this species are limited to the construction phase of the development. Given the current proposed scheme plans, no additional effects upon this receptor are likely during the operation phase of the proposed scheme.

## 16.7 Mitigation Measures

Whilst the assessment has determined that no likely significant effects would be of moderate or greater significance either with, or without mitigation, a number of mitigation methods are suggested for implementation as good practice. Some of these are inherent measures, which have been considered during the design phase of the project, whilst others have been developed during the assessment process to reduce or avoid negative effects of the proposed scheme.

To minimise the potential for more widespread changes in water quality, inherent mitigation has been considered and developed within the construction methods. Specifically, the construction design has stipulated the use of jack-up barges or ‘spud-leg’ pontoons to remove the need for importing fill into standing water or employing backhoe methods, which would otherwise result in a larger impact footprint and/or high a level of suspended solids entering the canal and adjoining docks.

As part of the construction works a CEMP will be written and implemented by an appointed Environmental Clerk of Works. The CEMP will provide mitigation against potential pollution from the construction activities at the proposed development site and include an Incident Response Plan. In order to reduce to the likelihood of the transmission of INNS to/from the site during the construction phase numerous inherent mitigation design measures will be incorporated into construction methods via the CEMP and relevant best practice guidelines (Natural England and Natural Resources Wales Biosecurity Planning guidance (Cook et al., 2014)).

When considering pile driving, there is potential for sound levels to be created that are sufficient to result in recoverable injury to European eels. It would be expected that such noise levels would only be encountered close to the piling source. The precise pilling methods have not yet been confirmed. However, should impact piling be implemented, in order to mitigate sounds effects, soft-start methods could be adopted if practicable to give eels in the close vicinity of works to avoid injurious noise levels. As the piling would be carried out in a restricted area of the dock system, individual eels would be able to move away from the sound source through the dock system before sounds levels reached peak levels.

## 16.8 Residual Effects

The assessment has revealed that no effects moderate or higher significance are likely. As such, potential mitigation measures have been proposed but depending upon the final construction methods proposed, these would be unlikely to reduce effects sufficiently to lower the predicted significance to 'negligible'. Nonetheless, with the inherent mitigation measures already designed into the project and no implementation of the suggested mitigation measures proposed, the residual effects of the construction phase equal the likely effects already identified. This is summarised in Table 16.9.

## 16.9 Cumulative Impacts

The proposed scheme has been assessed cumulatively against other schemes in accordance with the methods outlined in Section 2.13. A review of planning applications has been undertaken to identify other schemes to be considered within the assessment cumulative effects.

For the purposes of the marine ecological assessment, only an effect that is of major or moderate significance is considered to be significant in EIA terms. The only effects arising at a local level during the construction phase were minor and related to effects upon the European eel (a nationally and internationally protected species), these were:

- Loss of habitat.
- Effects of underwater noise and vibration.

Of the schemes listed in Section 2.5, those with potential effects upon fish species, including the European eel are:

- Planning Application 10O/2424 – Liverpool Waters
- Planning Application 17O/3230 – Cruise Liner Terminal
- Planning Application 18F/3231 – Isle of Man Ferry Terminal

The ecology ES chapter for the Liverpool Waters project concludes that '*No significant residual effects on fish species*'. Whilst the marine ecology chapter for the Cruise Liner Terminal Project concludes that at most '*Local, temporary and of minor adverse significance for diadromous and other protected fish species*' would occur. It should be noted that these two schemes are for plans outside of the locality area of West Waterloo Dock which is significant given that the potential effects are predicted to be local. This assessment has also concluded that at most, only local, minor adverse effects are likely.

The proposed Isle of Man Ferry terminal is, however, adjacent to this proposed scheme and also involves a small area (2,127 m$^2$) of infill within West Waterloo Dock itself and two very small areas (total 311 m$^2$) within Princess half Tide Dock. Therefore, it is possible that the combination of underwater noise and vibration or loss of habitat from these two projects could adversely fish species within the dock system. However, the marine ecology chapter for the Isle of Man Ferry Terminal concludes that disturbance caused by noise would be *'temporary, local and of negligible significance'* and that the loss of habitat would be '*local and of minor significance for protected benthic fish species and of negligible significance for other fish species'*.

Given this, and that the main marine ecological findings of the other relevant schemes have concluded that the construction phase of those schemes would also not be significant in EIA terms, it is considered that any cumulative effects would be at most of **minor significance** to protected benthic fish species and of **negligible significance** for all important marine ecology receptors.

## 16.10 Assessment Summary

A summary of the potential effects from the proposed scheme in West Waterloo Dock on Marine Ecology is provided below in Table 16.9 for the construction phase. No potential effects on marine ecological receptors for the operational phase are anticipated given the current plans.

### 16.10.1 Conclusions

With the exception of the European eel, no habitats or species of conservation interest were recorded during the marine baseline surveys. Within the Mersey estuary catchment, the European eel is protected at regional, national and international level.

The 'Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine' (CIEEM, 2018) have been used as a basis for the marine ecology impact assessment. In accordance with the CIEEM guidelines important ecological features have been identified (habitats, species and ecosystems) with reference to a geographical context in which they are considered important. On that basis, with the exception of the European eel, all other marine ecological receptors were screened out of the assessment.

Marine receptors that have been identified within the footprint of the proposed scheme within West Waterloo Dock but have screened out of the assessment are summarised below:

The subtidal sediment which occupied the dock basin was identified as EUNIS Habitat type A5.542: angiosperm communities in reduced salinity in association with *Pomatogeton pectinatus*. The macrobenthos within the subtidal sediments was quite poor, being dominated by a few highly abundant taxa. Many of these were either lagoon specialists and/or taxa that are extremely tolerant of low DO and/or polluted sediments. This Habitat type is not protected and is of negligible importance.

The dock walls were characterised by infralittoral fouling seaweed communities (EUNIS Habitat type A3.72) for the first 20 cm after which this habitat gave way to *Mytilus edulis* beds on reduced salinity infralittoral rock (EUNIS Habitat type A3.361). Both communities were relatively poor in terms of species richness and were limited to mussels *Mytilus edulis*, sea squirts of the *Molgula* genus, and the non-native tube worm *Ficopomatus enigmaticus*. In the deeper zone high densities of amphipods (particularly *Microdeutopus gryllotalpa*, *Stenothoe monoculoides* and *Monocorophium acherusicum*) and the isopod *Jaera albifrons* were also found living between the mussels and tubes of *Ficopotus enigmaticus*. Juvenile specimens of the lagoon cockle, *Cerastoderma glaucum*, were also found attached to mussel shells and algal filaments. The subtidal communities found on the dock walls are not protected and are considered of negligible importance.

Baseline fish surveys concluded that the number and diversity of fish species within the dock was low. The dock does support a good population of stickleback. A few sand smelt were caught and two gobies which indicate that these species are present but probably in relatively low numbers.

Sediments within the dock were relatively contaminated. Concentrations of Pb and Zn exceeded the Probable Effect Level at all stations. However, no metal concentrations exceeded Cefas Action Level 2. All PAHs however exceeded cAL1 by a considerable margin and also exceeded the PEL where this exists. Contamination by organotins was relatively low with only one exceedance of the threshold limit for DBT and one for TBT. Piling within the dock is only likely to cause localised re-suspension of material and therefore the risk to the marine ecology of the area is insignificant. However, consideration should be given to measures to mitigate the resuspension of sediments (e.g. the use of silt curtains) particularly if medium-large scale dewatering practices are employed.

The greatest effects upon the European eel were determined to be during the construction phase and these were loss of habitat and underwater noise and vibration.

Mitigation has been proposed to reduce underwater noise but the need for this is dependent upon the piling/drilling methods proposed in the final construction method statement. Nonetheless, with the inherent mitigation measures already designed into the project, the residual effects of the construction phase assessed to be of minor adverse significance overall which are not considered significant in EIA terms.

## Table 16.9: Summary of Effects

| Potential impact | Environmental significant effect without mitigation | Mitigation | Effect after mitigation (residual effect) |
|---|---|---|---|
| Loss of habitat - European eel | Minor adverse | None | Minor adverse |
| Physical disturbance of benthic sediments – European eel | Negligible | Implementation of CEMP | Negligible |
| Changes to water quality – European eel | Negligible | Implementation of CEMP | Negligible |
| Underwater noise and vibration - European eel | Minor adverse | Implementation of CEMP dependent upon piling methods to be adopted | Minor adverse |
| Pollution – marine subtidal species and communities<br>Spread of INNS – Subtidal marine species and communities | Potential effects upon subtidal marine species and communities which are not considered important in terms of the EcIA process have additionally been considered here in terms of potential effects from pollution and spread of non-native species. This is to ensure that the overall nature conservation within the zone of impact of the proposed scheme is protected and/or enhanced as far as possible, and that relevant policy and best practice is complied with during the lifetime of the project. | Best practice to be implemented via CEMP. | Not applicable in terms of EIA. |

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# 17 Summary of Significant Environmental Effects, Mitigation and Monitoring

## 17.1 Introduction

This chapter provides a summary of the residual significant environmental effects, during the construction and operational phase, of the proposed scheme, and details the mitigation proposals outlined in the technical chapters (Chapters 5-16).

Standard best practice construction measures that are inherent to any development are therefore relied on in the assessments and details specific to this construction project for the proposed scheme are expected to be conditioned by the LPA.

Mitigation that has been identified through the technical chapters with the aim of reducing any environmental effects is detailed within each technical chapter and summarised in Table 17.1.

## 17.2 Environmental Effects, Mitigation and Monitoring

Table 17.1 summarises the technical chapters set out above (chapters 5 – 16) and show that there are no potential residual significant environmental effects caused by the proposed scheme that have been identified by the individual technical chapters.

For the purposes of this ES, an effect is considered to be significant if it is assessed to be:

- moderate (adverse or beneficial); or
- major (adverse or beneficial).

**Table 17.1: Summary of potential residual significant effects**

| Development Stage | Environmental effect (following scheme design and impact avoidance measures) | Environmental significant effect without mitigation | Additional mitigation/ enhancement (if identified) | Residual effect after additional mitigation | Recommended monitoring (if applicable) |
|---|---|---|---|---|---|
| **Chapter 5: Transport and Access** | | | | | |
| Construction | No significant residual effects identified. | | | | |
| Operation | No significant residual effects identified. | | | | |
| **Chapter 6: Air Quality** | | | | | |
| Construction | No significant residual effects identified. | | | | |
| Operation | No significant residual effects identified. | | | | |
| **Chapter 7: Noise and Vibration** | | | | | |
| Construction | No significant residual effects identified. | | | | |
| Operation | No significant residual effects identified. | | | | |
| **Chapter 8: Townscape and Visual** | | | | | |
| Construction | No significant residual effects identified. | | | | |
| Operation | No significant residual effects identified. | | | | |
| **Chapter 9: Cultural Heritage and Archaeology** | | | | | |

| | |
|---|---|
| Construction | No significant residual effects identified. |
| Operation | No significant residual effects identified. |
| **Chapter 10: Ground Conditions and Contamination** | |
| Construction | No significant residual effects identified. |
| Operation | No significant residual effects identified. |
| **Chapter 11: Dock Infill Methodology and Impact** | |
| Construction | No significant residual effects identified. |
| Operation | No significant residual effects identified. |
| **Chapter 12: Flood Risk and Drainage** | |
| Construction | No significant residual effects identified. |
| Operation | No significant residual effects identified. |
| **Chapter 13: Wind** | |
| Construction | No significant residual effects identified. |
| Operation | No significant residual effects identified. |
| **Chapter 14: Daylight and Sunlight** | |
| Construction | No significant residual effects identified. |
| Operation | No significant residual effects identified. |
| **Chapter 15: Terrestrial Ecology** | |

| | |
|---|---|
| Construction | No significant residual effects identified. |
| Operation | No significant residual effects identified. |
| **Chapter 16: Marine Ecology** | |
| Construction | No significant residual effects identified. |
| Opening | No significant residual effects identified. |