



PREAMBLE

Silvertown Homes Limited (SHL) and Greater London Authority Land and Property (GLAP) have submitted a hybrid planning application to the London Borough of Newham (LBN) for the redevelopment of the Thameside West site, accessed off Dock Road in Newham (the Site).

SHL is a property development company and joint land owners of the Site. SHL has over 65 years combined experience at delivering high quality regeneration projects across London. GLAP is a subsidiary corporation of the Greater London Authority (GLA) and took over assets and liabilities from the London Development Agency (LDA) in 2012. GLAP is primarily focused on delivering genuinely affordable homes and jobs for London.

The proposal is to construct a new high-quality residential-led mixed-use development comprising new homes, new industrial floorspace, a new local centre, a new primary school and nursery school, new community facilities, a new public park (with associated outdoor play facilities), enhanced SINC and over 800m of new riverside walk along the River Thames with ecological / biodiversity enhancements. This development has been designed to focus its community hub around the delivery of a new Dockland Light Rail (DLR) station that is proposed to be constructed on the Site by Transport for London's (TfL) in 2023.

The proposals have been designed by Foster & Partners, John McAslan & Partners, Patel Taylor and the wider project team (listed, right) taking into account comments provided by local residents during summer and public exhibition events and comments provided during pre-application discussions with a variety of statutory and non-statutory interests, including LBN and its Design Review Panel (DRP), the Greater London Authority (GLA), Transport for London (TfL), Environment Agency (EA), Port of London Authority (PLA) and London City Airport (LCA).

This document is one of a suite of planning application documents submitted to LBN, including an Environmental Statement. The planning application is available to review at LBN's office or using LBN's online services:

Search for planning application reference number 18/03557/OUT at:
<https://pa.newham.gov.uk/online-applications/search.do?action=simple>

The planning application can also be viewed on the GLA's website at: <https://www.london.gov.uk/what-we-do/planning/planning-applications-and-decisions/public-hearings>

PROJECT TEAM

GREATERLONDONAUTHORITY

**BARTON
WILLMORE**

Foster + Partners

JOHN McASLAN + PARTNERS

Patel Taylor

Tavernor

**BURO HAPOLD
ENGINEERING**

MEINHARDT

AnsteyHorne

SYSTRA

Aviaire WILDLIFE HAZARD
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Thameside West

**Environmental Statement Addendum Volume III: Appendices to the Main
Report**

035668

March 2020

Revision 00

Revision	Description	Issued by	Date	Checked
00	Environmental Statement Addendum Volume III: Appendices to the Main Report	HC	March 2020	TC

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approved **Trevor Curson**

signature



date **March 2020**

Chapter	Author
1-4 & 18-19 Introductory and concluding chapters	Hannah Clement BuroHappold
5 Traffic and transportation	Chris Mullett & Natalie Maynard BuroHappold
6 Noise and vibration	Jana Guijarro BuroHappold
7 Air quality	Peter Henshaw BuroHappold
8 Water resources and flood risk	Laurens Dominicus BuroHappold
9 Terrestrial ecology	Pernille Olsen BuroHappold
10 Waste management	Edward Wilkins BuroHappold
11 Ground conditions	Hugh Mallett BuroHappold
12 Wind and microclimate	Gilberto Osornio Nieto BuroHappold
13 Daylight, sunlight and overshadowing	Gracie Irvine & Matthew Grant Anstey Horne
14 Population and human health	Debbie Mayes Barton Willmore
15 Cultural heritage	Christina Holloway & Alicia Vickers Museum of London Archaeology
16 Townscape and visual amenity (TVIA)	Greg Mahon Barton Willmore
17 Greenhouse gas emissions	Trevor Keeling BuroHappold

Contents of the Environmental Statement Addendum

Environmental Statement Addendum: Non-Technical Summary

Environmental Statement Addendum Volume I: Main Report

Environmental Statement Addendum Volume II: Baseline conditions and photomontages

Environmental Statement Addendum Volume III: Technical Appendices

Contents of Volume III: Appendices to the Main Report

Appendix 4 – Amendments to Proposed Development

4-A Maximum Height Limits

4-B Horizontal Deviation Limits

4-C Development Zones

Appendix 8 – Water Resources and Flood Risk

8-A Revised Masterplan Drainage Strategy

8-B Flood Risk Assessment (FRA) Statement of Conformity

8-C Revised Phase 1 Below Ground Drainage Strategy

Appendix 10 – Waste

10-A Outline Waste Management Strategy (OWMS) (Updated for March 2020)

10-B Site Waste Management Plan (SWMP) (Updated for March 2020)

Appendix 12 – Wind Microclimate

12-A RWDI Technical Memo – Phase 1

Appendix 13 – Daylight, Sunlight and Overshadowing

13-A Site plans and 3D views of the current baseline condition (2020)

13-B Site plans and 3D views of the future baseline condition (2022)

13-C Site plans and 3D views of the proposed development scenario (2031)

13-D VSC results of the current baseline (2020) vs proposed development scenario (2031)

13-E DD results of the current baseline (2020) vs proposed development scenario (2031)

13-F DD contours of the current baseline (2020) vs proposed development scenario (2031)

13-G APSH results of the current baseline (2020) vs proposed development scenario (2031)

13-H VSC results of the future baseline (2022) vs proposed development scenario (2031)

13-I DD results of the future baseline (2022) vs proposed development scenario (2031)

13-J DD contours of the future baseline (2022) vs proposed development scenario (2031)

13-K APSH results of the future baseline (2022) vs proposed development scenario (2031)

13-L ADF results of the future baseline condition (2022) vs proposed development scenario (2031)

13-M ADF drawings for proposed development scenario (2031)

13-N APSH results of the future baseline condition (2022) vs proposed development scenario (2031)

13-O VSC and APSH façade mapping results of the future baseline condition (2022) vs proposed development scenario (2031)

13-P VSC and APSH façade mapping renders for the proposed development scenario (2031)

Appendix 14 – Population and Human Health

14-A Health Impact Assessment (HIA) Addendum

Appendix 15 – Built Heritage

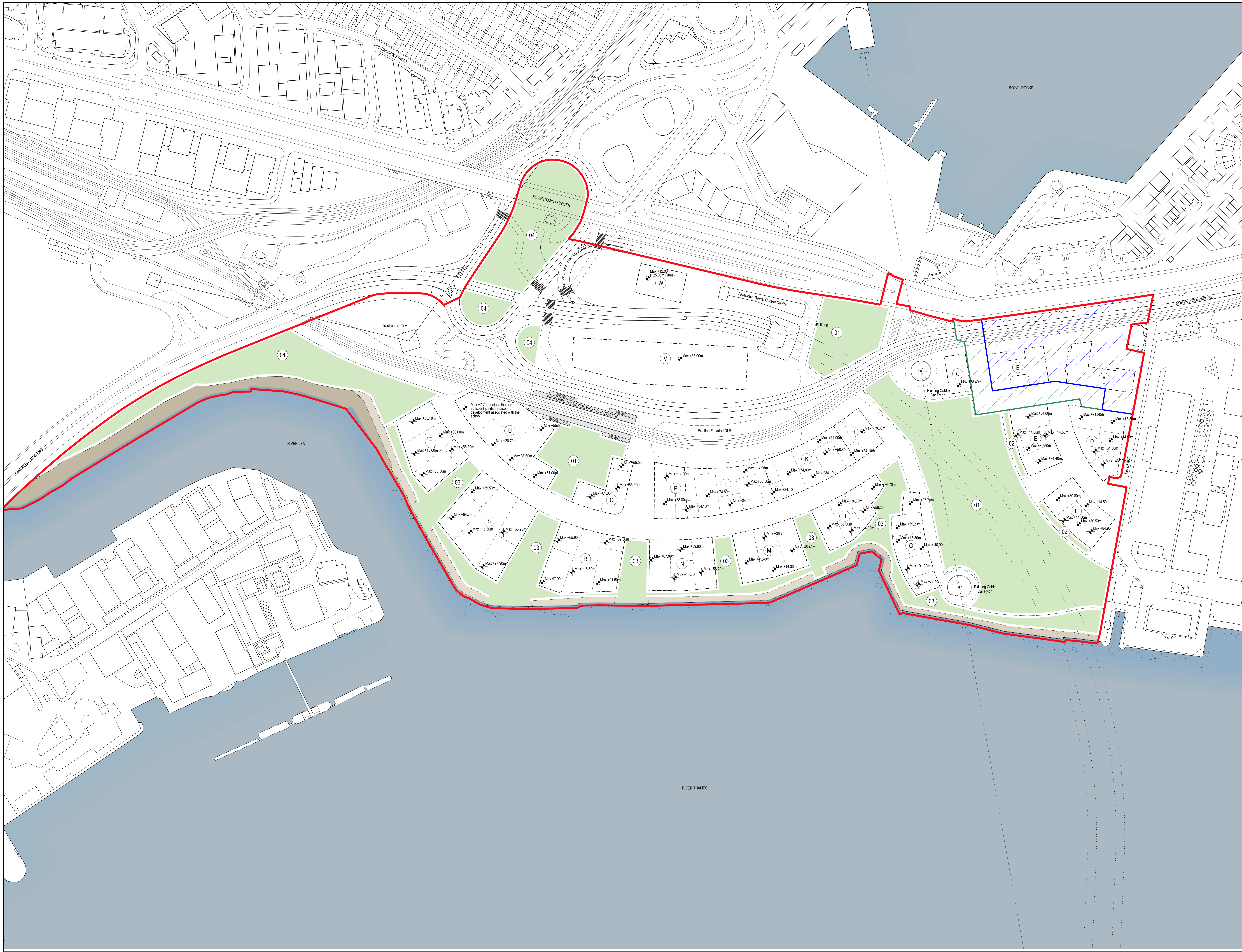
15-A Historic Environment Assessment (HEA) (Updated for March 2020)

15-B Historic Statement (Updated for March 2020)

Appendix 17 – Greenhouse Gas Emissions

17-A General Project Inputs

4-A: MAXIMUM HEIGHT LIMITS



- General Notes
1. Do not scale drawings. Dimensions govern.
 2. All dimensions are in millimetres unless noted otherwise.
 3. All levels are in metres unless noted otherwise.
 4. All dimensions shall be verified on site before proceeding with the work.
 5. Foster + Partners shall be notified in writing of any discrepancies.
 6. Any areas indicated on this sheet are approximate and indicative only.

Rev.	Date	Reason For Issue	CHK
03	17/04/20	For Planning Resubmission	F+P
02	10/03/20	For Planning Resubmission	F+P
01	28/06/19	For Planning Resubmission	F+P
00	13/12/18	For Planning	F+P

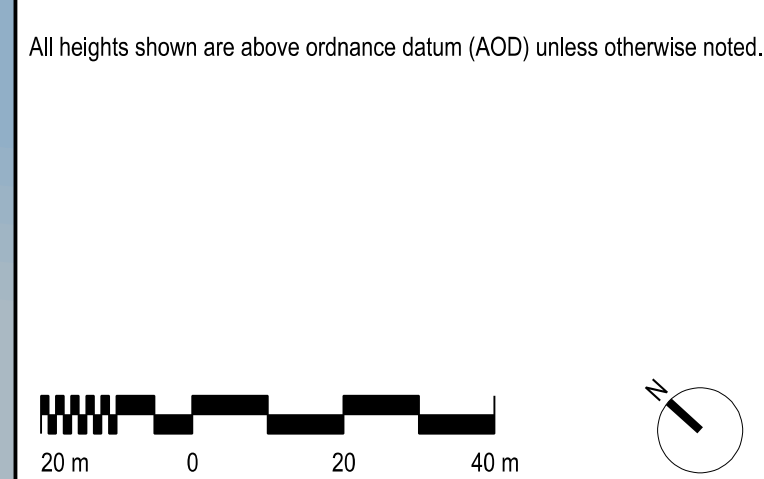
FOR PLANNING		
03	17/04/20	For Planning Resubmission
02	10/03/20	For Planning Resubmission
01	28/06/19	For Planning Resubmission
00	13/12/18	For Planning

Key Plan

Royal Docks
River Lea
River Thames

LEGEND

- Thameside West Planning Application Boundary
- Detailed Application
- Detailed and Outline Application
- Development Zone
- Development Zone Reference
- Open Space
- Landscape Treatment Reference (Refer to A-SL-011-xx-03)
- Spot Height



Foster + Partners
 Riverside, 22 Hester Road
 London SW11 4AN
 T +44 (0)20 7738 0455
 www.fosterpartners.com

Client
Silvertown Homes Limited & GLA Land and Property

Project
Thameside West Masterplan

Title
Site Layout Masterplan - Parameter Plan 04 Development Zones Maximum Height Limit

Project No.	Date	Scale at ISO A0
2693	13/12/18	1:1000
Number	Revision	
A-SL-011-xx-04	03	

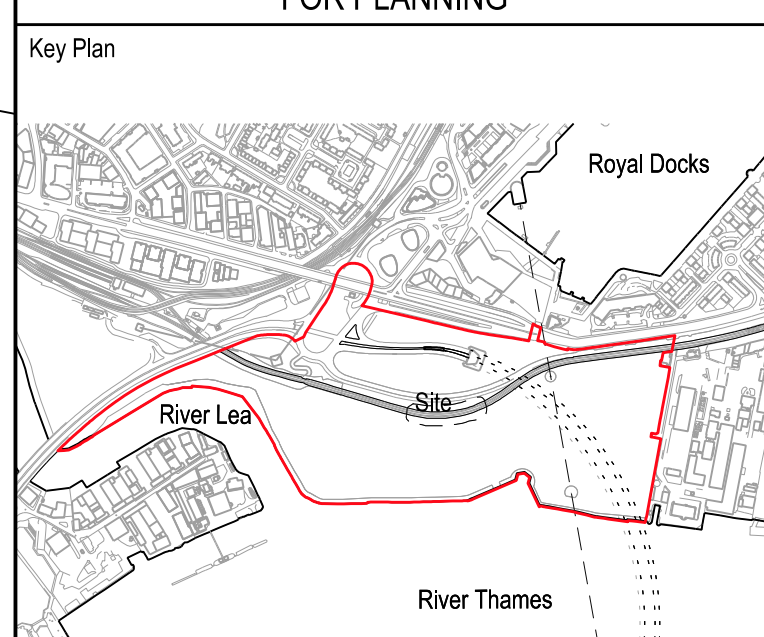
4-B: HORIZONTAL DEVIATION LIMITS



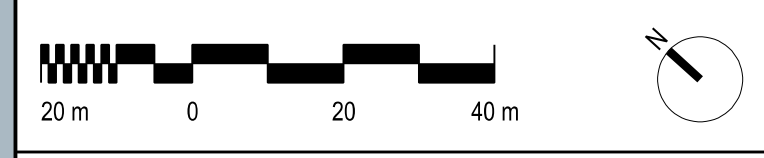
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02	17/04/20	For Planning Resubmission	F+P
01	10/03/20	For Planning Resubmission	F+P
00	13/12/18	For Planning	F+P

FOR PLANNING



- LEGEND
- Thameside West Planning Application Boundary
 - Detailed Application
 - Detailed and Outline Application
 - Development Zone
 - Development Zone Reference
 - Open Space
 - Landscape Treatment Reference (Refer to A-SL-011-xx-06)
 - Development boundary with maximum horizontal deviation +/- 2m
 - Development boundary with maximum horizontal deviation +/- 3m
 - Development boundary with maximum horizontal deviation - 3m
 - Development boundary with maximum horizontal deviation - 6m



Foster + Partners
 Riverside, 22 Hester Road
 London SW11 4AN
 T +44 (0)20 7738 0455
 www.fosterpartners.com

Client
Silvertown Homes Limited & GLA Land and Property

Project
Thameside West Masterplan

Title
Site Layout Masterplan - Parameter Plan 03 Development Zones Horizontal Deviation Limit

Project No.	Date	Scale at ISO A0
2693	13/12/18	1:1000
Number	Revision	
A-SL-011-xx-03	02	

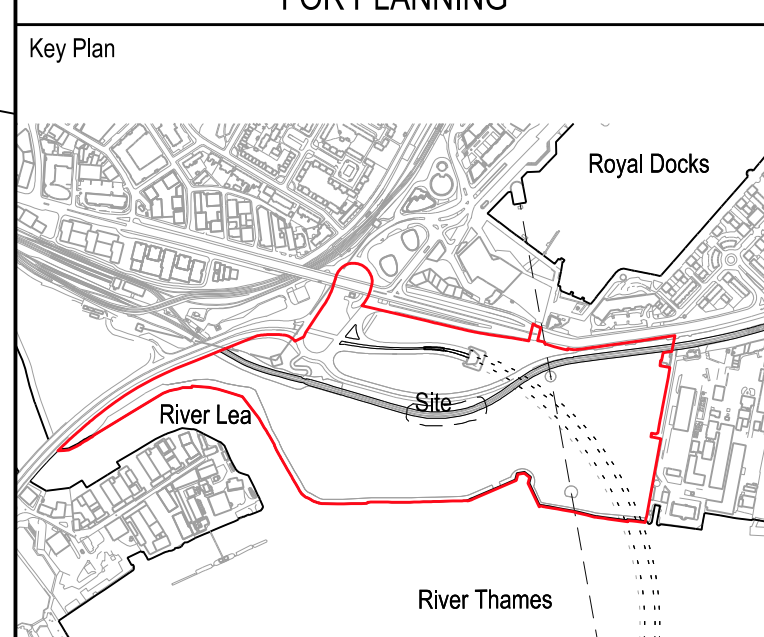
4-C: DEVELOPMENT ZONES



General Notes

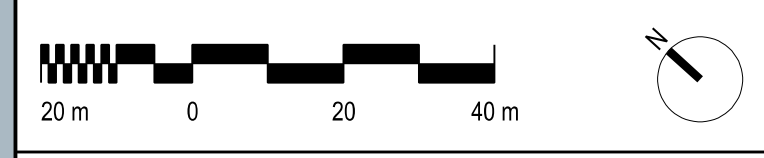
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Rev.	Date	Reason For Issue	CHK
01	10/03/20	For Planning Resubmission	F+P
00	13/12/18	For Planning	F+P
FOR PLANNING			



LEGEND

Thameside West Planning Application Boundary	
Detailed Application	
Detailed and Outline Application	
Development Zone	
Development Zone Reference	
Open Space	
Landscape Treatment Reference (Refer to A-SL-011-xx-02)	



Foster + Partners
 Riverside, 22 Hester Road
 London SW11 4AN
 T +44 (0)20 7738 0455
 www.fosterpartners.com © Foster + Partners

Client
 Silvertown Homes Limited &
 GLA Land and Property

Project
 Thameside West
 Masterplan

Title
 Site Layout
 Masterplan - Parameter Plan 02
 Development Zones

Project No.	Date	Scale at ISO A0
2693	13/12/18	1:1000
Number	Revision	
A-SL-011-xx-02	01	

8-A: REVISED MASTERPLAN DRAINAGE STRATEGY

Thameside West
Masterplan Drainage Strategy

035668

15 May 2020

Revision 04

Revision	Description	Issued by	Date	Checked
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03	Update for Second Amendments to Masterplan	JF	24.06.2019	DKP
04	Update for Third Amendments to Masterplan	JF	15.05.2020	DKP

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author **Les Johnson**

date **15th May 2020**

approved **David Palmer**

signature 

date **15th May 2020**

Contents

1	Executive Summary	11
2	Introduction	13
2.1	Background	13
2.2	Site Description	13
2.3	Proposed Development	14
3	Planning Context	16
3.1	Overview	16
3.2	National Planning Policy Framework	17
3.3	The London Plan	18
3.4	Newham Local Plan	19
3.5	Newham Local Flood Risk Management Strategy	19
3.6	London Borough of Newham Surface Water Management Plan	19
3.7	Operational Development	20
3.8	Consultation	20
3.8.1	Environment Agency	20
3.8.2	Thames Water	21
3.8.3	Lead Local Flood Authority	21
3.8.4	Greater London Authority	21
4	Existing Drainage	22
4.1	Existing Infrastructure	22
4.1.1	Thames Water Asset Records	22
4.1.2	On-site Drainage Records	22
4.2	Surface Water	22
4.3	Foul Water	23
5	Proposed Surface Water Drainage	24
5.1	Overview	24
5.2	Drainage to the River Thames	25

5.3	Drainage to the Thames Water Sewer Network	27
5.3.1	Overview	27
5.3.2	Discharge Rate	27
5.3.3	Discharge Locations	28
5.3.4	Attenuation	28
5.4	Proposed SuDS Features	29
5.4.1	Open Water Features and Swales	29
5.4.2	Bio-retention Strips	30
5.4.3	Green Roofs	31
5.4.4	Below Ground Attenuation	32
5.5	Pollution Control	32
5.6	Additional Benefits	32
5.7	Thames Water Rising Mains	32
5.8	Summary	32
6	Proposed Foul Water Drainage	33
6.1	Overview	33
6.2	Flow Calculations	33
6.3	Discharge Locations	36
6.4	Storage and Pumping	36
7	Summary and Conclusion	38
	Appendix A – Proposed Development Drawings	
	Appendix B – Thames Water Consultation and Asset Records	
	Appendix C – Proposed Drainage Strategy Drawings	
	Appendix D – MicroDrainage Attenuation Calculations	
	Appendix E – Surface Water Catchment Calculations	
	Appendix F – Foul Water Discharge Calculations	
	Appendix G – Newham LLFA Drainage Pro Forma	

Table of Tables

Table 3-1: Recommended climate change allowances for peak rainfall intensity	18
Table 5-1: Summary of proposed surface water drainage options in accordance with the London Plan drainage hierarchy	24
Table 5-2: Surface water drainage strategy design criteria for rainfall events	24
Table 5-3: Surface water drainage strategy design criteria for joint probability fluvial/tidal and rainfall events	26
Table 5-4: Surface water runoff coefficients	28
Table 5-5: Summary of proposed surface water drainage strategy	32
Table 6-1: Foul water flow benchmarks and assumptions	34
Table 6-2: Summary of estimated peak foul water discharge rates from the proposed development	34
Table 6-3: Phasing of proposed development	35
Table 6-4: Summary of proposed foul water connections to the TW combined sewer network	36
Table 7-1: Summary of existing and proposed discharge rates to the Thames Water sewers	39

Table of Figures

Figure 2-1: Site location plan with indicative site boundary shown in red	14
Figure 2-2: Plan drawing showing the proposed development (Source: Patel Taylor, drawing 522-PT-MP-TYP-DR-L-PL-1030 Rev P06)	15
Figure 2-3: Alignment of proposed Silvertown Tunnel	15
Figure 5-1: Plan showing the overall proposed surface water drainage strategy	25
Figure 5-2: Cross-section of proposed river wall, showing indicative location of surface water outfall	26
Figure 5-3: Plan showing the overall proposed surface water drainage strategy	29
Figure 5-4: Typical cross-section detail of a lined swale (Source: CIRIA SuDS Manual)	30
Figure 5-5: Typical cross-section detail of a bio-retention system (Source: CIRIA SuDS Manual)	30
Figure 5-6: Typical make-up of a green roof (Source: Green Roofs Direct, CIRIA SuDS Manual)	31
Figure 6-1: Plan showing the overall proposed foul water drainage strategy	33
Figure 6-2: Klargester horizontal pumping station, with integrated foul water storage	37

Abbreviations

Term	Definition
DLR	Docklands Light Railway
EA	Environment Agency
ES	Environmental Statement
FRA	Flood Risk Assessment
GIS	Geographical Information System
LBN	London Borough of Newham
NPPF	National Planning Policy Framework
SAAR	Standard Average Annual Rainfall
SuDS	Sustainable Drainage System
SWMP	Surface Water Management Plan
TW	Thames Water

1 Executive Summary

This Drainage Strategy has been prepared by BuroHappold Engineering to accompany the hybrid planning application for the Thameside West development. The hybrid planning application will be submitted with detailed proposals for Phase 1 and outline proposals for the remaining masterplan.

This report describes the surface water and foul water drainage strategies for the masterplan elements of the proposed development and has been updated to reflect the proposed amendments to the scheme, known as the March 2020 amendments. The detailed surface water and foul water drainage strategies for Phase 1 of the proposed development have been prepared by Meinhardt. The proposed drainage strategy has been prepared in accordance with the National Planning Policy Framework, the London Plan (2016), the London Borough of Newham Local Plan (2018), Local Flood Risk Management Strategy (2015) and the Surface Water Management Plan (2011).

The site is currently occupied by warehouses and industrial areas, with a high proportion of impermeable ground covering such as concrete and asphalt hardstanding. The proposed development is a mixed-use development consisting of 5,000 residential units, commercial, community, industrial, and educational facilities in buildings of up to 29 storeys, as well as public realm landscaping.

The Asset Location Search provided by Thames Water (TW) indicates that there are a number of existing TW surface water and combined sewers within Dock Road, towards the east edge of the site. In addition, there are two 1,400mm diameter surface water rising mains that run through the site and discharge to the River Thames. Where gravity allows, surface water drainage from the existing hardstanding areas is discharged to the River Thames via outfalls within the river wall. Where the topography does not allow drainage by gravity to the River Thames, it is assumed that surface water is discharged to the TW sewers within Dock Road.

It is proposed that surface water will be discharged directly to the River Thames, for all areas of the site where the proposed levels permit gravity drainage to the river. The discharge will be via four, new 500-800mm diameter outfalls within the new river wall, fitted with not less than two non-return valves within each outfall. As the discharge is to a surface water body, there is no requirement to restrict the rate of discharge to the River Thames. However since the invert levels of the outfalls are all below the mean high water level, in order to prevent surface water flooding during periods when a rainfall event coincides with high water levels in the River Thames, the surface water drainage network has been designed with oversized pipes to provide additional storage capacity. A number of joint probability fluvial/tidal and rainfall events have been modelled in MicroDrainage.

For the parts of the site that cannot be drained by gravity to the River Thames, due to the proposed topography or other obstructions, it is proposed that surface water runoff is discharged to the existing TW sewer network via a series of SuDS features. The flow rate of surface water being discharged to the TW sewer is proposed to be restricted to the calculated greenfield runoff rate for the site, Q_{BAR} , which is 3.9l/s/ha. This will be achieved through a combination of above and below ground attenuation, with a total volume of 5,350-6,850m³, which has been designed for storm events up to and including the 1 in 100 year event, including an additional 40% allowance for the predicted increase in rainfall intensity as a result of climate change.

The large area of soft landscaping to the south of the proposed development contains a large open water feature that will act as a retention basin for surface water during storm events, with surface water conveyed to the basin from the surrounding areas by swales. Bio-retention strips are proposed on either side of the Central Spine road and within the areas of hard landscaping and public realm around the proposed buildings. Green roofs are proposed on 15 of the proposed buildings, with a total area of 4,400m², which will help to attenuate and reduce the surface water discharge rate from the proposed development. These green roofs will provide further benefits in terms of habitat, energy efficiency and public realm. Below ground attenuation is proposed in locations where there is not sufficient space to provide open water features.

The proposed uses of the development will result in an increase of foul water discharge to 233l/s. It is proposed that foul water is discharged to the existing TW combined sewers to the east of the site. The majority of foul water from proposed development will drain directly to the TW combined sewers by gravity, however topographical constraints and obstructions such as the DLR prevent gravity drainage of foul water from buildings R, S and T. It is therefore proposed that a below ground foul water storage tank is provided to receive foul flows from these buildings before being pumped to a connection to the TW gravity network. All foul water connections from the site to the TW sewers discharge by gravity. In a response letter to a pre-planning enquiry for the proposed development, TW have confirmed that the existing TW sewer network will have enough capacity to accommodate foul water flows from Phases 1 and 2 of the proposed development. Upgrades will be required in order to accept foul water from Phase 3 onwards. Ongoing coordination will be required to ensure that these upgrades are complete before the occupation date of Phase 3.

The total combined surface water and foul water discharge from the proposed development represents a significant decrease from the existing combined discharge rate. It is therefore considered that the introduction of the proposed development will contribute to improvements in the risk of sewer surcharge and surface water flooding, both on the site of the proposed development and within the local area.

2 Introduction

2.1 Background

This Drainage Strategy report has been prepared by BuroHappold Engineering (BuroHappold) as part of the hybrid planning application for the Thameside West development, hereafter referred to as the 'proposed development'. The hybrid planning application will be submitted with detailed proposals for Phase 1 and outline proposals for the remaining masterplan.

This report presents the surface water and foul water drainage strategies for the masterplan elements of the proposed development. The detailed surface water and foul water drainage strategies for Phase 1 of the proposed development have been prepared by Meinhardt and is included in Appendix 9-C of the Environmental Statement (ES).

2.2 Site Description

The proposed development is located to the west of the Royal Docks, within the London Borough of Newham (LBN). The site is 18.8ha and is bounded by the A1020 (Lower Lea Crossing) which joins the A1011 along the north and east edge of the site. Bell Lane forms the south-eastern boundary and the River Thames bounds the south-west. The Docklands Light Railway (DLR) runs through the site and the proposed Silvertown Tunnel will emerge into the site.

The River Lea, or Bow Creek as it is also referred to, bounds the north-west end of the site and joins the River Thames along the western edge of the site. A drainage cut runs through the centre of the site and discharges surface water runoff from the existing hardstanding to the River Thames. Figure 2-1 shows the site location and surrounding area.

The site is currently occupied by warehouses and industrial areas. The existing site is generally at a level of approximately 4.8mAOD along the existing river frontage. There are low points within the centre of the site where the existing DLR viaduct is located. Along the site boundary, the existing levels of Dock Road and the Lower Lea Crossing are at approximately 1.5mAOD.

The Asset Location Search provided by Thames Water (TW) indicates that there are a number of existing TW surface water and combined sewers within Dock Road, towards the east edge of the site. In addition, there are two 1,400mm diameter surface water rising mains that run through the site and discharge to the River Thames. The existing surface water and foul water drainage networks are described further in Section 4.

According to the online GeoIndex tool provided by the British Geological Survey, the underlying geology is the London Clay Formation, with superficial deposits of Alluvium (clay, silt, sand and peat), which for the purposes of this drainage report, is considered to be impermeable.

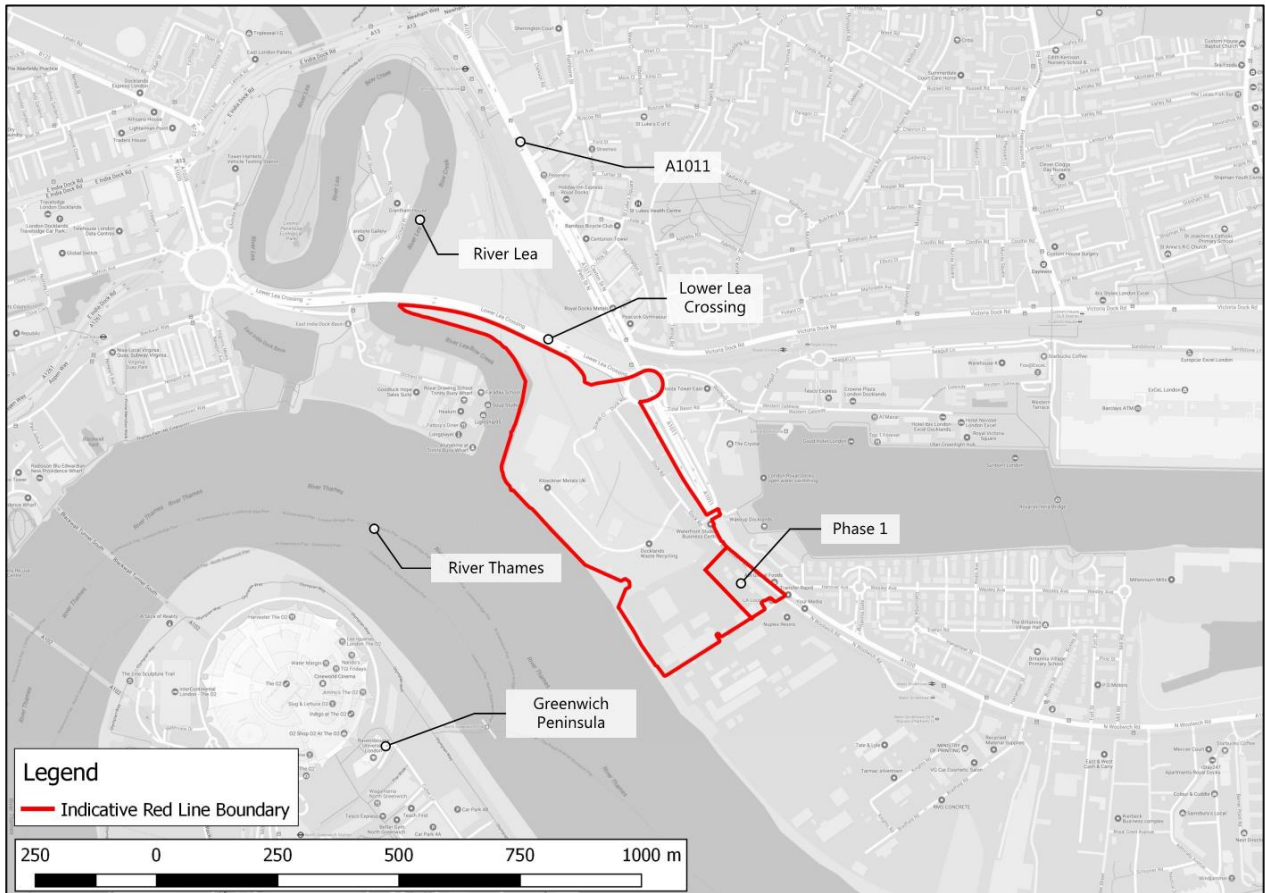


Figure 2-1: Site location plan with indicative site boundary shown in red

2.3 Proposed Development

The proposed development is a mixed-use development consisting of 5,000 residential units, commercial, community, industrial, and educational facilities, as well as public realm landscaping.

The proposed development includes the provision of a new river wall for the entire 1,080m river frontage of the site, which will incorporate a flood defence with a crest level of 6.2mAOD. It is proposed that the ground level immediately behind the new flood defence is raised create a podium level at an elevation of at least 6.2mAOD. The proposed ground levels will then slope back down to tie in with existing levels along Dock Road and the north and south boundary of the site.

The development includes a basement level below the part of the site where ground levels are proposed to be raised. The finished floor level of the basement is proposed to be approximately the same as existing levels. The basement will include car parking, plant and storage, with access gained from the roads to the east of the development.

The proposed layout and levels of the buildings and external landscaping of the proposed development are shown in Figure 2-2. Full drawings are attached in Appendix A.

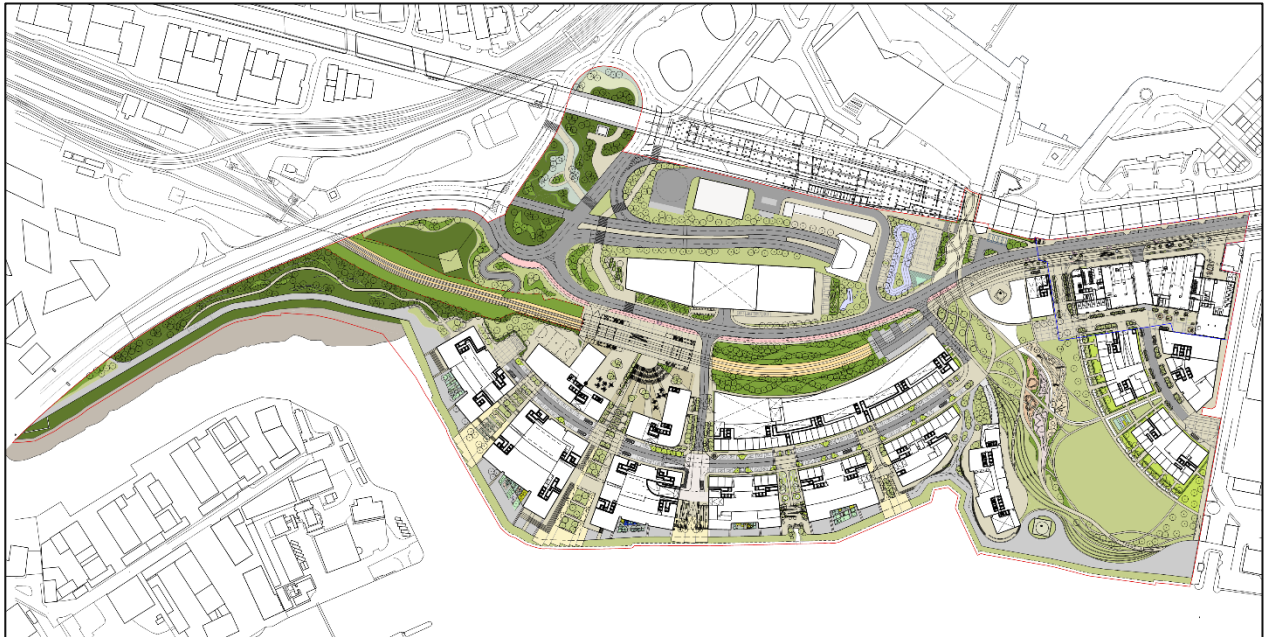


Figure 2-2: Plan drawing showing the proposed development (Source: Patel Taylor, drawing 522-PT-MP-TYP-DR-L-PL-1001 Rev P19)

The proposed Silvertown Tunnel involves the construction of a 1.4km long twin bore road tunnel providing a new connection between the A102 on Greenwich Peninsula and the A1020 Silvertown Way. The tunnel will emerge within the site, as shown in Figure 2-3. The tunnel is due to start construction in 2019 and is expected to be open between 2025 and 2031.

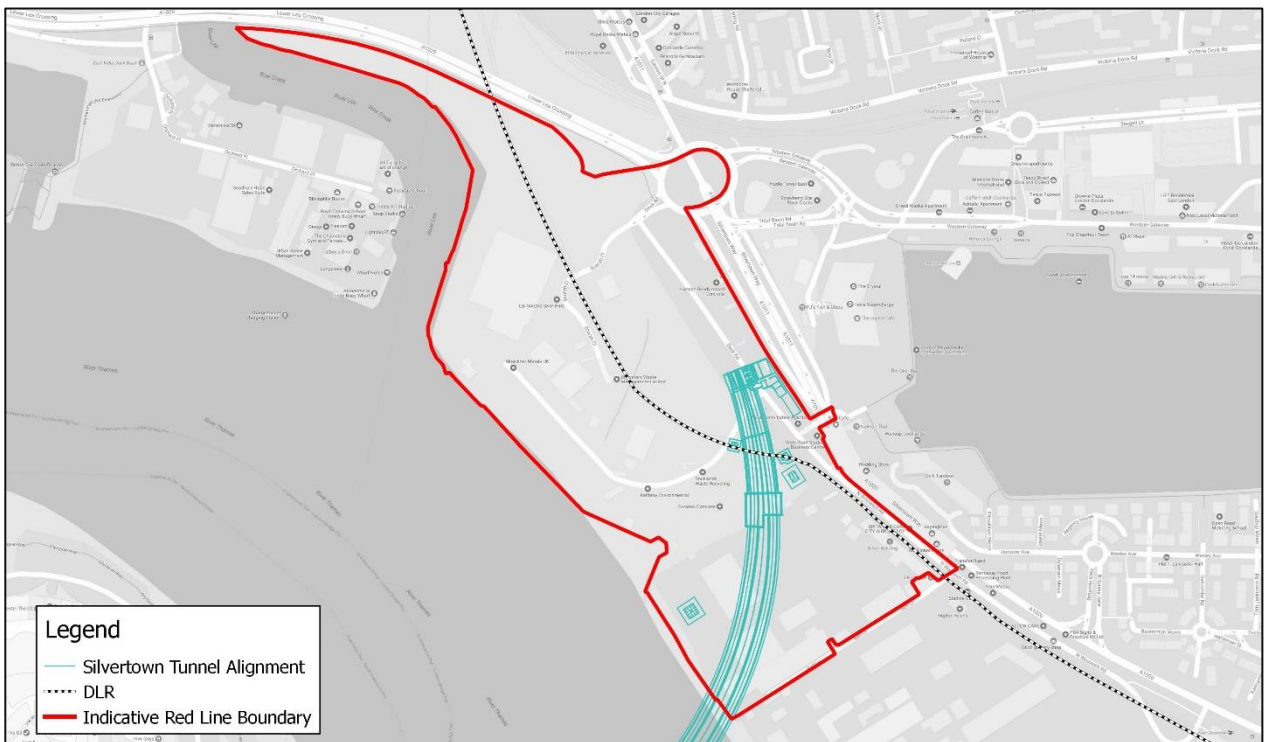


Figure 2-3: Alignment of proposed Silvertown Tunnel

3 Planning Context

3.1 Overview

The following text provides a summary of the planning context of the proposed development.

"A hybrid planning application was submitted to London Borough of Newham (LBN) in December 2018 by Silvertown Homes Limited (SHL) and Greater London Authority Land and Property (GLAP) (the "Applicants"). This application proposed the phased construction of a major mixed use development on land at Thameside West, Dock Road, London E16 (the "Site"). Phase 1 of the development is submitted in full detail and all other phases of the development, as well as a new river wall, are submitted in outline (with all matters reserved). The planning application was validated by LBN in January 2019 under reference 18/03557/OUT.

The Applicants submitted amendments to the proposed development and supporting planning application material to LBN on 17th May 2019, which included:

- *Amendments to the external appearance of the Phase 1 development;*
- *Altering the phasing of the development to bring forward the industrial phase of the development into Phase 3;*
- *Altering the description of development in relation to the industrial use classes proposed;*
- *Updating the traffic modelling;*
- *Updating the noise and air quality assessments to include the scenario of the retention of the Thames Wharf Safeguarded Wharf and other neighbouring wharves;*
- *Updating the Chapters of the Environmental Statement (ES) to take account of the comments received by statutory consultees; and*
- *Other minor amendments.*

The Applicants submitted a second set of amendments to the proposed development and supporting planning application material on 28th June 2019, which comprised:

- *Reducing the massing of buildings E (- 2 and - 5 storeys) and F (- 1 storey) and increasing the massing of the lower elements of buildings Q (+1 storey), R (+1 and +2 storeys), S (+1 and +2 storeys), T (+1 storey) and U (+1 storey);*
- *Undertake amendments to the elevation treatment of buildings A and B (but no massing changes);*
- *Marginally increasing the height of building V;*
- *Alterations to the ancillary uses proposed at podium level in buildings A and B; and*
- *Alterations to the podium level and ground level landscaping within Phase 1.*

The Applicants now propose to make a third set of amendments to the proposed development and supporting planning application material, which comprise:

- *Significant reduction in the massing of Building A;*

- *Decreasing the overall height of Building B;*
- *Internal and external amendments to the Buildings A and B;*
- *Amendments to the landscape proposals and reduction in amount of car and cycle parking proposed for Buildings A & B;*
- *Decreasing the overall height of Building C;*
- *Reducing the massing of Building D (focusing on the wings adjacent to the Allnex site) to form a stepping down in massing and the massing redistributed to Buildings N, M and J;*
- *Adjusting the heights of Buildings E & F and the position of the lower podium to improve proximity between the buildings and to improve the outlook of residential units;*
- *Increased separation distances in Buildings H, K, L and P (Thameside Crescent) to ensure separation distances between habitable rooms for single aspect units achieve a minimum of 18m;*
- *Buildings S and T have increased in height;*
- *Increased separation distances between Buildings Q and U to improve views and access from the Station Square to the riverside walkway; and*
- *Reduction in height of lower parts of Buildings Q & U to increase separation distances.*

This Drainage Strategy has been prepared in accordance with the policies and guidance applicable to the proposed development, outlined within the following publications:

- National Planning Policy Framework (February 2019);
- National Planning Policy Framework Planning Practice Guidance website (Updated: 22 October 2018);
- The London Plan: Consolidated with Alterations Since 2011 (March 2016);
- The London Plan: Sustainable Design and Construction, Supplementary Planning Guidance (April 2014);
- London Borough of Newham Local Plan (December 2018);
- London Borough of Newham Local Flood Risk Management Strategy (September 2015);
- London Borough of Newham Surface Water Management Plan (July 2011); and
- London Borough of Newham Strategic Flood Risk Assessment (September 2017).

3.2 National Planning Policy Framework

The National Planning Policy Framework¹ (NPPF) provides national policy for dealing with surface water, with a focus on sustainable development. The NPPF requires that developments incorporate sustainable drainage systems (SuDS) unless there is clear evidence that this would be inappropriate and to include mitigation for the anticipated impacts of climate change where necessary.

¹ Ministry of Housing, Communities and Local Government, (2019). *National Planning Policy Framework*.

The Planning Practice Guidance² to the NPPF states that the aim should be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

1. Into the ground (infiltration);
2. To a surface water body;
3. To a surface water sewer, highway drain, or another drainage system;
4. To a combined sewer.

The drainage strategy contained within this report has been developed in accordance with this drainage hierarchy.

The climate change guidance published by the Environment Agency (EA) in February 2016 to support the NPPF contains sensitivity ranges that are recommended to be applied to peak rainfall intensities, peak river flows, sea level rise, offshore wind speeds and extreme wave heights. The general trend is for each parameter to increase in the future, which in turn increases the risk of flooding to any site. The recommended allowances for peak rainfall intensity are given in Table 3-1.

Table 3-1: Recommended climate change allowances for peak rainfall intensity

Allowance Category	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper End	+10%	+20%	+40%
Central	+5%	+10%	+20%

The surface water drainage strategy contained within this report has made an allowance for a 40% increase in peak rainfall intensity as this 'upper end' allowance represents the more conservative scenario

3.3 The London Plan

The Greater London Authority (GLA) produced the London Plan³ in 2015 (Consolidated with Alterations Since 2011), which is a strategic overview of development across London until 2036, including frameworks relating to economic, environmental, social and transport factors. It contains specific policies on flood risk management and the use of sustainable drainage.

Policy 5.13 of the London Plan states that developments should utilise SuDS unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1. Store rainwater for later use;
2. Use infiltration techniques, such as porous surfaces in non-clay areas;
3. Attenuate rainwater in ponds or open water features for gradual release;

² Ministry of Housing, Communities and Local Government, (2014). National Planning Policy Framework Planning Practice Guidance. [online] Available at: <https://www.gov.uk/guidance/flood-risk-and-coastal-change>. [Accessed 04 October 2018].

³ Greater London Authority, (2016). *The London Plan Consolidated with Alterations Since 2011*.

4. Attenuate rainwater by storing in tanks or sealed water features for gradual release;
5. Discharge rainwater direct to a watercourse;
6. Discharge rainwater to a surface water sewer/drain;
7. Discharge rainwater to the combined sewer.

The drainage strategy contained within this report has been developed in accordance with this drainage hierarchy.

The policies regarding sustainable drainage contained within the December 2019 Intend to Publish version of the London Plan (Policy SI 13) are in line with the current London Plan. No further amendments to the drainage strategy contained within this report would therefore be required to suit the December 2019 Intend to Publish London Plan.

In paragraph 3.4.10 within Section 3.4 of the Sustainable Design and Construction, Supplementary Planning Guidance to the London Plan, it is clarified that for previously developed sites, runoff should not be greater than three times the calculated greenfield rate. Greater discharge rates may be acceptable where a pumped discharge would be required in order to meet the lower runoff standards.

3.4 Newham Local Plan

Policy SC3 of the Newham Local Plan⁴ states that all development should enable separation of foul and surface flows and incorporate SuDS that reduce surface water run-off and that all major development and any development falling within a Critical Drainage Area (CDA) should achieve greenfield run-off rates, unless it can be demonstrated that site conditions prohibit meeting this standard.

3.5 Newham Local Flood Risk Management Strategy

The Newham Local Flood Risk Management Strategy⁵ (LFRMS) is the most up to date document regarding surface water flood risk and SuDS requirements within Newham and reflects the policies within the Local Plan, which requires surface water runoff to be restricted to the greenfield runoff rate unless demonstrably unfeasible.

3.6 London Borough of Newham Surface Water Management Plan

The Surface Water Management Plan⁶ (SWMP) for the LBN was published in July 2011 and outlines the preferred surface water management strategy for the borough. The objectives of the SWMP are to:

- Develop a robust understanding of surface water flood risk in and around the borough, taking into account the challenges of climate change, population and demographic change and increasing urbanisation in London;
- Identify, define and prioritise Critical Drainage Areas, including further definition of existing local flood risk zones and mapping new areas of potential flood risk; and
- Make holistic and multifunctional recommendations for surface water management, which improve emergency and land use planning, and enable better flood risk and drainage infrastructure investments.

⁴ London Borough of Newham, (2018). *Newham Local Plan 2018*.

⁵ London Borough of Newham, (2015). *London Borough of Newham Local Flood Risk Management Strategy*.

⁶ Capita Symonds, (2011). *London Borough of Newham Surface Water Management Plan*.

The SWMP Action Plan recommends that the following policies are implemented:

- **Policy 1:** All developments across the borough (excluding minor house extensions less than 250m²) which relate to a net increase in impermeable area are to include at least one 'at source' SuDS measure (e.g. waterbutt, rainwater harvesting tank, bioretention planter box etc.). This is to assist in reducing the peak volume of runoff discharging from the site.
- **Policy 2:** Proposed 'brownfield' redevelopments greater than 0.1 hectare are required to reduce post development runoff rates for events up to and including the 1 in 100 year return period event with an allowance for climate change (in line with PPS25 and UKCIP guidance) to 50% of the existing site conditions. If this results in a discharge rate lower than the Greenfield conditions it is recommended that the Greenfield rate (calculated in accordance with loH124) are used.
- **Policy 3:** Developments located in Critical Drainage Areas and greater than 0.5 hectare are required to reduce runoff to that of a predevelopment Greenfield runoff rate (calculated in accordance with loH124). It is recommended that a SuDS treatment train is utilised to assist in this reduction.

It is noted that the standards for runoff reduction do not represent the current requirements and have been superseded by the LFRMS and policy SC3 of the Local Plan.

3.7 Operational Development

A surface water drainage strategy was prepared by BuroHappold in July 2017 as part of the Flood Risk Assessment (FRA) for the Operational Development planning application for the site. The Operational Development included proposals to raise the ground level of the site by using spoil excavated from construction of the Silvertown Tunnel, as well as increase the flood defence level and deliver a new inter-tidal ecological habitat along the River Thames frontage. The Operational Development received planning approval in March 2018.

The surface water drainage strategy for the Operational Development proposed that surface water would be discharged directly to the River Thames, for all areas of the site where the proposed levels permitted gravity drainage to the river. Two outfalls to the River Thames were proposed as part of the Operational Development drainage strategy. This principle is the same for the proposed masterplan surface water drainage strategy, however, in order to provide a drainage strategy that is coordinated with the proposed phasing of the masterplan, four new outfalls are proposed. The Operational Development did not include proposals for the construction of buildings or landscaping features other than the land raising. This report therefore provides recommendations specific to the proposed masterplan layout.

3.8 Consultation

3.8.1 Environment Agency

The project team has met with officers from the EA to discuss the key aspects of the proposed development throughout the development of the masterplan. The primary purpose of these meetings was to discuss and agree the proposed flood risk management strategy for the site. At the most recent meeting, held on 11 September 2018, the principles of the proposed surface water drainage strategy were discussed. Details of the guidance given by the EA is provided within Section 5.2 of this report.

3.8.2 Thames Water

Preliminary consultation has been undertaken with TW in order to understand the potential impact of the proposed development on the existing drainage network. A response to a pre-planning enquiry was received on 28th November 2018, which is included in Appendix B.

TW have carried out an assessment of the impact of the foul water flows from the proposed development on the existing TW sewer network. The details of this assessment are given in the response to the pre-planning enquiry. The conclusion of this impact assessment is that the existing TW sewer network will have enough capacity to connect the first 1,330 residential units, 4,424m² of light industrial uses and 162m² of retail use only. This is equivalent to the total foul water flow from Phases 1 and 2 of the proposed development. The TW response notes that upgrades known as 'off-site reinforcement' will be required in order to accept foul water from the full development. TW are responsible for funding the modelling, design and construction of any reinforcement work. Ongoing coordination is required to ensure that the reinforcement work will be complete before the occupation date of Phase 3.

For the management of surface water, the TW response to the pre-planning enquiry notes that a positive surface water connection to a public sewer will only be consented when it can be demonstrated that the following hierarchy of disposal methods have been examined and proven to be impracticable.

1. Soakaways;
2. Watercourses; and
3. Sewers.

The TW response also notes that where surface water is discharged to sewers, the flow rate should be restricted to the greenfield runoff rate for the site. The full TW pre-planning enquiry response is included in Appendix B.

3.8.3 Lead Local Flood Authority

The consultation response from the Newham Lead Local Flood Authority (LLFA), dated 19/02/2019, states that where surface water is discharged to a Thames Water (TW) sewer, the discharge rate should be restricted to the greenfield runoff rate for the site, in accordance with the Newham LFRMS and policy SC3 of the Newham Local Plan. The proposed surface water drainage strategy contained within this report reflects this requirement.

A further consultation response from the LLFA, dated 30/05/2019, requested additional clarifications regarding the proposed discharge of surface water to the TW sewer at the greenfield runoff rate, the area that is proposed to drain to the TW sewer and SuDS features for areas proposed to drain directly to the Thames. In addition, the LLFA requested that the Newham LLFA drainage pro-forma is completed for the proposed development. A copy of the completed Newham LLFA drainage pro-forma is provided in Appendix G.

3.8.4 Greater London Authority

The consultation response from The Greater London Authority (GLA), dated 22/02/2019, states that the discharge of surface water should be restricted to greenfield rates or less. The proposed surface water drainage strategy contained within this report reflects this requirement.

4 Existing Drainage

4.1 Existing Infrastructure

4.1.1 Thames Water Asset Records

The Asset Location Search provided by TW indicates that there are existing TW surface water and combined sewers within Dock Road, towards the east edge of the site. In addition, there are two 1,400mm diameter surface water rising mains that run through the site and discharge to the River Thames. The indicative alignment of these drainage systems is shown TW Asset Maps given in Appendix B.

4.1.2 On-site Drainage Records

BuroHappold has been provided with a report⁷ by GVA, dated December 2015, detailing remedial works that have been carried out to some elements of the surface water drainage network within the site. This report contains partial records of the existing drainage network within the site.

The existing plots containing warehouses and areas of hardstanding are drained through a network of gullies, drainage channels and roof gutters into a traditional below ground drainage system. Where gravity allows, surface water drainage from the existing hardstanding areas is conveyed through petrol interceptors to a balancing pond and, in turn, to an existing open surface water drainage channel known as 'The Cut' before being discharged to the River Thames via an outfall with a check valve within the river wall. In other locations surface water is discharged directly to the River Thames via small outfalls within the river wall. Where the topography does not allow drainage by gravity to the River Thames, it is assumed that surface water is discharged to the TW sewers within Dock Road. It is not known what proportion of the site drains surface water to the River Thames or to the TW sewers within Dock Road.

The existing drainage for the DLR discharges by gravity into the surface water drainage network and via the open surface water drainage channel, The Cut, to the River Thames.

There is no information regarding the existing drainage for the land to the north west of the site, in the area immediately south of the Lower Lea Crossing, or within the area in the south east of the site, adjacent to Phase 1 of the proposed development.

4.2 Surface Water

The site is not within an area identified as a Critical Drainage Area within the LBN SWMP.

It is not known whether there are any mechanisms to limit the rate of surface water discharge from the existing site. In the absence of more detailed site information, it is therefore assumed that surface water is currently discharged via one of the following:

- Directly to the existing TW combined or surface water sewers within Bell Lane, unrestricted and without attenuation; or
- To the River Thames via The Cut or other small surface water outfalls within the river wall.

⁷ GVA, (2015). *Thames Wharf Drainage Report on Remedial Works*.

The existing surface water runoff rate has been calculated in order to demonstrate that the proposed development achieves an improvement in surface water discharge from the existing condition. The existing surface water runoff rate has been estimated using the Rational Method:

$$Q = \frac{CiA}{3600}$$

Where: Q is the runoff rate in l/s
 C is the dimensionless runoff coefficient
 i is the rainfall intensity in mm/hr
 A is the catchment area in m²

The area of permeable ground covering for the existing site has been estimated as 3.0ha, by measuring the area of vegetated ground covering from satellite imagery of the existing site using geographical information software (GIS). The total site area is 18.8ha. The runoff coefficient is therefore 0.84.

A rainfall intensity of 50mm/hr has been used, in accordance with the recommendations of The SuDS Manual⁸.

The existing surface water runoff rate is therefore estimated to be **117l/s/ha**.

4.3 Foul Water

It is understood that the site is served by a series of existing TW combined sewers within the existing roads to the north and east of the site, with diameters of between 300mm-450mm. The drainage records available for the site do not include information on the existing foul water drainage network within the site or the location of connections to the TW network.

The existing foul water discharge from the site has been estimated based on the assumption that foul flows are generated from the industrial warehouses and associated buildings at a rate of 1.6l/s/ha, with a peak factor of 6, in accordance with Sewers for Adoption 7th Edition.

The existing industrial warehouses and associated buildings cover approximately 24,000m². It is therefore estimated that the foul water discharge rate from the existing site is **23l/s**.

⁸ CIRIA, (2015). *CIRIA C753 The SuDS Manual*.

5 Proposed Surface Water Drainage

5.1 Overview

The proposed surface water drainage strategy has been prepared in accordance with the drainage hierarchy identified in the NPPF Planning Practice Guidance, the London Plan and the TW response the pre-planning enquiry and includes a number of SuDS features. A summary of the drainage options identified within these drainage hierarchies and the application of these to the proposed development is given in Table 5-1.

In general, the proposed method of discharge of surface water for the proposed development falls under one of the two scenarios, described in further detail in 5.2 and 5.3:

1. Unrestricted drainage directly to the River Thames, via a number of outfalls within the new river wall; and
2. Drainage to the existing Thames Water sewer network, restricted to the calculated greenfield runoff rate for the site.

Table 5-1: Summary of proposed surface water drainage options in accordance with the London Plan drainage hierarchy

Drainage Option	Proposed Development
Rainwater storage	The collection and storage of rainwater for later use within the buildings will be developed during the detailed design stage for each of the individual buildings.
Infiltration	The underlying ground conditions consists of the London Clay Formation, with superficial deposits of Alluvium (clay, silt, sand and peat). Infiltration is not considered appropriate due to the low permeability of the underlying clay.
Attenuation within ponds or open water features	Green roofs are proposed on some of the buildings. This soft landscaping will help to attenuate and reduce the surface water discharge rate from the proposed development. A number of swales are proposed within the large area of landscaping, which drain to an open water feature which will be used as attenuation to restrict the rate of surface water discharge.
Attenuation within tanks or sealed water features	Below ground attenuation is proposed only in locations where there is not sufficient space to provide open water features.
Discharge direct to a watercourse	Surface water will be discharged directly to the River Thames, for all areas of the proposed development where the proposed levels permit gravity drainage to the river.
Discharge to a surface water sewer	Areas of the proposed development that cannot be drained by gravity to the River Thames will be discharged at a restricted rate to the existing TW surface water sewer network.
Discharge to a combined sewer	Areas of the proposed development that cannot be drained by gravity to the River Thames or the existing TW surface water sewer network will be discharged at a restricted rate to the existing TW combined sewer network.

The surface water drainage has been designed to satisfy the criteria in Table 5-2, in accordance with BS EN 752.

Table 5-2: Surface water drainage strategy design criteria for rainfall events

Criteria	Return Period of Design Rainfall Event
Flooding should not occur in any part of the site	30 year *
Consideration should be given to the effect of rainfall in excess of the 1 in 30 year event up to the 1 in 100 year event	100 year *

* Including a 40% allowance for climate change

The proposed site-wide surface water drainage strategy is shown in Figure 5-1, with full drawings included in Appendix C. The plans show:

- Use of SuDS where possible within the proposed development;
- The proposed location of all outfall points;
- The region of the proposed development that is proposed to drain directly to the River Thames, in blue, and
- The region of the proposed development that is proposed to drain to the existing TW sewer network, in red.

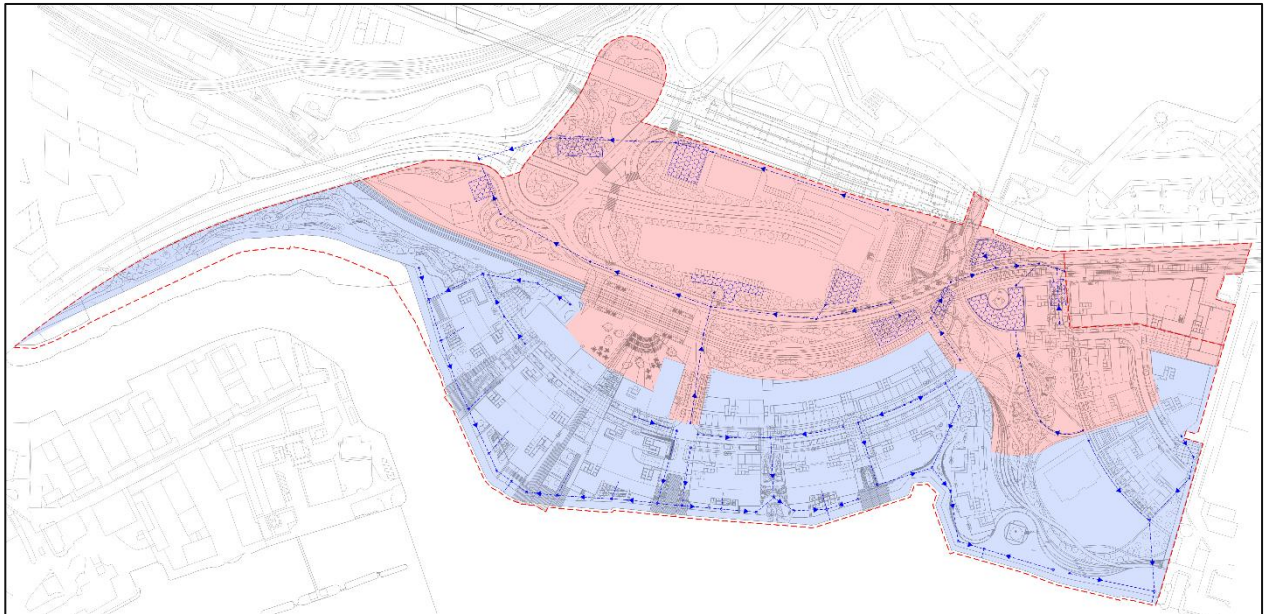


Figure 5-1: Plan showing the overall proposed surface water drainage strategy

It is proposed that surface water runoff from the area of landscaping to the north west of the site is drained directly to the River Thames at an unrestricted rate via a series of local drainage channels to one or more small new outfalls within the new river wall. The arrangement of the local drainage channels will be subject to the topography proposed at the detailed design stage and are therefore not shown on the masterplan drainage strategy drawing.

The proposed ground levels are such that during exceedance events surface water runoff will flow away from the proposed buildings, either towards the River Thames or to areas such as the park where the impact of surface water flooding is least.

5.2 Drainage to the River Thames

It is proposed that surface water will be discharged directly to the River Thames, for all areas of the site where the proposed levels permit gravity drainage to the river, as shown in blue in Figure 5-1.

The discharge will be via four, new 500-800mm diameter outfalls within the new river wall. Outfall S8 is 500mm in diameter and outfalls S20, S32 and S51 are 800mm in diameter. Each outfall will be fitted with no less than two non-return valves, in accordance with the guidance provided by the EA during the meeting held on 11 September 2018. Details of the discussions held with the EA are provided within the FRA, in Appendix 9-A of the EA. A cross section for one of the proposed 800mm diameter surface water outfalls is shown in Figure 5-2.

The additional storage volume that is provided within the drainage network in the form of oversized pipes provides sufficient attenuation to prevent flooding during a 1 in 30 year rainfall event, including climate change, which occurs at the same time as the predicted mean high water spring tide level in the River Thames for the year 2100.

Although the EA has confirmed that there is no requirement to restrict the rate of discharge of surface water to the Thames, scour protection will be required to be installed below the proposed outfalls to prevent erosion of the river bed. The design of this scour protection will be carried out in the next stages of design.

Section 5.4 contains details of the SuDS features which are proposed to be included within the surface water drainage network which discharges to the River Thames.

5.3 Drainage to the Thames Water Sewer Network

5.3.1 Overview

For the parts of the site that cannot be drained by gravity to the River Thames, due to the proposed topography or other obstructions, it is proposed that surface water runoff is discharged to the existing TW surface water sewer network via a series of SuDS features, including above and below ground attenuation.

5.3.2 Discharge Rate

The flow rate of surface water being discharged to the TW sewer will be restricted to the calculated greenfield runoff rate for the site, in accordance with the requirements of the London Plan and the LLFA. The greenfield runoff rate has been estimated using the IH124 method, as recommended by the EA⁹ and the CIRIA SuDS Manual¹⁰.

The runoff rate for the mean annual flood, Q_{BAR} , is given by:

$$Q_{BAR} = 0.00108AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$$

Where: Q_{BAR} is the runoff rate for the mean annual flood in m³/s, equivalent to a return period of approx. 2.3 years
 $AREA$ is the area of the catchment in km²
 $SAAR$ is the Standard Average Annual Rainfall for the period 1941-1970, in mm
 $SOIL$ is the soil index

The total site area is approximately 187,900m² (0.19km² or 18.79ha). The guidance within the SuDS Manual recommends that for sites less than 50ha, the formula should be applied for 50ha and the resulting Q_{BAR} scaled based on the ratio of the actual site area to the applied area of 50ha.

The values for $SAAR$ and $SOIL$ for the site were obtained from the online UK SuDS Greenfield Runoff Estimation tool¹¹. The $SAAR$ is 577mm/hr, and the soil type is 4, which gives a $SOIL$ value of 0.47.

Q_{BAR} for the site is therefore 72.4l/s.

In order to meet the requirements of the LLFA and the London Plan, it is proposed that where surface water is discharged to the TW network, it is restricted to the greenfield rate, Q_{BAR} , which is **3.9l/s/ha**.

⁹ Environment Agency, (2013). *Rainfall Runoff Management for Developments (Report – SC030219)*.

¹⁰ CIRIA, (2015). *CIRIA C753 The SuDS Manual*.

¹¹ Uksuds.com. (2016). *Greenfield Runoff Estimation for Sites*. [online] Available at: http://www.uksubs.com/greenfieldrunoff_js.htm [Accessed 04 October 2018].

5.3.3 Discharge Locations

Due to the size and topography of the site, it is proposed that two connections are made to the existing TW water network, via manhole reference 7701 and 0403. TW 0403 is a combined sewer. TW 7701 is a dedicated surface water sewer, however discharges directly to a combined sewer.

It is understood that the proposed alignment of the Silvertown Tunnel clashes with the existing TW combined and surface water sewer networks. Details on the proposed diversion of these sewers have not been provided by TfL. For the purpose of this assessment, the connections to the existing TW network have therefore been proposed at the locations which are understood to be least likely to be diverted significantly, as shown on Figure 5-3. The diversion of the existing TW network as part of the Silvertown Tunnel works will therefore not have an impact on the surface water drainage strategy for the proposed development.

5.3.4 Attenuation

It is proposed that a combination of above and below ground attenuation is used to restrict the rate of surface water discharge to the TW network to 3.9l/s/ha. Where possible, attenuation will be provided within open features such as swales and ponds. These are primarily located within the large area of landscaping to the south of the site. In all other locations, storage will be provided by underground crate attenuation systems or tanks.

The volume of storage required to attenuate the rate of surface water discharge to no greater than 3.9l/s/ha has been calculated using MicroDrainage software, for a 1 in 100 year storm event, including a 40% increase to allow for the anticipated increase in storm intensity caused by climate change. The outputs from MicroDrainage are included within Appendix D.

For the purpose of calculating the area that contributes to surface water runoff, in order to estimate the required volume of attenuation, the runoff coefficients given in Table 5-4 have been assumed. The areas of DLR track within the site have been assumed to have the same runoff coefficient as impermeable paving and contribute to runoff from the site. Runoff from the DLR is therefore included within the surface water drainage strategy. A full summary of the areas contributing to surface water runoff at each proposed outfall are given in Appendix E.

Table 5-4: Surface water runoff coefficients

Surface Type	Runoff Coefficient
Impermeable paving	0.95
Soft landscaping	0.35
Roof	0.95
Green roof	0.7

The total volume of attenuation for the proposed development, excluding Phase 1, is 5,350-6,850m³. This will be provided within a series of above and below ground water features and tanks, as shown in Figure 5-3.

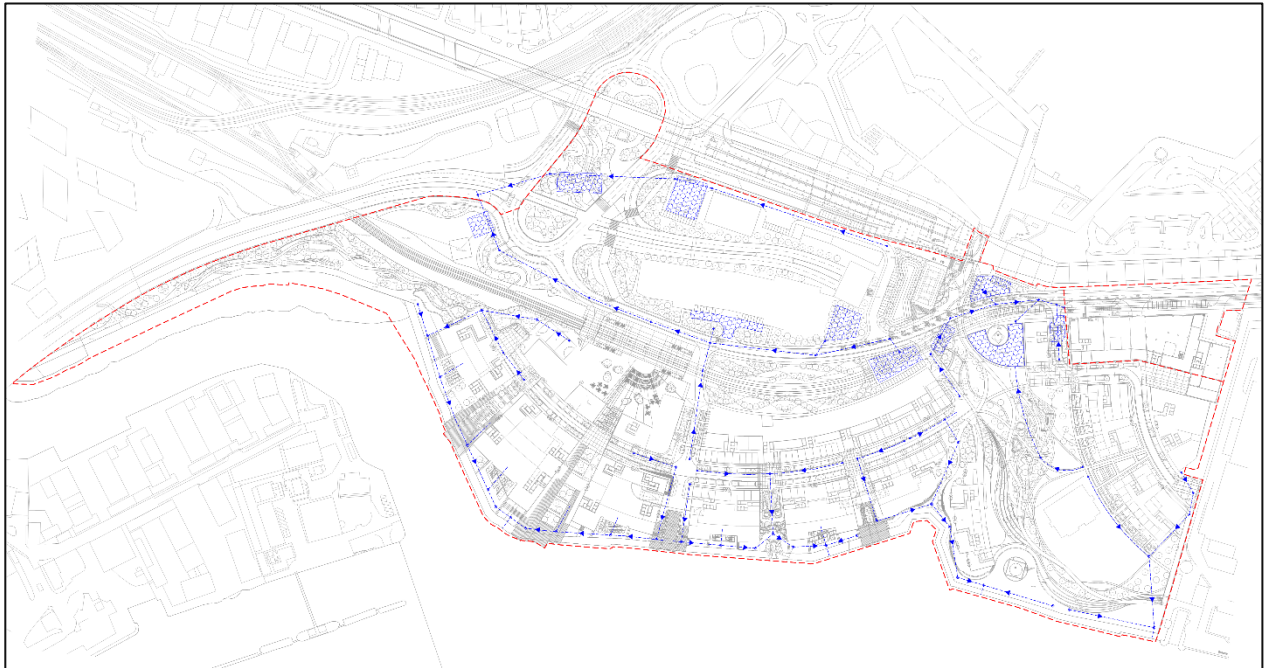


Figure 5-3: Plan showing the overall proposed surface water drainage strategy

5.4 Proposed SuDS Features

The SuDS features described in the following sections are proposed for all parts of the surface water drainage network, including areas which drain both directly to the River Thames and to the Thames Water sewer network.

5.4.1 Open Water Features and Swales

The large area of soft landscaping to the south of the proposed development contains a large open water feature that will act as a retention basin for surface water during storm events. The retention basin has been sized to provide sufficient volume of attenuation to restrict the discharge of surface water to the downstream TW combined sewer to the calculated greenfield runoff rate. The attenuation volume of the open water feature is required to be 925-1,185m³ in order to restrict the discharge to the greenfield runoff rate of 3.9l/s/ha. The detailed dimensions of the open water feature will be determined at the next stage of design.

Swales will collect runoff from the landscaping as well as the impermeable areas surrounding the landscaping and convey surface water to the retention basin. The swales and open water features will be lined and therefore impermeable, in order to prevent infiltration to the ground directly above the proposed Silvertown Tunnel. A typical detail of a dry swale is shown in Figure 5-4. An impermeable liner would be installed at the base to prevent infiltration to the ground below the perforated pipe. For the purpose of the outline planning application attenuation volume provided by the volume of the swales has therefore been assumed to be zero.

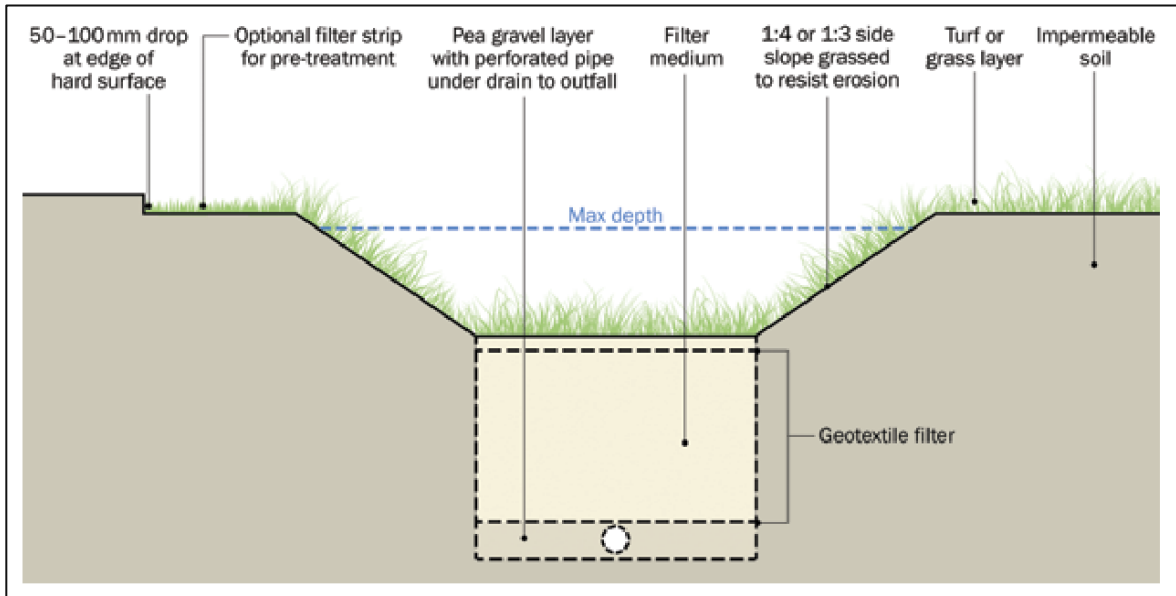


Figure 5-4: Typical cross-section detail of a lined swale (Source: CIRIA SuDS Manual)

5.4.2 Bio-retention Strips

Bio-retention strips are proposed on either side of the Central Spine road and within the areas of hard landscaping and public realm around the proposed buildings. These will be used in conjunction with piped systems to convey surface water to the proposed main surface water sewers within the site.

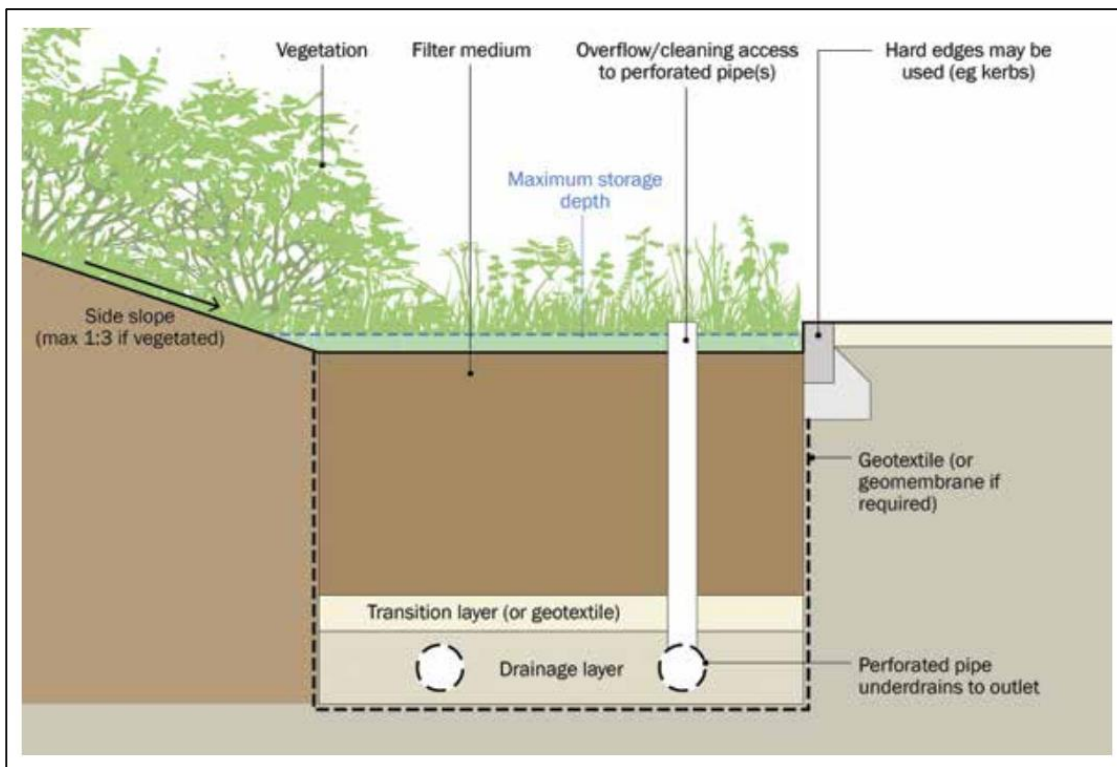


Figure 5-5: Typical cross-section detail of a bio-retention system (Source: CIRIA SuDS Manual)

5.4.3 Green Roofs

Green roofs are proposed on 15 of the buildings, with a total area of 4,400m². This soft landscaping will help to attenuate and reduce the surface water discharge rate from the proposed development as well as provide wider sustainability benefits including habitat, energy efficiency and potential for public realm. For the purpose of the outline planning application, it has been assumed that all of the attenuation volume required to restrict the surface water discharge to the greenfield runoff rate is provided within open water features or below ground storage. The attenuation volume of the green roof has therefore been assumed to zero. An example of the typical make-up of a green roof is shown in Figure 5-6.

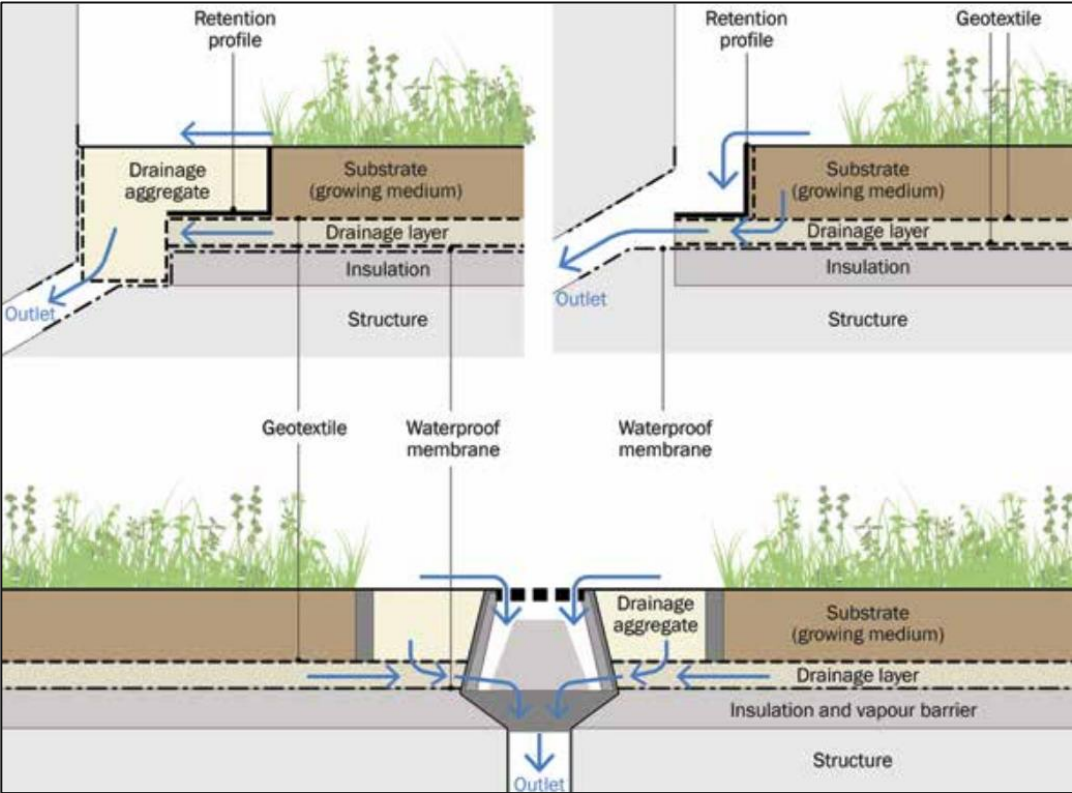


Figure 5-6: Typical make-up of a green roof (Source: Green Roofs Direct, CIRIA SuDS Manual)

5.4.4 Below Ground Attenuation

Below ground attenuation is proposed in locations where there is not sufficient space to provide open water features. The volume of the attenuation has been sized in order to restrict the discharge rate to the calculated greenfield runoff rate.

5.5 Pollution Control

Petrol interceptors are proposed within the areas with vehicle access, in order to remove hydrocarbon pollutants from road runoff and will be located at the discharge from each catchment. Siltation controls and other pollution controls may also be installed if it is found at the detailed design stage that road gullies will not provide adequate treatment.

The proposed green roofs, swales, filter strips and bio-retention strips will all contribute to improving the quality of water that is discharged to the River Thames, by removing contaminants. The design of these measures to achieve the requirements of Policy 4 of the Newham SWMP will be carried out at the detailed design stage.

5.6 Additional Benefits

The green roofs, swales, filter strips, bio-retention strips and above ground attenuation features will all provide benefits in terms of biodiversity habitat, in addition to improvements in the quality and quantity of surface water runoff. The dry swales within the large area of soft landscaping and the green roofs also provide amenity value.

5.7 Thames Water Rising Mains

There are two 1,400mm diameter TW surface water rising mains that run through the site and discharge to the River Thames via a large concrete outfall structure. The structural engineering design for the proposed development has been carried out by Meinhardt. Refer to the Meinhardt design documents for discussions and agreements with TW regarding the proximity of the proposed buildings to the existing surface water rising mains.

5.8 Summary

A summary of the proposed surface water drainage strategy for each of the proposed surface water discharge points is provided in Table 5-5, with proposed runoff rates given for the 100 year rainfall event including a 40% allowance for climate change.

Table 5-5: Summary of proposed surface water drainage strategy

Outfall ID	Total Catchment Area (m ²)	Total Volume of Attenuation (m ³)	Existing Runoff Rate (l/s)	Proposed Runoff Rate (l/s)	Notes
TW 7701	57,900	3,650-4,670	675l/s (117l/s/ha)	22.3l/s (3.9l/s/ha)	Discharge restricted to the greenfield runoff rate.
TW 0403	26,300	1,700-2,170	386l/s (117l/s/ha)	10.1l/s (3.9l/s/ha)	
S8	16,800	N/A	Discharge to the River Thames is unrestricted via four new 500-800mm diameter outfalls within the new river wall, Drainage network is oversized to prevent flooding during tide locking scenario, described more detail in Section 5.2.		
S20	15,700				
S32	13,800				
S51	27,700				

6 Proposed Foul Water Drainage

6.1 Overview

It is proposed that foul water is discharged to the existing TW combined sewers within Dock Road and the A1020 Lower Lea Crossing, via new connections to existing manholes, subject to confirmation from TW that the sewers and connection points are in a satisfactory condition.

The majority of foul water from proposed development will drain by gravity, however topographical constraints and obstructions such as the DLR prevent gravity drainage of foul water from buildings R, S and T. It is therefore proposed that a below ground foul water storage tank is provided to receive foul flows from these buildings before being pumped to a connection to the gravity network. This is described in further detail in Section 6.4.

The proposed site-wide foul water drainage strategy is shown in Figure 6-1, with full drawings included in Appendix C.

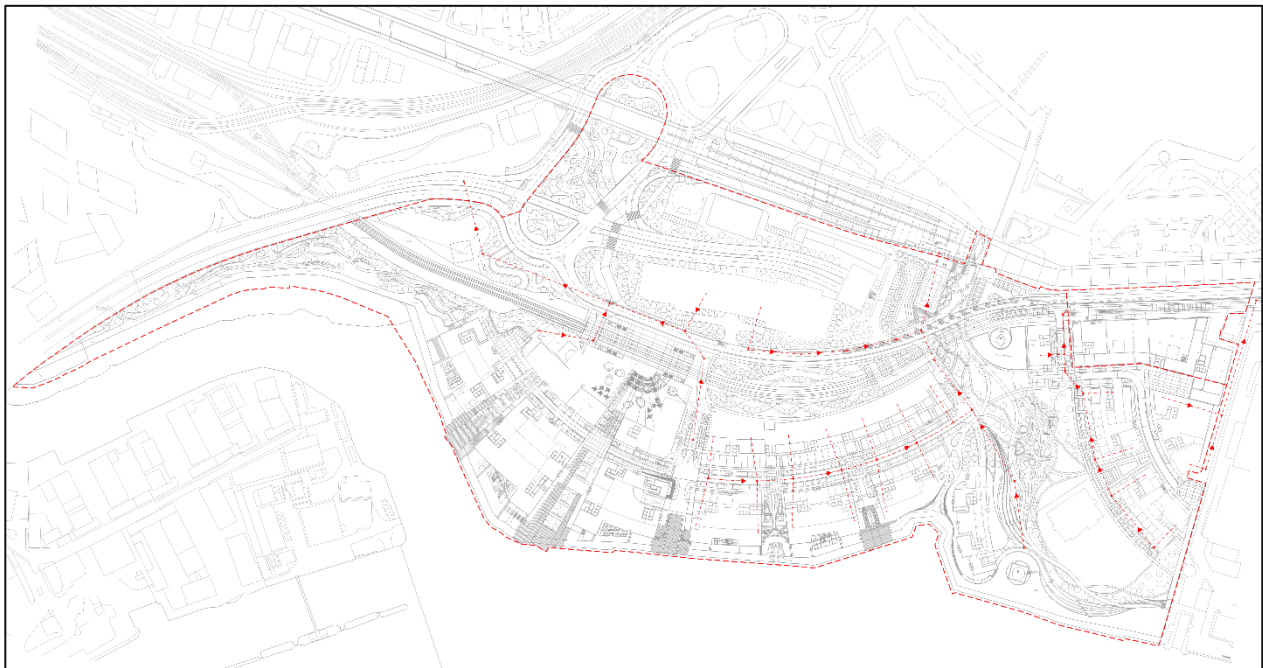


Figure 6-1: Plan showing the overall proposed foul water drainage strategy

6.2 Flow Calculations

An initial assessment of the foul water discharge rates for the proposed development is given in Table 6-2 and has been made using the benchmarks and assumptions in Table 6-1.

Table 6-1: Foul water flow benchmarks and assumptions

Building Use	Average Foul Flow	Peak Foul Flow	Notes / Source
Residential	N/A	4,000litres/unit/day	Sewers for Adoption 7 th Edition
Retail	400litres/day/100m ²	6 times average	Urban Drainage ¹²
School / Community	750litres/day/100m ²	6 times average	Urban Drainage Assumed to be similar foul flows as office type use
Light Industrial	1.6litres/sec/ha	6 times average	Sewers for Adoption 7 th Edition Assumed to be 'wet industry' as a conservative estimate

Table 6-2: Summary of estimated peak foul water discharge rates from the proposed development

Area	Building ID	No. Residential Units	Residential Foul Flow (l/s)	Non-Residential Foul Flow (l/s)	Total Foul Flow (l/s)
Parkside	C	145	6.7	0.0	6.7
	D	206	9.5	0.8	10.3
	E	267	12.4	0.0	12.4
	F	326	15.1	0.0	15.1
The Quays	G	320	14.8	0.3	15.1
	J	218	10.1	0.1	10.2
	M	205	9.5	0.0	9.5
	N	313	14.5	0.1	14.6
Central Spine	H	143	6.6	0.0	6.6
	K	207	9.6	0.0	9.6
	L	211	9.8	0.0	9.8
	P	83	3.8	0.0	3.8
Riverside Quarter	Q	218	10.1	1.0	11.1
	R	542	25.1	0.3	25.4
	S	575	26.6	0.6	27.2
	T	423	19.6	0.1	19.7
	U	197	9.1	0.2	9.3
Other	Nursery	0	0.0	0.5	0.5
	School	0	0.0	2.1	2.1
	Industrial Site	0	0.0	13.7	13.7

Note: the estimated peak foul water discharge rates for buildings A and B are given in the Phase 1 Drainage Strategy

The total peak foul water discharge from the proposed development is estimated to be **233l/s**. Full calculations for the peak foul water discharge rate are given in Appendix F.

¹² Butler, D. and Davies, J. W., (2000). *Urban Drainage*. London: E & FN Spon

The phasing of the proposed development was provided to TW in order for an assessment of the impact of the foul water flows from the proposed development on the existing TW sewer network to be carried out. A summary of the phasing of the March 2020 amendments to the proposed development is given in Table 6-3, including a comparison to the previous layout. It should be noted that the total number of residential units remains unchanged, at 5,000.

Table 6-3: Phasing of proposed development

Phase	Details	Start on Site	Complete	Comparison to previous scheme *
1	401 residential units 3,608m ² industrial 230m ² retail	Nov 2020	June 2022	-59 residential units +191m ² industrial +68m ² retail
2	473 residential units 833m ² industrial	Feb 2021	May 2023	-64 residential units -191m ² industrial
3	471 residential units 15,000m ² industrial	Dec 2021	April 2024	No change
4	320 residential units 1,247m ² retail	Sept 2022	Sept 2024	+45m ² retail
5	361 residential units 414m ² retail	July 2023	July 2025	+19 residential units -21m ² retail
6	412 residential units	June 2024	April 2026	+15 residential units
7	524 residential units 457m ² retail	April 2025	July 2027	+31 residential units -163m ² retail
8	542 residential units 1,084m ² retail	Feb 2026	May 2028	-15m ² retail
9	498 residential units 1,272m ² retail 1,790m ² community	Jan 2027	April 2029	+5 residential units +92m ² retail -10m ² community
10	575 residential units 2,165m ² retail	Jan 2028	May 2030	+8 residential units -5m ² retail
11	423 residential units 499m ² retail 5,265m ² school	April 2029	Feb 2031	+36 residential units -1m ² retail +10m ² school

* Comparison is between the third amendments to the scheme, dated March 2020, and the second amendments, dated June 2019

TW have confirmed that the existing TW sewer network will have enough capacity to connect the first 1,330 residential units, 4,424m² of light industrial uses and 162m² of retail use. This is equivalent to the total foul flow from Phases 1 and 2 of the proposed development. Upgrades known as 'off-site reinforcement' will be required in order to accept foul water from Phase 3 onwards. The modelling, design and construction of this reinforcement will be carried out by TW. Ongoing coordination will be required to ensure that the reinforcement work will be complete before the occupation date of Phase 3.

It should be noted that since the submission of the pre-planning enquiry and subsequent response from TW, the phasing of the development has been altered to include the 15,000m² of industrial use within Phase 3. There have also been some amendments to the massing of the buildings, resulting in changes to the number of residential units in each Phase of the development. These amendments are described in Section 3.1 and summarised in Table 6-3. Since the number of residential units in Phase 1 and Phase 2 has reduced, the advice from TW that there is sufficient capacity for Phases 1 and 2 that upgrades to the TW sewer network will be required for Phases 3 and onwards is considered to remain valid. The information given in Table 6-4 has been updated to reflect the amendments to the massing of the buildings.

6.3 Discharge Locations

It is understood that the proposed alignment of the Silvertown Tunnel clashes with existing TW combined and surface water sewer networks. Details on the proposed diversion of these sewers have not been provided. For the purpose of this assessment, the connections to the existing TW network have therefore been proposed at the locations that are understood to be least likely to be diverted significantly, as shown on Figure 5-3.

Table 6-4 provides a summary of the proposed connections to the TW combined sewer network and the estimated foul water flow rates.

Table 6-4: Summary of proposed foul water connections to the TW combined sewer network

Discharge Point	Contributing Buildings	Total Foul Flow (l/s)	Connection Details †
TW manhole Ref 0403	C, E, F	34.2	225mm diameter pipe at a gradient of 1:150
TW manhole Ref 1301	D	10.3	150mm diameter pipe at a gradient of 1:124
TW manhole Ref 7801	Q, R, S, T, U, Industrial Site *	102.2	375mm diameter pipe at a gradient of 1:150
TW manhole Ref 9502	G, H, J, K, L, M, N, P, Industrial Site *	86.1	300mm diameter pipe at a gradient of 1:150

* It is assumed that the foul flow from the Industrial Site is discharged equally between TW manholes 7801 and 9502

† All foul water connections from the site to the to the TW sewers discharge by gravity

The network has been designed in order to achieve a minimum flow velocity of 0.75m/s, in accordance with Sewers for Adoption 7th Edition.

6.4 Storage and Pumping

Topographical constraints and obstructions such as the DLR prevent a gravity connection to the existing TW combined sewer network being made directly from buildings R, S and T. Foul water from these buildings is therefore proposed to be collected in a below ground storage tank before being pumped to a connection to the proposed gravity network which will then discharge to the TW sewer network by gravity.

The volume of the storage tank has been sized in accordance with the following requirements for foul pumping stations within Sewers for Adoption 7th Edition:

- 160 litres/dwelling for residential units; and
- One hour of peak design flow for commercial or industrial developments.

Buildings R, S and T include 1,540 residential units and 3,561m² of retail space. The required foul water storage volume is therefore **250m³**.

It is proposed that the foul water storage is provided by a proprietary, below ground combined storage and pumping station such as the Klargester horizontal pumping station, an example of which is shown in Figure 6-2. The capacity of the Klargester horizontal pumping station is 18-79m³. A series of four pumping stations, each with a capacity of 65m³ would therefore be required to meet the required capacity for the proposed development. The advantage of using four pumping stations is that it provides more flexibility in terms of design and location as well as enabling the construction of the foul water storage to be phased in line with the rest of the proposed development.

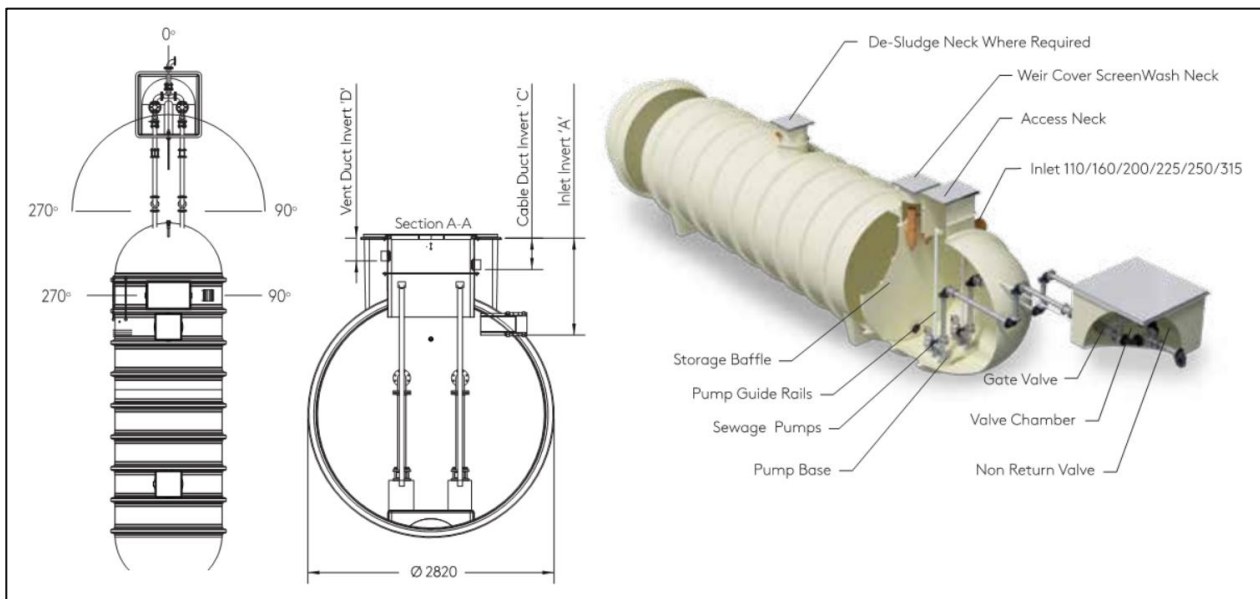


Figure 6-2: Klargester horizontal pumping station, with integrated foul water storage

7 Summary and Conclusion

The site is currently occupied by warehouses and industrial areas, with a high proportion of impermeable ground covering such as concrete and asphalt hardstanding. The existing site is generally at a level of approximately 4.8mAOD along the existing river frontage. There are low points within the centre of the site where the existing DLR viaduct is located. Along the site boundary, the existing levels of Dock Road and the Lower Lea Crossing are at approximately 1.5mAOD.

The proposed development is a mixed-use development consisting of 5,000 residential units, commercial, community, industrial, and educational facilities, as well as public realm landscaping. The proposed development includes the provision of a new river wall for the entire 1,080m river frontage of the site, which will incorporate a flood defence with a crest level of 6.2mAOD. It is proposed that the ground level immediately behind the new flood defence is raised create a podium level at an elevation of at least 6.2mAOD. The proposed ground levels will then slope back down to tie in with existing levels along Dock Road and the north and south boundary of the site.

The proposed method of discharge of surface water for the proposed development falls under one of the following two scenarios:

1. Unrestricted drainage directly to the River Thames, via a series of outfalls within the new river wall; and
2. Drainage to the existing TW sewer network, restricted to the calculated greenfield runoff rate for the site.

The surface water drainage strategy has been developed in accordance with the drainage hierarchy set out in the London Plan. This includes a series of SuDS features, in combination with traditional below ground piped drainage.

The large area of soft landscaping to the south of the proposed development contains a large open water feature that will act as a retention basin for surface water during storm events, with surface water conveyed to the basin from the surrounding areas by swales. Bio-retention strips are proposed on either side of the Central Spine road and within the areas of hard landscaping and public realm around the proposed buildings. Green roofs are proposed on 15 of the buildings, with a total area of 4,400m², which will help to attenuate and reduce the surface water discharge rate from the proposed development.

Below ground attenuation is proposed in locations where there is not sufficient space to provide open water features, in order to restrict the discharge rate to the calculated greenfield runoff rate for the site, which is 3.9l/s/ha. This will be achieved through a combination of above and below ground attenuation, with a total volume of 5,350-6,850m³, which has been designed for storm events up to and including the 1 in 100 year event, including an additional 40% allowance for the predicted increase in rainfall intensity as a result of climate change.

The proposed foul water discharge rate from the entire development is 233l/s, which is an increase from the estimated existing rate of 23l/s.

Where surface water must be discharged to the TW sewer network, the dedicated TW surface water sewers have been prioritised as discharge points. However it should be noted that the dedicated TW surface water sewers flow directly into the TW combined sewers further downstream. The combined discharge rate of foul and surface water from the proposed development is therefore compared against the existing condition, as summarised in Table 7-1.

The existing network of TW sewers to the east of the site can be simplified into two separate systems. The sewers towards the north of the site drain in a northerly direction, whereas the sewers to the south of the site drain in a southerly direction. Each of the proposed connections to the existing TW network is to one or the other of these systems, referred to as 'North' and 'South' for simplicity. For the purpose of the assessment of combined discharge, flow rates within Table 7-1 are given for the North and South existing TW sewer systems.

Table 7-1: Summary of existing and proposed discharge rates to the Thames Water sewers

TW Sewer System	Condition	Foul Water Discharge Rate (l/s) ¹	Surface Water Discharge Rate (l/s) ²	Combined Discharge Rate (l/s)
North	Existing	13.8	674.8	689
	Proposed	188.3	22.3	211
South	Existing	9.2	386.5	396
	Proposed	44.5	10.1	54.6

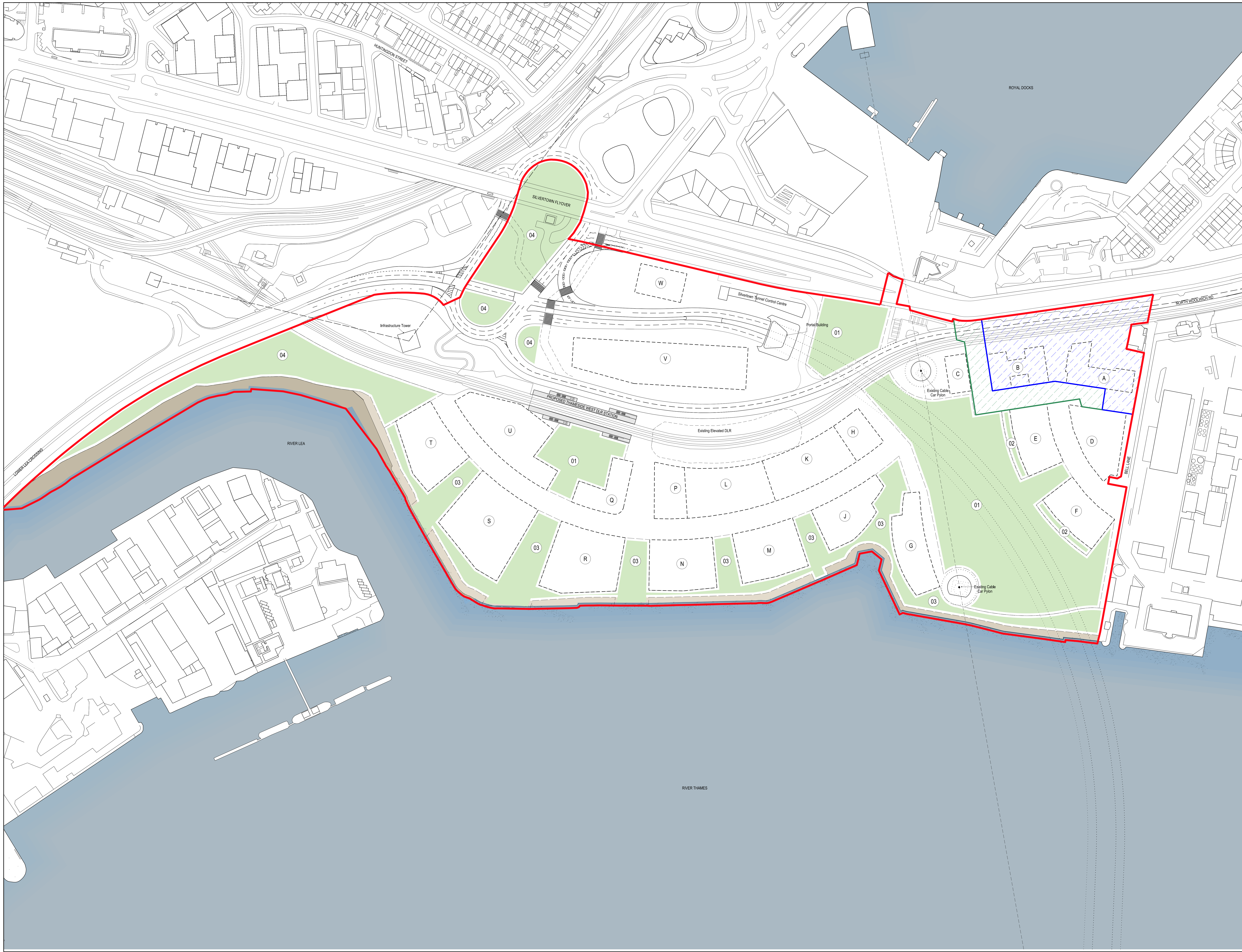
¹ In the absence of more detailed information, it is assumed that 60% of the existing foul water flows are discharged to the North sewer and 40% to the South sewer

² In the absence of more detailed information, it is assumed that a similar proportion of the surface water discharge from site drains to the TW sewers for the existing condition as has been calculated for the proposed development

The combined surface and foul water discharge rate from the proposed development to the TW sewers is significantly lower than the existing combined surface and foul water discharge rate. It is therefore considered that the introduction of the proposed development will contribute to improvements in the risk of sewer surcharge and surface water flooding, both on the site of the proposed development and within the local area.

In a response letter to a pre-planning enquiry, TW have confirmed that the existing TW sewer network will have enough capacity to accommodate foul water flows from Phases 1 and 2 of the proposed development. Upgrades will be required in order to accept foul water from Phase 3 onwards. Ongoing coordination will be required to ensure that these upgrades are complete before the occupation date of Phase 3.

Appendix A – Proposed Development Drawings

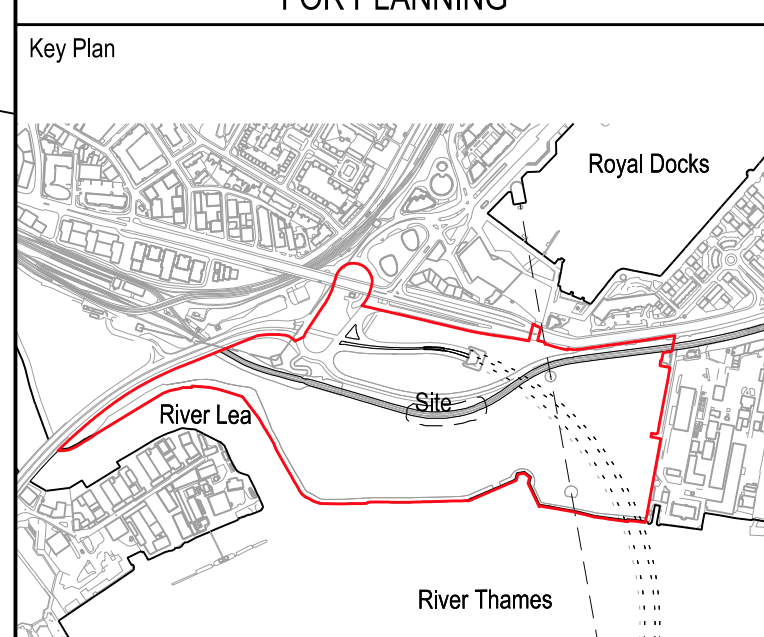


General Notes

1. Do not scale drawings. Dimensions govern.
2. All dimensions are in millimetres unless noted otherwise.
3. All levels are in metres unless noted otherwise.
4. All dimensions shall be verified on site before proceeding with the work.
5. Foster + Partners shall be notified in writing of any discrepancies.
6. Any areas indicated on this sheet are approximate and indicative only.

Rev.	Date	Reason For Issue	CHK
01	10/03/20	For Planning Resubmission	F+P
00	13/12/18	For Planning	F+P

FOR PLANNING			



Foster + Partners

Riverside, 22 Hester Road
 London SW11 4AN
 T +44 (0)20 7738 0455
 www.fosterpartners.com

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Client
 Silvertown Homes Limited &
 GLA Land and Property

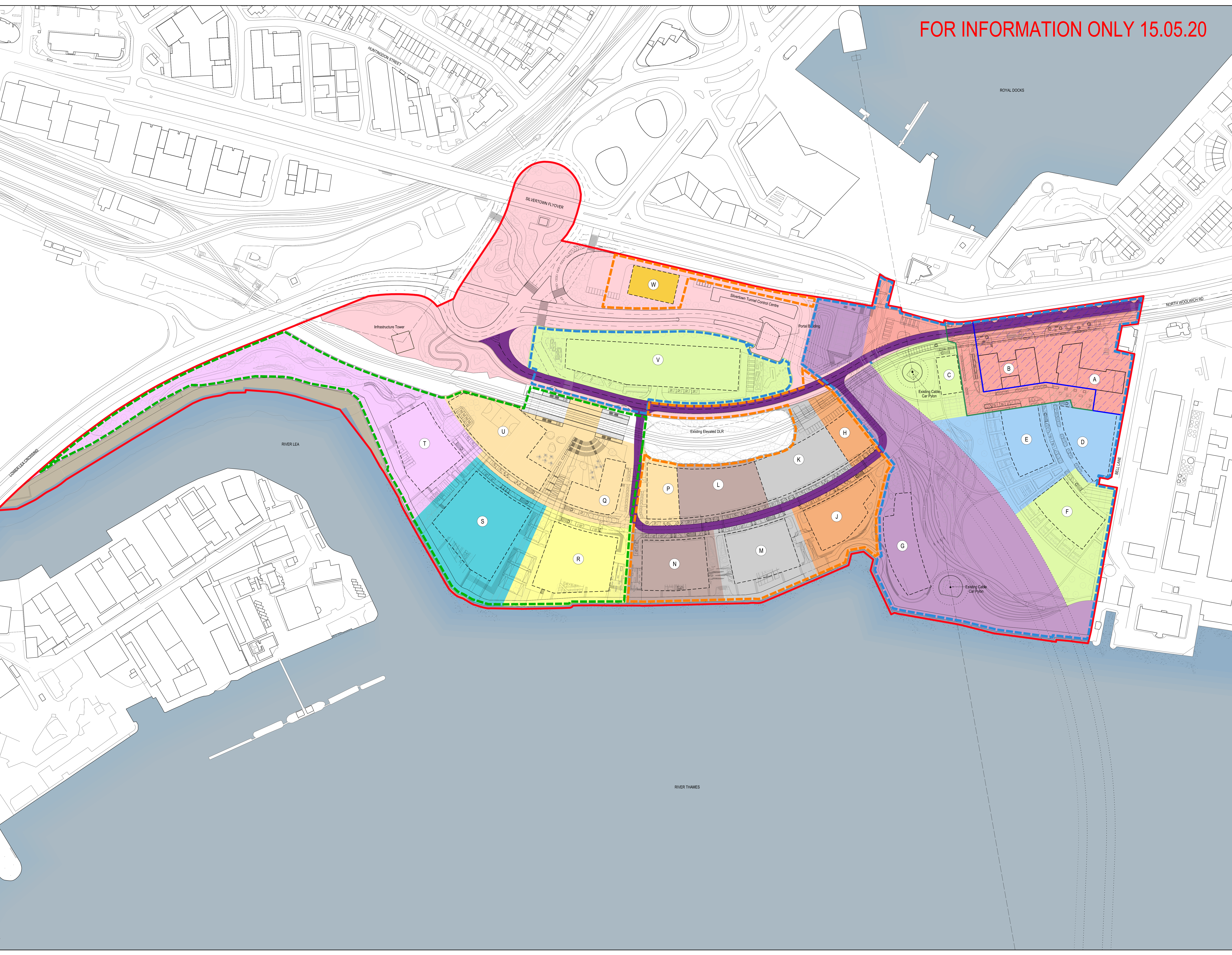
Project
 Thameside West
 Masterplan

Title
 Site Layout
 Masterplan - Parameter Plan 02
 Development Zones

Project No.	Date	Scale at ISO A0
2693	13/12/18	1:1000
Number	Revision	
A-SL-011-xx-02	01	

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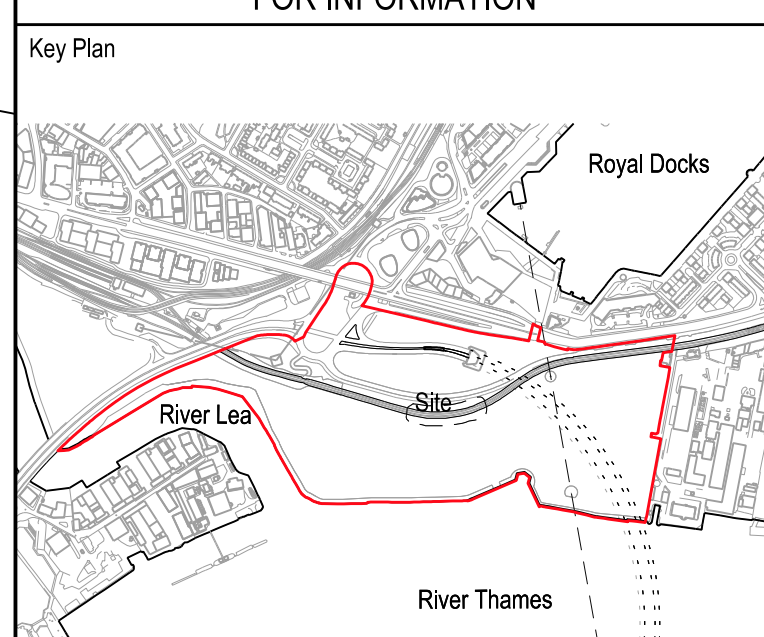
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Rev.	Date	Reason For Issue	CHK
04	14/05/20	For Planning Resubmission	F+P
03	17/04/20	For Planning Resubmission	F+P
02	10/03/20	For Planning Resubmission	F+P
01	13/05/19	For Planning Resubmission	F+P
00	13/12/18	For Planning	F+P

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FOR INFORMATION



- LEGEND
- Thameside West Planning Application Boundary
 - Detailed Application
 - Detailed and Outline Application
 - Development Zone
 - Development Zone Reference
- DEVELOPMENT STAGES
- Stage 1
 - Stage 2
 - Stage 3
- DEVELOPMENT PHASES
- Phase 1
 - Phase 2
 - Phase 3
 - Phase 4
 - Phase 5
 - Phase 6
 - Phase 7
 - Phase 8
 - Phase 9
 - Phase 10
 - Phase 11
 - Delivered as Part of Silver Town Tunnel Works
 - Dock Road and Thameside Crescent installed by Riverline prior to Phase 4
 - Energy Centre Phase

Foster + Partners

Riverside, 22 Hester Road
London SW11 4AN
T +44 (0)20 7738 0455
www.fosterpartners.com

Client
Silvertown Homes Limited & GLA Land and Property

Project
Thameside West Masterplan

Title
Site Layout Masterplan Phasing Strategy

Project No.	Date	Scale at ISO A0
2693	13/12/18	1:1000
Number	Revision	
A-SL-011-xx-13	04	