Flood Risk Assessment

Port Control Centre, Gravesend

Port of London Authority

January 13, 2026

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1 Introduction

HDR Consulting Ltd were commissioned on behalf of the Port of London Authority (hereafter referred to as the PLA) to undertake a Flood Risk Assessment (FRA) in relation to the proposed refurbishment of the Port Control Centre (PCC) at Royal Pier Road, Gravesend, within Gravesham Borough Council in north west Kent.

1.1 Site Description

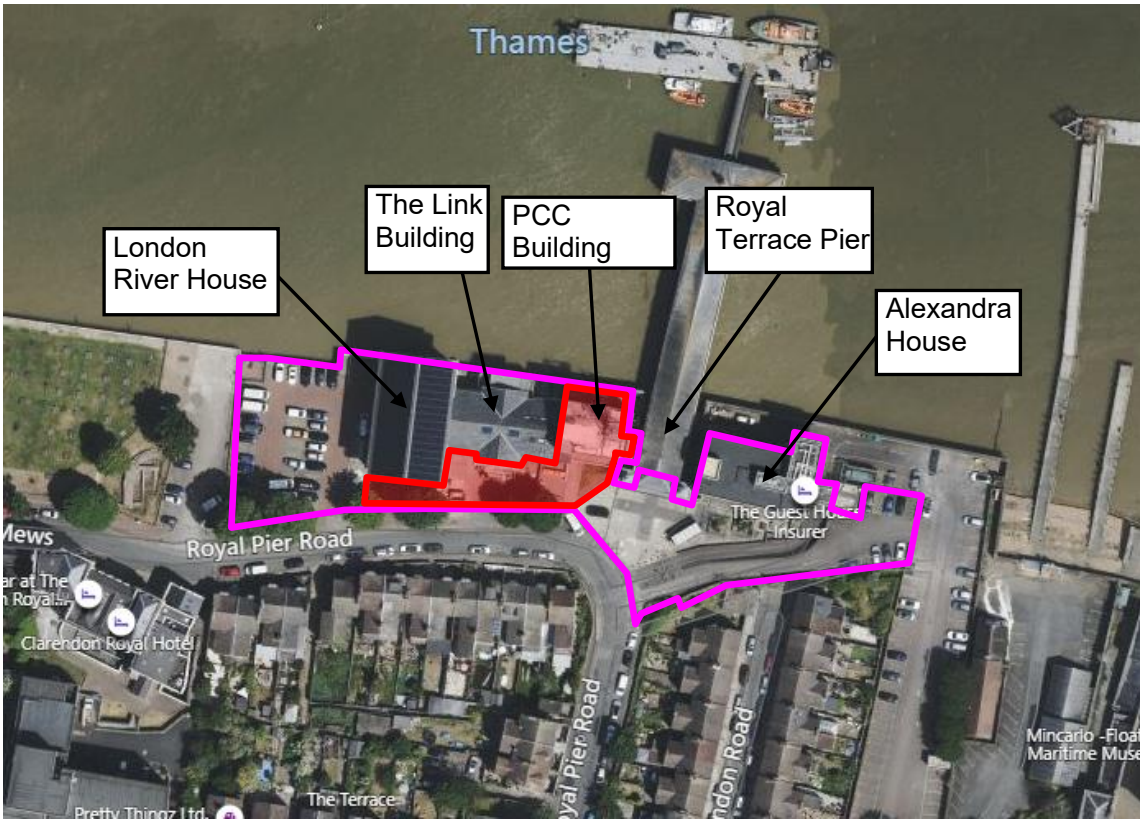
The planning application boundary (as shown in pink in Figure 1-1) covers an area of approximately 0.45 hectares (ha) and comprises buildings, associated parking and external landscaping areas all owned and operated by the PLA.

There are no intrusive works proposed across the majority of the planning application boundary, and as a result there will be no impact on flood risk or drainage. This FRA therefore focuses on the area of proposed works (hereafter referred to as 'the Site' and clarified in red in Figure 1-1 overleaf) which includes refurbishment of the PCC along with updates to the external landscaping adjacent.

The existing PCC building on Site comprises a ground plus 3 storey building over a single level lower ground. The building is currently used to house Vessel Traffic Services and radar equipment for the PLA and is also utilised for ancillary office use with plant in the lower ground.

The Site is bound by Royal Pier Road to the south, the River Thames to the north, the Link Building to the west and the listed Royal Terrace Pier to the east.

Figure 1: Site Location Plan



Key

Application Boundary

Area of Proposed Works (the Site)

1.2 Proposed Development

The development proposals (Appendix A1) comprise the following:

- Single storey vertical extension to the existing building;
- Refurbishment/ replacement of the façade;
- Internal changes to the floor layout, with a new lift and stair core and associated new openings to the floor structure;
- Plant and building services refurbishment and replacement;
- External works to provide a new piazza external entrance area to enhance links between London River House, the Link Building and Port Control Centre;
- Removal of the radar tower and associated equipment to the roof level; and
- Removal of server rooms to be relocated within Alexandra House.

2 Planning Policy and Guidance

2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[1], last revised in July 2021, states that vulnerable development types should be directed away from areas at highest risk of flooding (whether existing or future risk). Where development is necessary in flood risk areas, the development should be made safe for its lifetime without increasing risk elsewhere. The NPPF states that, when determining planning applications, Local Planning Authorities (LPAs) should ensure that flood risk is not increased elsewhere as a result of development. Where appropriate, applications should be supported by a site-specific FRA. Development should only be permitted in areas at risk of flooding where it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
- The development is appropriately flood resistant and resilient;
- Any residual risk can be safely managed; and
- Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Major developments should incorporate Sustainable Drainage Systems (SUDs) unless there is clear evidence that this would be inappropriate. The systems used should:

- Take account of advice from the Lead Local Flood Authority (LLFA);
- Have appropriate proposed minimum operational standards;
- Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development, and;
- Where possible, provide multifunctional benefits.

2.2 Planning Practice Guidance

2.2.1.1 The Planning Practice Guidance (PPG)[2] notes provide additional advice to LPAs, to ensure that the NPPF is applied correctly when assessing development in areas at risk of flooding. Assessments of flood risk should identify sources of current and future risk and describe how these will be accounted for in a mitigation strategy.

[1] Ministry of Housing, Communities and Local Government, March 2012. National Planning Policy Framework.

[2] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, August 2022. Planning Practice and Guidance: Flood Risk and Coastal Change.

2.2.1.2 A sequential approach should be employed, which involves applying the 'Sequential Test' and, if needed, the 'Exception Test'. This is designed to ensure that areas at little or no risk of flooding are developed in preference to higher risk areas.

2.2.1.3 For site-specific risk assessments, the characteristics of a possible flood event should be considered. The ability of residents and users to safely access and exit a building during a 'design' flood event and to evacuate before an extreme flood event (0.1% annual probability of flooding with allowance for climate change) should also be assessed.

2.2.1.4 The 'design' flood event is considered to be fluvial flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), or tidal flooding with a 0.5% annual probability (1 in 200 chance each year). In addition, the 1% annual probability pluvial event should also be considered.

2.2.1.5 Development layouts should be designed to locate the most vulnerable aspects of a development within areas of lowest flood risk, unless there are overriding reasons present. In addition, measures to avoid flood risk vertically can be taken by locating the most vulnerable uses on upper levels within a building, and by raising finished floor and/or ground levels where appropriate. Such measures should also account for any residual flood risks occurring due to flood risk management infrastructure.

2.2.1.6 Management measures, such as safe access and egress routes, should be provided to deal with any residual risk remaining after avoidance, control and mitigation measures have been utilised. The provision of adequate flood warning should also be considered.

2.2.1.7 Residential development can be assumed to have a lifetime of at least 100 years, unless specific justification exists for considering a different time period. The lifetime of a non-residential development depends on the characteristics of that development, but a period of at least 75 years is considered to form a starting point for assessment.

2.2.1.8 The PPG provides guidance on flood risk vulnerability and flood zone compatibility. The following flood zones refer to the probability of river and sea flooding, without the presence of defences:

- **Zone 1: low probability**, less than 0.1% annual probability of river or sea flooding (<1 in 1000) in any year;
- **Zone 2: medium probability**, between a 1% and 0.1% annual probability of river flooding (1 in 100 to 1 in 1000) or between a 0.5% and 0.1% (1 in 200 to 1 in 1000) annual probability of sea flooding in any year;
- **Zone 3a: high probability**, 1% or greater (>1 in 100) annual probability of river flooding or a 0.5% or greater (>1 in 200) annual probability flooding from the sea in any year; and
- **Zone 3b: functional floodplain**, where water flows or is stored in times of flood, identification should take account of local circumstances but will typically flood with an annual probability of 3.3% (>1 in 30) or greater in any

year or is designed to flood in an extreme 0.1% (1 in 1000 annual probability) flood.

2.2.1.9 Climate change allowances for river flow and rainfall intensity are determined in accordance with the local river management catchment. Allowances are provided to cover development lifespans to the 2050s epoch (from present day to the year 2060) and the 2070s epoch (between 2061 and 2125).

2.2.1.10 Table 2 of the PPG splits flood risk vulnerability into five classifications. The compatibility of these development uses within each Flood Zone is set out in Annex 3 of the NPPF:

- **Essential Infrastructure**: essential transport and utility infrastructure, wind turbines;
- **Highly Vulnerable:** emergency services (those required to be operational during flooding), installations requiring hazardous substances consent, lower ground dwellings;
- **More Vulnerable:** residential dwellings, hospitals, schools, hotels, drinking establishments;
- **Less Vulnerable**: retail, offices, storage and distribution, leisure, restaurants; and
- **Water-Compatible Development**: docks, marinas, wharves.

2.2.1.11 The Development predominantly comprises refurbishment of existing buildings and upward extension. The proposed development would continue to be classified as 'Less Vulnerable' and development within Flood Zone 3 is therefore considered acceptable.

2.3 Non-statutory Technical Standards for Sustainable Drainage Systems

The Non-Statutory Technical Standards for Sustainable Drainage Systems[3] was published in March 2015 and is the current guidance for the design, maintenance, and operation of SUDs.

Technical standard S3 states that runoff rates from a new development to any drain, sewer or surface water body must be as close as reasonably practicable to the equivalent greenfield runoff rate for the site area. This must be maintained for all rainfall events up to and including the 1 in 100 year event. Accordingly, surface water discharge rates from a new development should never exceed those from the site prior to redevelopment.

Technical standard S5 requires that the runoff volume from developments on a previously developed site, resulting from the 1 in 100 year 6 hour duration storm event, must be attenuated to a value as close as is reasonably practicable to the equivalent greenfield runoff volume. The post development runoff volume must not exceed the runoff volume

[3] Department for Environment, Food and Rural Affairs, March 2015. Non-Statutory Standards for Sustainable Drainage Systems.

from the site prior to redevelopment, where this is not reasonably practicable however, the runoff volume must be discharged at a rate that does not adversely affect flood risk (in line with standard S6).

Standards also indicate that drainage systems should be designed to ensure that flooding does not occur on any part of a site for a 1 in 30 year rainfall event (standard S7) and that flooding of a building (including the lower ground and utility plant) does not occur during a 1 in 100 year rainfall event (standard S8). Technical standard S12 states that pumping should only be used as part of a surface water drainage system where it is not reasonably practicable to discharge runoff via gravity.

2.4 Gravesham Borough Council Local Plan Core Strategy

The Gravesham Borough Council Core Strategy[4] sets out the Council's long term spatial strategy for the borough. It involves a wide range of topics, with flood risk policy included within the climate change section.

[4] Gravesham Borough Council, Gravesham Local Plan Core Strategy, September 2014

2.4.1 Policy CS18: Climate Change – Flood Risk

Policy CS18: Climate Change, highlights requirements regarding flood risk and drainage, the key points of the policy are summarised below.

- Application of a sequential test is required for all developments at the application stage, excluding previously developed sites along the Thames Riverside and other regeneration sites.
- Proposals in areas at risk of flooding must be accompanied by an FRA and a flood risk management plan (if required), to demonstrate that the development is adequately defended and safe over its lifetime.
- The Council will prioritise maintenance, improvement, or replacement of flood defence infrastructure over other land uses where relevant. The Council will expect new developments to take advantage of opportunities to reduce the causes and impacts of flooding from all sources where technically and financially feasible.
- Developments should adhere to objectives within the wider Water Framework Directive and associated Thames River Basin Management Plan, which look to support improving water quality to 'good' status over the plan period.
- The Council will seek to minimise the impact on surface water flooding and wastewater systems by ensuring that new developments, as a minimum, have no greater adverse impact than the existing use. Also, implementing SuDS where technically and financially feasible.

2.5 Kent Thameside Strategic Flood Risk Assessment

A Strategic Flood Risk Assessment[5] (SFRA) was undertaken for Kent Thameside. The participating borough councils include Dartford and Gravesham. The report was published in 2005 and updated by Entec in 2009.

The adopted SFRA aims to aid in strategic planning of Kent Thameside, by analysing the consequences of proposed and existing developments that may be exposed to flood risk. It aims to educate stakeholders involved in the investment and delivery of developments, to gain a better understanding of the challenges associated with flood risk management.

Consideration has been given to this document and reference is made to it where appropriate within this report.

[5] Kent Thameside Delivery Board, Strategic Flood Risk Assessment of Kent Thameside, December 2005.

2.6 Kent County Council Preliminary Flood Risk Assessment

Kent County Council is the Lead Local Flood Authority (LLFA) and has published the Preliminary Flood Risk Assessment (PRFA)[6] 2011.

The PFRA aims to collate and analyse the most up to date flood risk information from all sources, to provide an overview of flood risk across Kent. The report is to be updated every six years. However, the latest 2017 report is unavailable. Despite being published in 2011, it is intended that the document is used by the borough to inform the Gravesham Local Plan and also provides an evidence base developers should review when submitting applications and producing flood risk management strategies.

This document has therefore been reviewed and reference is made to it where appropriate within this report.

2.7 Kent County Council Local Flood Risk Management Strategy

The local flood risk management strategy 2017-2023[7] has been published to aid in Kent's strategic development, to prevent and mitigate against flooding throughout the County. The local flood risk management strategy uses information from the PRFA to devise plans which inhibit flooding in various catchment areas, indicating the current challenges and objectives of managing flood risk throughout the County.

This document has been reviewed and reference has been made to it where appropriate.

[6] Kent County Council, September 2011. Preliminary Flood Risk Assessment.

[7] Kent County Council, Local Flood Risk Management Strategy, 2017-2023

3 Sources of Potential Flooding

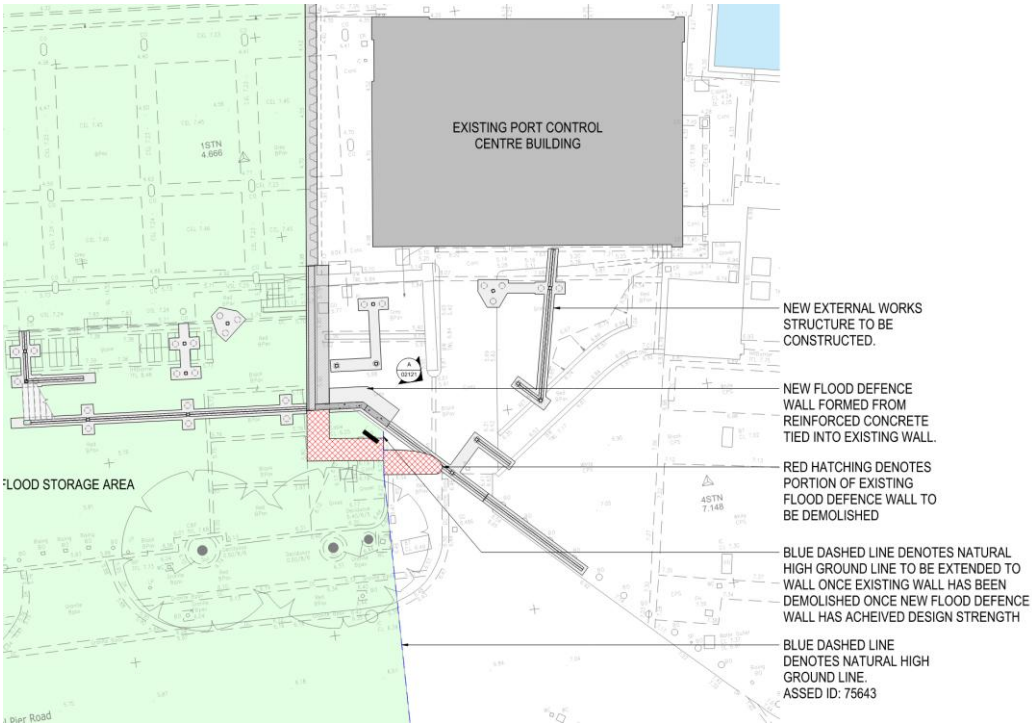
3.1 Fluvial and Tidal

The River Thames is located along the northern boundary of the Site. In this location the overriding risk from this watercourse is tidal, rather than fluvial, with the potential for flood risk caused by the gravitational pull of the moon and surge tides.

According to the EA Flood Map for Planning (Figure 3-1), areas of the Site lie within Flood Zones 2 and 3, indicating a medium and high probability of tidal flooding.

The PCC building however is shown to benefit from flood defences, which provide protection up to a 1 in 1000 year design standard. The defences are maintained to a very high standard to ensure they function appropriately, and in line with the TE2100 Plan would be raised in the future to protect against the impacts of climate change. This means that assuming normal operation of the defences, the building itself should be protected from flooding. It is proposed during the works for the Flood Defence wall line to be amended to allow for the new proposed ramp up to the piazza. This strategy has been agreed with the Environment Agency under Flood Risk Activity Permit EPR_MB3340UR. The area of wall to be amended as part of the works is shown below, the total storage volume in front of the wall will be increased therefore the protection of the wall will not be impeded. The extents of the EA maintained flood defence wall is shown in the flood map included in this report.

Figure 2: Amendment Works to Flood Defence Wall



Areas of the wider site to the west are shown to be located within undefended Flood Zone 2, however there is no proposed development in these areas.

The proposals include creating a new piazza within flood zone 1, no works are proposed in flood zones 2 or 3. In the area of the site that does not benefit from the flood defence wall, a void is proposed below the piazza therefore storage volumes are not impacted. However, flood risk in this location is tidal, with flood levels being controlled by the gravitational pull of the moon, rather than a specified rainfall catchment. As a result, flood risk will not be increased elsewhere, and any minor offset will be insignificant. National and local guidance does not require floodplain compensation for tidal floodplains.

3.1.1 Breach Flood Risk

Despite the PCC building being protected by the existing flood defences, consideration of a residual breach scenario (i.e. failure of the defences) needs to be made. Based on the EA's Thames Tidal Downriver Breach Inundation Modelling from 2018, the maximum modelled breach level anticipated on the Site in the 1 in 200 year plus climate change (to 2115) event is 6.850m AOD (refer to Figure 3-2 overleaf and Appendix A2).

The ground floor (which comprises a raised ground floor) is set at a minimum finished floor level (FFL) of 8.187m AOD, and is therefore over 1.3m above the peak breach flood level of 6.850m AOD. The lower ground floor is set at 5.182m AOD and could therefore be flooded to approximately 1.6m in a breach scenario. The uses in the lower ground floor are limited to plant (along with one storage cupboard) which is considered to be less vulnerable and therefore acceptable to flood in the highly unlikely event of a breach.

Should a breach occur, safe refuge would be provided within the building itself at the ground floor and above. Internal access would be provided from the lower ground floor via the stairwells to the levels above, therefore providing safe refuge for any users of the lower ground floor.

Furthermore, based on the existing levels plan (Appendix A3), it is anticipated that a dry escape route would be provided to the south along Royal Pier Road which is shown to be set at between approximately 7.28m AOD and 8.88m AOD. Should breach flooding occur across Royal Pier Road in the south however (as shown in Figure 3-2), there would only be a requirement to cross approximately 20m of breach flooding to access a dry route.

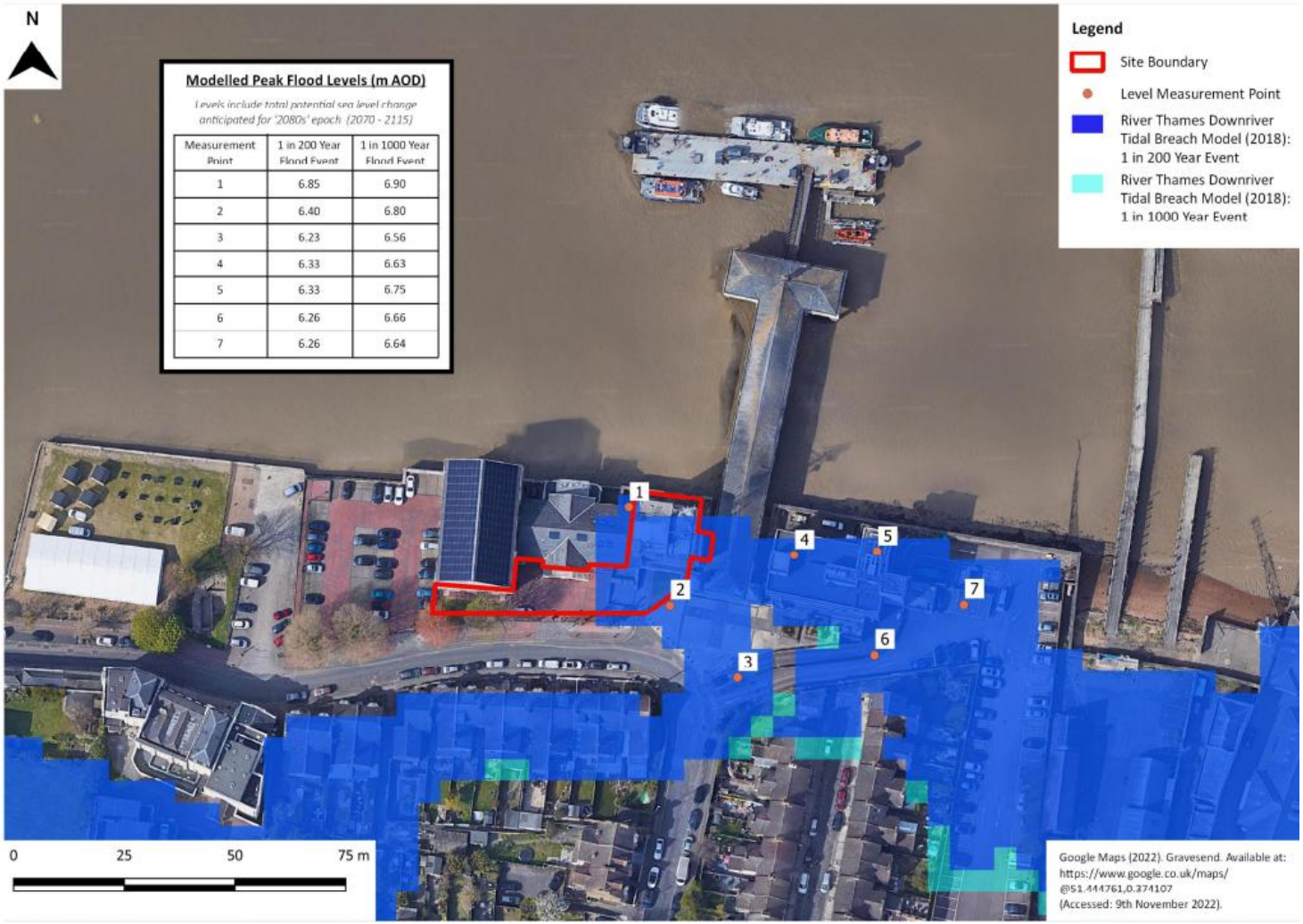
Figure 3: Environment Agency Flood Map for Planning

Key

	Site Boundary		Areas Benefitting from Flood Defences
	Flood Zone 3		Existing Flood Defences
	Flood Zone 2		

Flood Map Source: https://flood-map-for-planning.service.gov.uk/

Figure 4: Environment Agency Breach Flood Mapping and Levels



Modelled Peak Flood Levels (m AOD)

Levels include total potential sea level change anticipated for '2080s' epoch (2070 - 2115)

Measurement Point	1 in 200 Year Flood Event	1 in 1000 Year Flood Event
1	6.85	6.90
2	6.40	6.80
3	6.23	6.56
4	6.33	6.63
5	6.33	6.75
6	6.26	6.66
7	6.26	6.64

3.2 Pluvial

Pluvial flooding occurs when natural and engineered systems lack capacity to manage the volume of rainfall. Pluvial flooding can occur during an extreme, high intensity rainfall event which overwhelms the local surface water drainage systems. This flood water will then be conveyed via overland flow routes based on the local topography.

3.2.1 Overland Flows

Review of the EA's Flood Risk from Surface Water maps (Figure 3-3) indicates that the majority of the Site is at a very low risk of surface water flooding. There is one localised area of flood risk externally to the Link Building, which is based on a topographic low spot within the Site. No works are proposed to this area of the site. It is worth noting that a surface water drainage strategy will be provided (refer to Section 4) to manage runoff from these areas, ensuring there is no increase in flood risk to the Site or surrounding area as a result of the proposals.

The risk of flooding originating from overland flows is therefore considered to be very low.

Figure 5: Environment Agency Flood Risk from Surface Water Mapping

High Medium Low Very low

Key

Site Boundary

Flood Map Source: https://check-long-term-flood-risk.service.gov.uk/

3.2.2 Sewer Flooding

Information provided by Southern Water to inform the SFRA indicates that only one sewer flooding incident has been recorded in Gravesend in a location approximately 1.5km to the south of the Site.

The risk of flooding from sewers is therefore considered to be low.

3.3 Groundwater

The British Geological Survey (BGS) online geology mapping[8] indicates that the Site is underlain by bedrock geology of Lewes Nodular Chalk Formation, Seaford Formation and Newhaven Chalk Formation. Although the mapping indicates that the Site itself does not have any recorded superficial deposits, it is in close proximity to Alluvium (consisting of clay, silt, sand and peat) directly to the north (within the banks of the Thames).

According to Figure 7.3 of the SFRA (Appendix A4), the Site does not lie in an area at risk of groundwater flooding.

Furthermore, there are no structural changes proposed to the existing lower groundlower ground and the risk of groundwater flooding is therefore considered to be low.

3.4 Artificial Sources

Based on the EA's reservoir flood maps (Figure 3-4), the Site does not lie within the extents of flooding originating from the failure of any reservoirs in the vicinity.

Although there is an artificial pond and marina approximately 300m to the east of the Site, based on topography it is considered unlikely that a failure at these features would result in flooding to the Site.

The risk of flooding from artificial sources is therefore considered to be low.

[8] British Geological Survey. Geology Viewer: https://geologyviewer.bgs.ac.uk, [Accessed: September 2022]

Figure 6: Environment Agency Flood Risk from Reservoirs

when river levels are normal when there is also flooding from rivers

Key

Site Boundary

Flood Map Source: https://check-long-term-flood-risk.service.gov.uk/

4 Surface Water Drainage

4.1 Existing Surface Water Drainage

Asset records from Southern Water (Appendix A5) indicate that there are no public surface water sewers in the vicinity of the Site.

A CCTV drainage survey for the wider Site has been undertaken and confirms that surface water runoff from existing areas of London River House in the west currently discharge directly to the River Thames to the north.

Although survey information regarding surface water drainage for the Site itself has not been provided, due to the lack of public surface water sewers it is anticipated that runoff is similarly directed unrestricted to the River Thames directly to the north.

4.2 Proposed Drainage

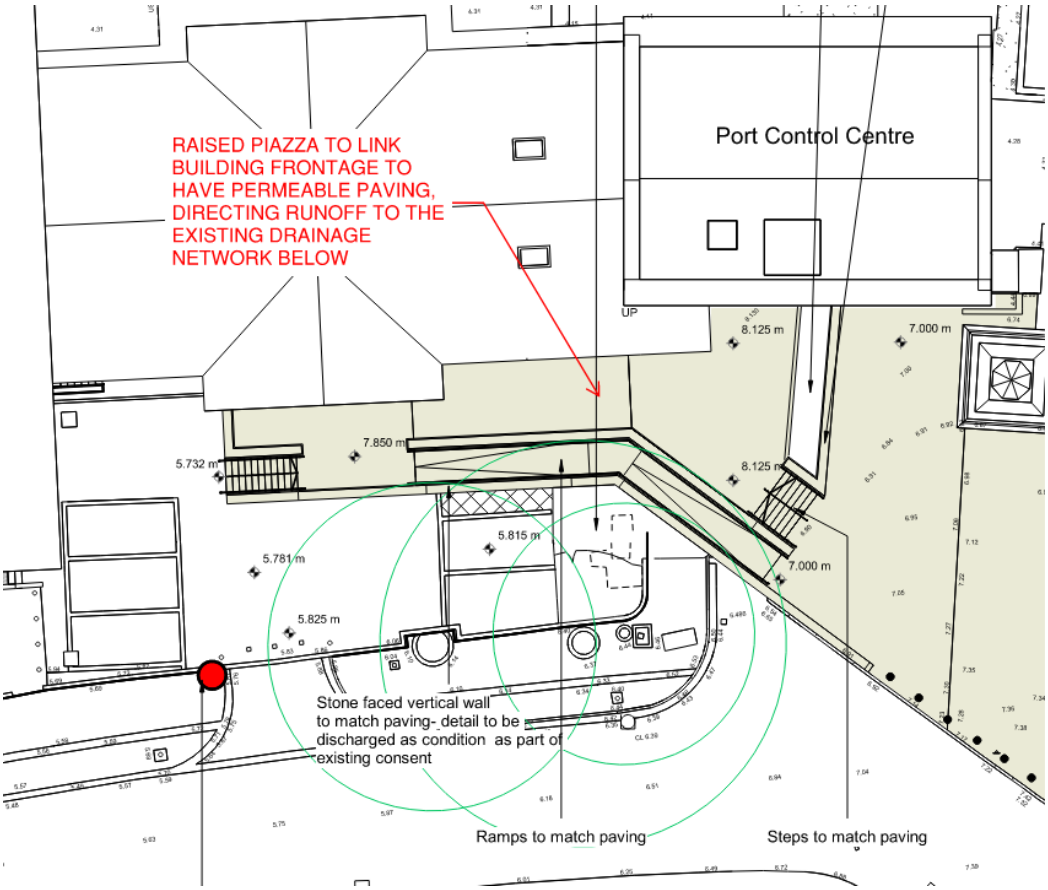
On the basis that the majority of the Site (i.e. the PCC building) is subject to refurbishment and upwards extension only, the existing surface water drainage infrastructure will be retained as existing and reused. With this in mind, there will be no change in runoff rate or volume when considering the existing and proposed building.

4.2.1 SuDS Strategy

It is noted that there are proposed enhancements to the external areas to the south of the PCC building, which includes the raising of levels to meet the FFL of the ground floor. Given this raising, it is proposed that permeable paving in the new piazza will direct flows to the existing surface water network and out to the Thames via the existing outfall.

As part of the updated landscaping proposals, it is proposed that permeable surfacing will be incorporated as highlighted in Figure 4-1 below.

Figure 7: Proposed Landscaping/SuDS Features



Source: Bennet Associates, External Works Plan

Surface water runoff from the external areas will discharge to the River Thames to the north, as per the existing situation. On the basis that the Thames is tidal in this location, it is not considered necessary to provide attenuation in line with policy.

The need for attenuation to account for a tide locked scenario however has been considered. Based on the tidal data provided by the Port of London Authority (PLA) at the Tilbury gauging station (Appendix A6), the maximum high water spring in this area would be 3.48m AOD. This is considerably lower than the lowest Site levels of 5.8m AOD and tide locking is therefore not anticipated to be of concern to runoff from the Site.

4.2.2 Water Quality

Any proposed strategy needs to ensure that appropriate treatment is provided through the incorporation of SuDS, in line with the CIRIA SuDS Manual.

The external landscaping area is for pedestrian use only and therefore does not compare with any Land Use categories set out within CIRIA guidance. To be conservative, the pollution hazard level has been considered to be low, with pollutions indices as set out below in Table 4-1.

Table 4-1: Pollution Hazard Indices (taken from Table 26.2 of the SuDS Manual)

Pollution Hazard Level	Total Suspended Solids	Metals	Hydro-carbons

Low	0.5	0.4	0.4

As noted previously, it is proposed that runoff from the external landscaping areas will be managed through the use of permeable surfacing before discharging to the River Thames. As can be seen in Table 4-2 below, the proposed permeable surfacing will provide sufficient treatment to runoff prior to discharge.

Table 4-2: SuDS Mitigation Indices (taken from Table 26.3 of the SuDS Manual)

SuDS Component	Total Suspended Solids	Metals	Hydro-carbons
Permeable Surfacing	0.7	0.6	0.7

4.2.3 Exceedance Routing

Should a storm event occur that exceeds the design scenario or if there is a blockage within the drainage network, overland flows from the external landscaping areas would be directed to the south and away from the existing buildings.

4.2.4 SuDS Maintenance

The PPG sets out the requirement for developers to consider the operation, management, and maintenance of all SuDS.

Post construction, the on-site management company will be responsible for the SuDS included in the scheme. Table 4-3 outlines what maintenance is anticipated for the proposed SuDS features.

Table 4-3: SuDS Maintenance

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required

Maintenance schedule	Required action	Typical frequency
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three monthly 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

5 Foul Water Drainage

5.1 Existing Foul Drainage

Asset records from Southern Water (Appendix A5) indicate that there is a 225mm foul sewer to the south of the Site, within Royal Pier Road.

As noted previously, a CCTV drainage survey for the application boundary has been undertaken and confirms that foul runoff from the Site ultimately discharges to the 225mm Southern Water foul sewer within Royal Pier Road.

It is estimated that the existing foul flows from the Site (the PCC building) are approximately 0.2 l/s.

5.2 Proposed Foul Drainage

On the basis that the majority of the Site (i.e. the PCC building) is subject to refurbishment and upwards extension only, it is proposed that the existing foul drainage infrastructure will be retained as existing and reused.

Should any additional below ground foul drainage be required, this would be designed in accordance with BS EN 752 – Drain and Sewer Systems Outside Buildings, BS EN 12056 – Gravity Drainage Systems Inside Buildings and Approved Document H of Building Regulations.

Whilst there is an existing floor proposed, due to the relatively small addition, rounding of the calculations show that the estimated foul flows from the Site will remain at approximately 0.2 l/s. It is therefore anticipated that there will be no impact on the capacity of the existing public foul sewers in the vicinity.

6 Conclusion

According to the EA Flood Map for Planning, areas of the wider site lie within Flood Zones 2 and 3 indicating a medium and high probability of tidal flooding at this location. However, no works are proposed in these areas of the site.

The PCC building is shown to benefit from flood defences, which provide protection up to a 1 in 1000 year design standard. The building itself should therefore be protected from flooding, assuming normal operation of the flood defences. Areas to the west are shown to be located within undefended Flood Zone 1, however proposals here are limited to external landscaping only with a void underneath therefore storage volumes are not impacted. It is proposed during the works for the line of the existing flood defence wall to be amended as agreed with the Environment Agency. The total storage volume in front of the flood defnece wall will increase therefore the protection will not be impeded.

Despite the PCC building being protected by the existing flood defences, consideration of the residual risk should be undertaken, in the event of a breach (failure) in the flood defences. Should a breach of the defences occur, a maximum level of 6.850m AOD is anticipated on the Site.

The ground floor and above are set at a minimum FFL of 8.187m AOD and would therefore remain dry in a breach event, with 1.3m freeboard provided. The lower ground floor is set at 5.182m AOD and could therefore be flooded to a depth of approximately 1.6m in a breach scenario. The uses in the lower ground are limited to plant (along with one storage cupboard) which is considered to be less vulnerable and acceptable in terms of flooding.

Should a breach occur, safe refuge would be provided within the building itself at the ground floor and above. Access would be provided from the lower ground via the internal stairwells to the floors above, therefore providing safe refuge for any users of the lower ground. Furthermore, based on the existing and proposed levels plan, it is anticipated that a dry escape route would be provided to the south along Royal Pier Road.

The risk of flooding from pluvial, groundwater and artificial sources have also been assessed and found to be low.

It is anticipated that existing surface water runoff is directed unrestricted to the River Thames directly to the north. Since the PCC building is subject to refurbishment and upwards extension only, it is proposed that the existing surface water drainage infrastructure will be retained and reused. With this in mind, there will be no change in runoff rate or volume when considering the existing and proposed building.

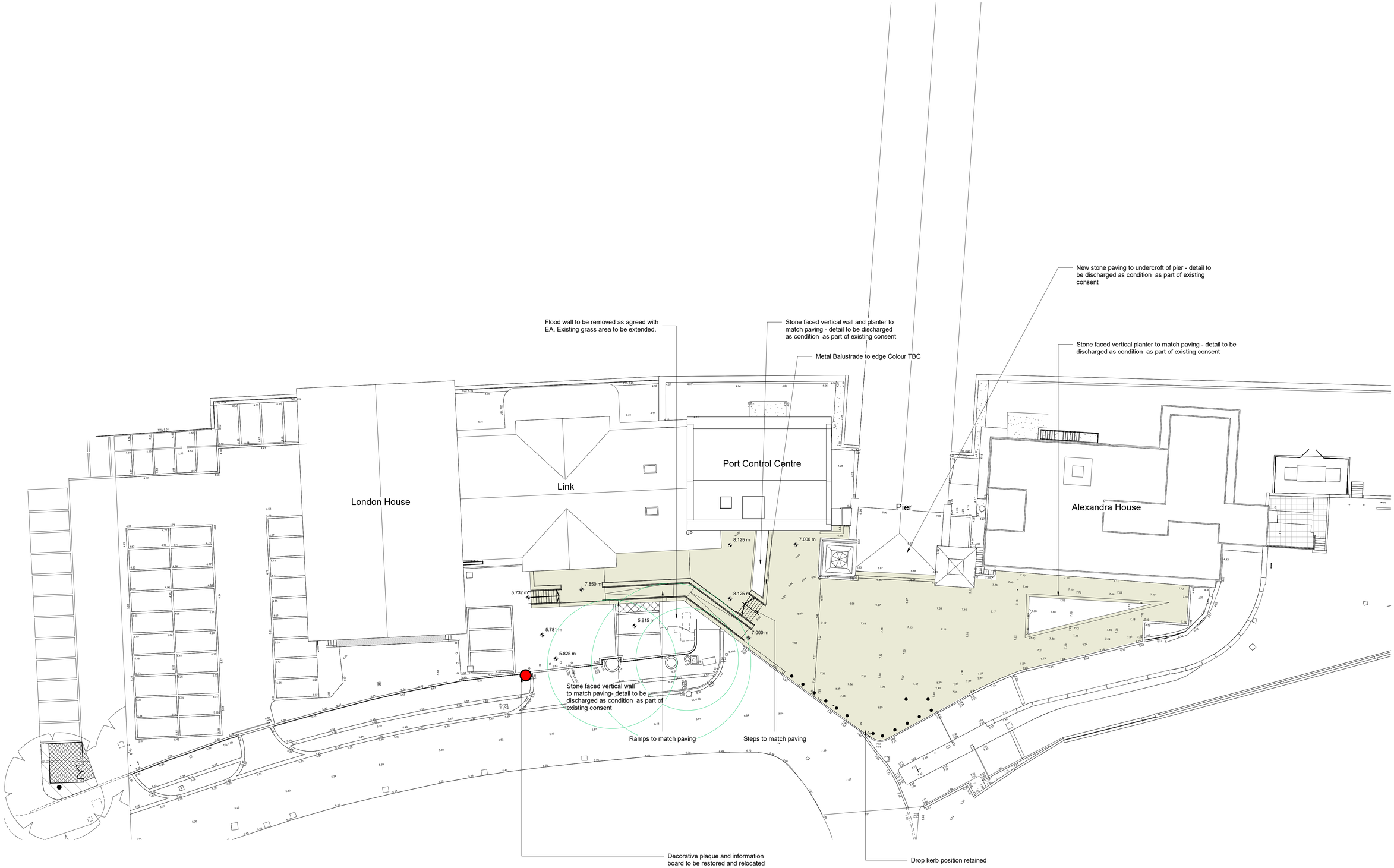
It is proposed that permeable surfacing will be incorporated as part of the updated landscaping design with surface water runoff from the external areas discharging to the River Thames in the north. On the basis that the Thames is tidal in this location, it is not considered necessary to provide formal attenuation. Consideration of a tide locked scenario has been undertaken, and would not cause an issue.

It is anticipated that there will be no change in foul flows from the Site as a result of the proposals meaning that there will be no impact on the capacity of the existing public foul sewers in the vicinity.

Flood risk to the proposed development would be managed appropriately to ensure safety of occupants, and would not increase flood risk elsewhere. It is therefore considered that Flood Risk the scheme is appropriate, in line with local and national planning policy.

7 Appendices

A1 Development Proposals



Rev	Date	Revision	By	Chk
P1	221021	Issued for Planning	KL	AB
P2	221117	Issued for Planning	KL	DK
P3	250404	Updated for Section 73 Application	TD	AB
P4	250714	Updated for Section 73 Clarification	TD	AB
P5	260210	Updated for NMA application	AB	TD

Notes

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Key:

Permeable flag stone paving Final material TBA

New steel slimline bollards to replace existing bollards

Existing information board and decorative plaque to be restored and relocated

RPA Zone

Final lighting design TBA

NOTE: Final kerb material TBA proposed to match existing condition

N

0 10

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Project
Port Control Centre Gravesend
Port of London Authority

Project No. 2204

Drawing Title
Planning
Proposed Site Surface Types

Drawing Number
PCC-BA-90-ZZ-DP-A-0

Revision/Suitability
P5 S4

Scale @ A3
1:400

Scale @ A1
1 : 200

Revision Date
260210

YY MM DD

1 Lower Ground Floor Plan

1 : 50

Void former to landscape to build up levels: see structural engineer's information for details

Rev	Date	Revision	By	Chk
P1	220909	WIP - Draft Issue	KL	AB
P2	220916	WIP - Draft Issue	KL	AB
P3	220923	WIP - Draft Issue	KL	AB
P4	221007	Stage 3 Issue	KL	AB
P5	240119	Stage 3 Update for Coordination	TD	AB
P6	240206	Stage 3 Issue For SQ Tender	TD	AB
P7	240412	Issued for ITT	TD	AB
P8	250207	Updated Stage 3 - Draft Issue	TD	AB
P9	250214	Updated Stage 3	TD	AB

Notes

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DRAFT ISSUE

Indicative ceiling mounted FCU casette locations

Indicative ceiling mounted ducted FCU locations

Indicative ceiling raft location

Indicative duct routing

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Project
Port Control Centre Gravesend
Port of London Authority

Project No. 2204

Drawing Title
General Arrangement
Lower Ground Floor Plan

Drawing Number
PCC-BA-20-L0-D-A-0

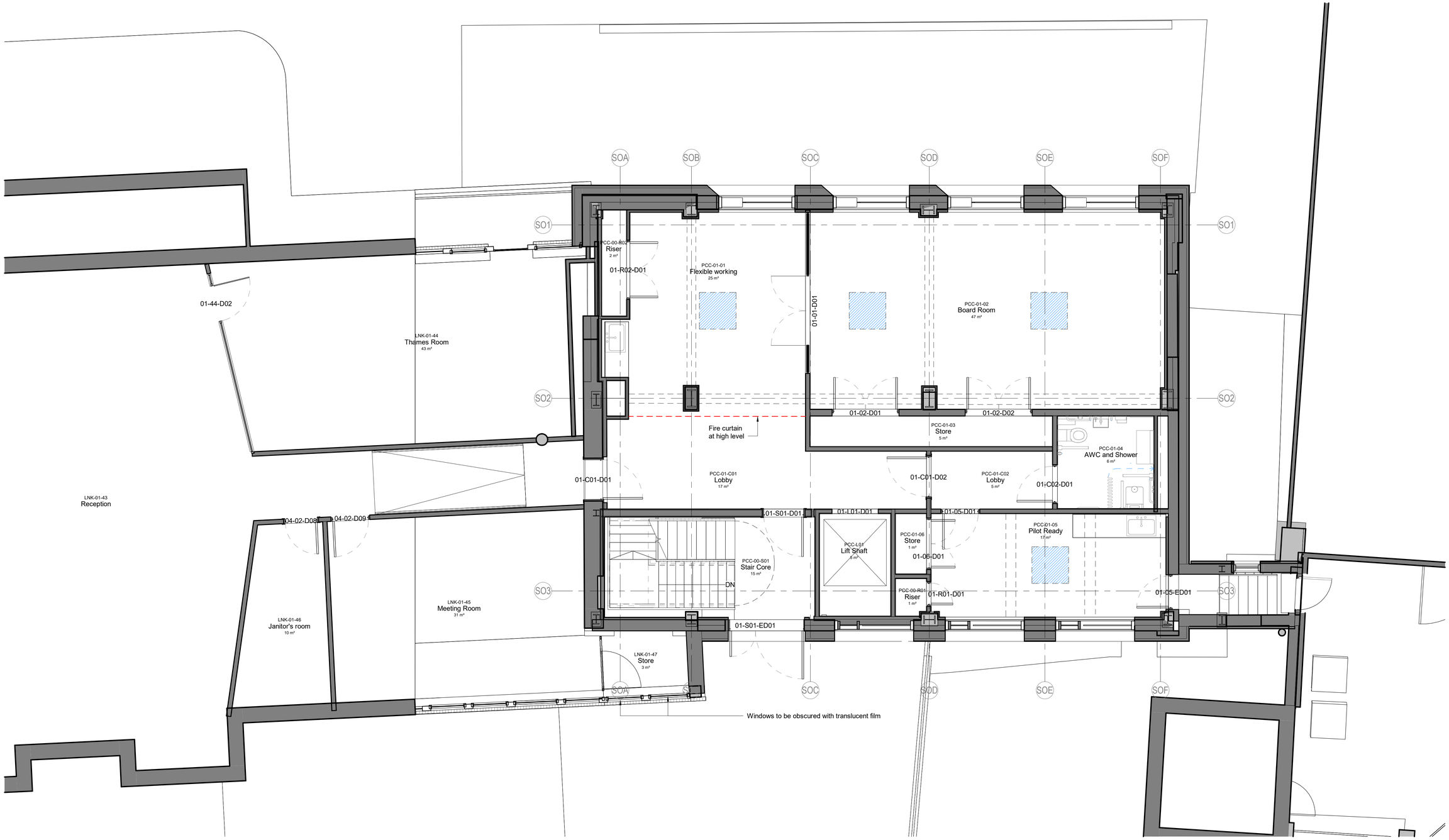
Revision/Suitability
P9 S4

Scale @ A3
1:100

Scale @ A1
1 : 50

Revision Date
250214

YY MM DD



1 Level 01 Floor Plan

1 : 50

Rev	Date	Revision	By	Chk
P1	220909	WIP - Draft Issue	KL	AB
P2	220916	WIP - Draft Issue	KL	AB
P3	220923	WIP - Draft Issue	KL	AB
P4	221007	Stage 3 Issue	KL	AB
P5	240119	Stage 3 Update for Coordination	TD	AB
P6	240206	Stage 3 Issue For SQ Tender	TD	AB
P7	240412	Issued for ITT	TD	AB
P8	250207	Updated Stage 3 - Draft Issue	TD	AB
P9	250214	Updated Stage 3	TD	AB

Notes

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Indicative ceiling mounted ducted FCU locations

Indicative ceiling raft location

Indicative duct routing

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Project
Port Control Centre Gravesend
Port of London Authority

Project No. 2204

Drawing Title
General Arrangement
Level 1 Floor Plan

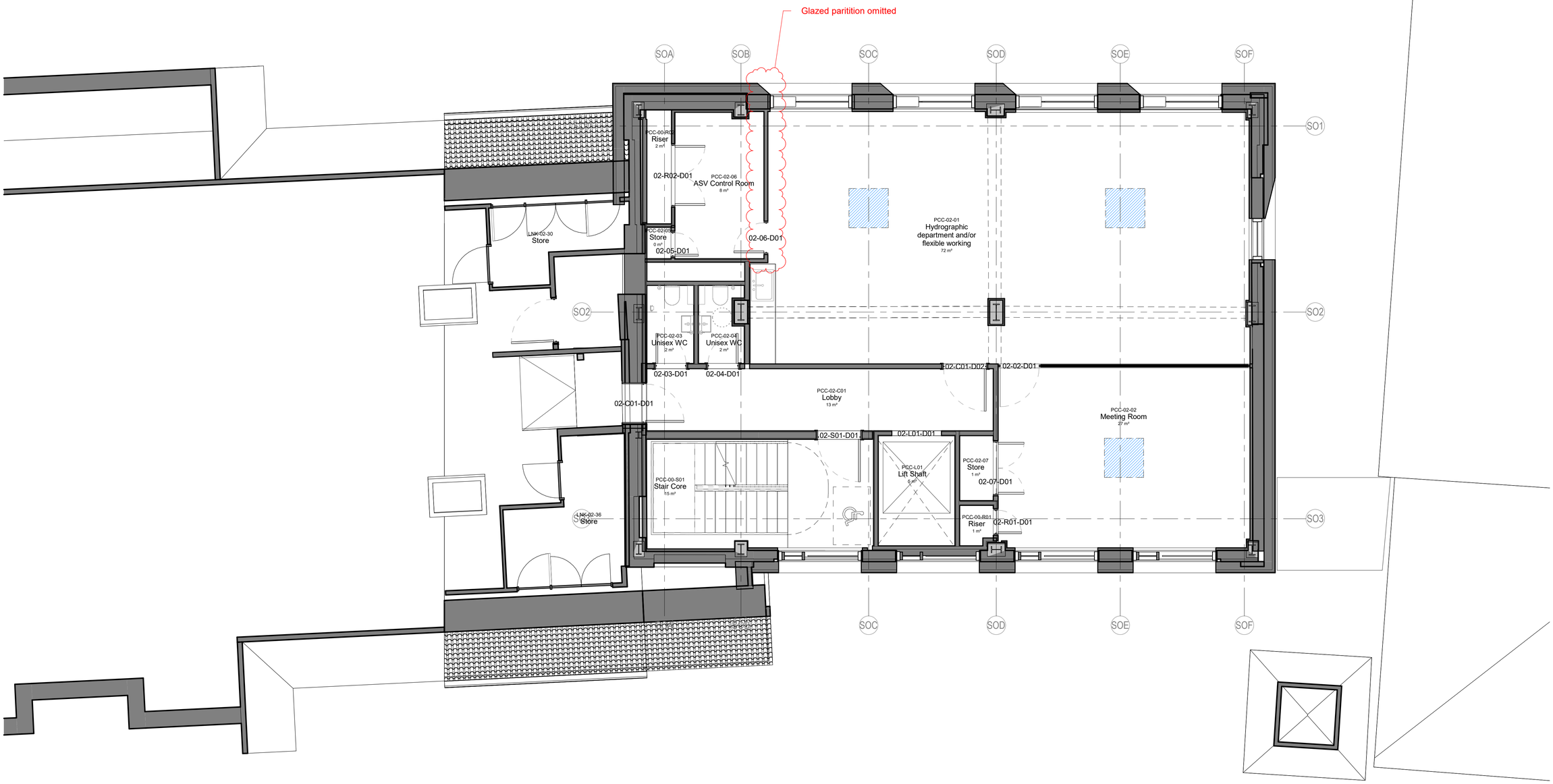
Drawing Number
PCC-BA-20-L1-D-A-0

Revision/Suitability
P9 S4

Scale @ A3
1:100

Scale @ A1
1 : 50

Revision Date
250214
YY MM DD



1 Level 02 Floor Plan

1 : 50

Rev	Date	Revision	By	Chk
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P2	220916	WIP - Draft Issue	KL	AB
P3	220923	WIP - Draft Issue	KL	AB
P4	221007	Stage 3 Issue	KL	AB
P5	240119	Stage 3 Update for Coordination	TD	AB
P6	240126	Stage 3 Update for Coordination	TD	AB
P7	240206	Stage 3 Issue For SQ Tender	TD	AB
P8	240412	Issued for ITT	TD	AB
P9	250207	Updated Stage 3 - Draft Issue	TD	AB
P10	250214	Updated Stage 3	TD	AB

Notes

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Indicative ceiling mounted FCU casette locations

Indicative ceiling mounted ducted FCU locations

Indicative ceiling raft location

Indicative duct routing

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Project
Port Control Centre Gravesend
Port of London Authority

Project No. 2204

Drawing Title
General Arrangement
Level 2 Floor Plan

Drawing Number
PCC-BA-20-L2-D-A-0

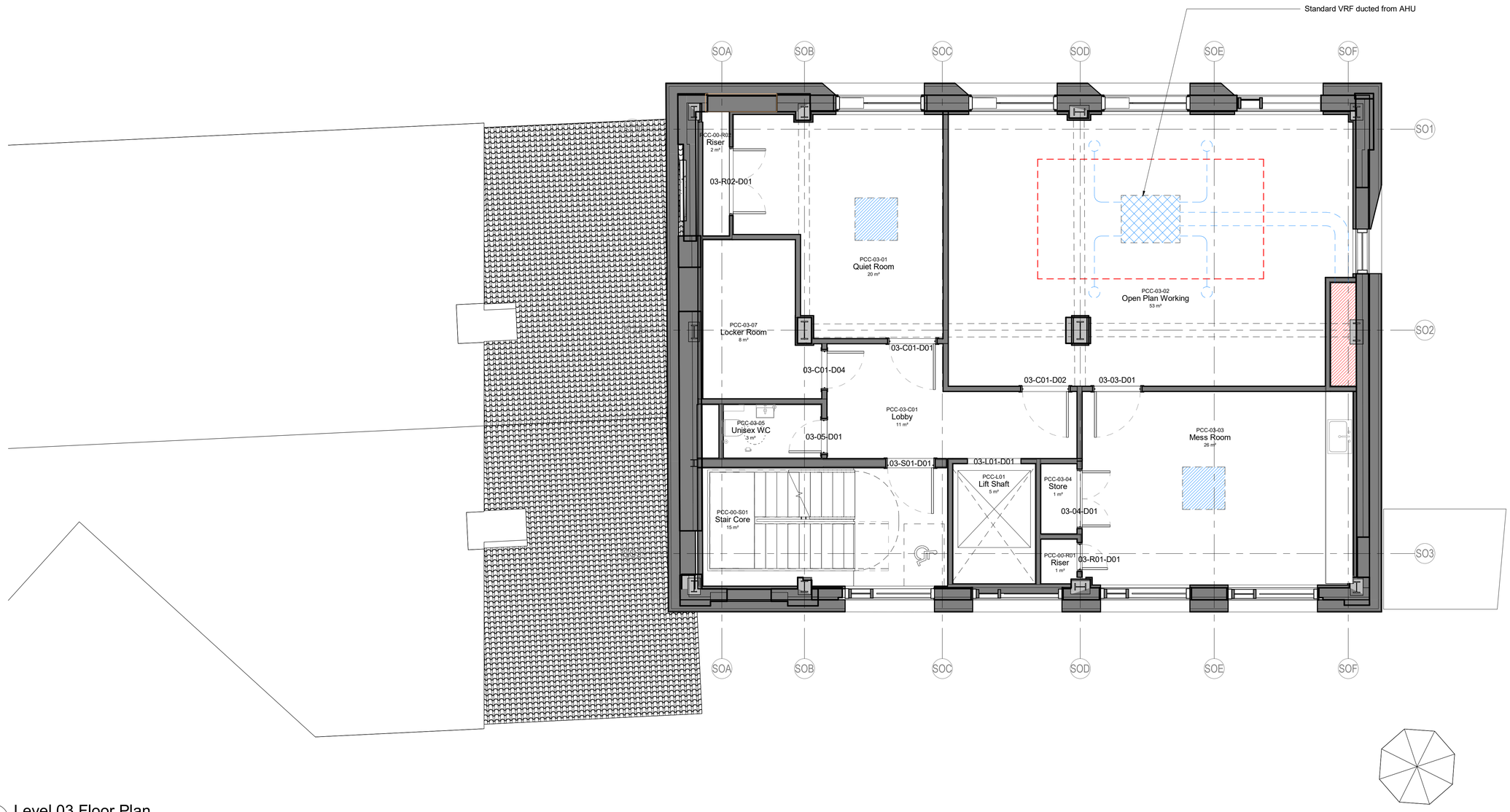
Revision/Suitability
P10 S4

Scale @ A3
1:100

Scale @ A1
1 : 50

Revision Date
250214

YY MM DD



2 Level 03 Floor Plan

1 : 50

Rev	Date	Revision	By	Chk
P1	220909	WIP - Draft Issue	KL	AB
P2	220916	WIP - Draft Issue	KL	AB
P3	220923	WIP - Draft Issue	KL	AB
P4	221007	Stage 3 Issue	KL	AB
P5	240119	Stage 3 Update for Coordination	TD	AB
P6	240126	Stage 3 Update for Coordination	TD	AB
P7	240206	Stage 3 Issue For SQ Tender	TD	AB
P8	240412	Issued for ITT	TD	AB
P9	250207	Updated Stage 3 - Draft Issue	TD	AB
P10	250214	Updated Stage 3	TD	AB

Notes

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DRAFT ISSUE

Indicative ceiling mounted FCU casette locations

Indicative ceiling mounted ducted FCU locations

Indicative ceiling raft location

Indicative duct routing

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Project
Port Control Centre Gravesend
Port of London Authority

Project No. 2204

Drawing Title
General Arrangement
Level 3 Floor Plan

Drawing Number
PCC-BA-20-L3-D-A-0

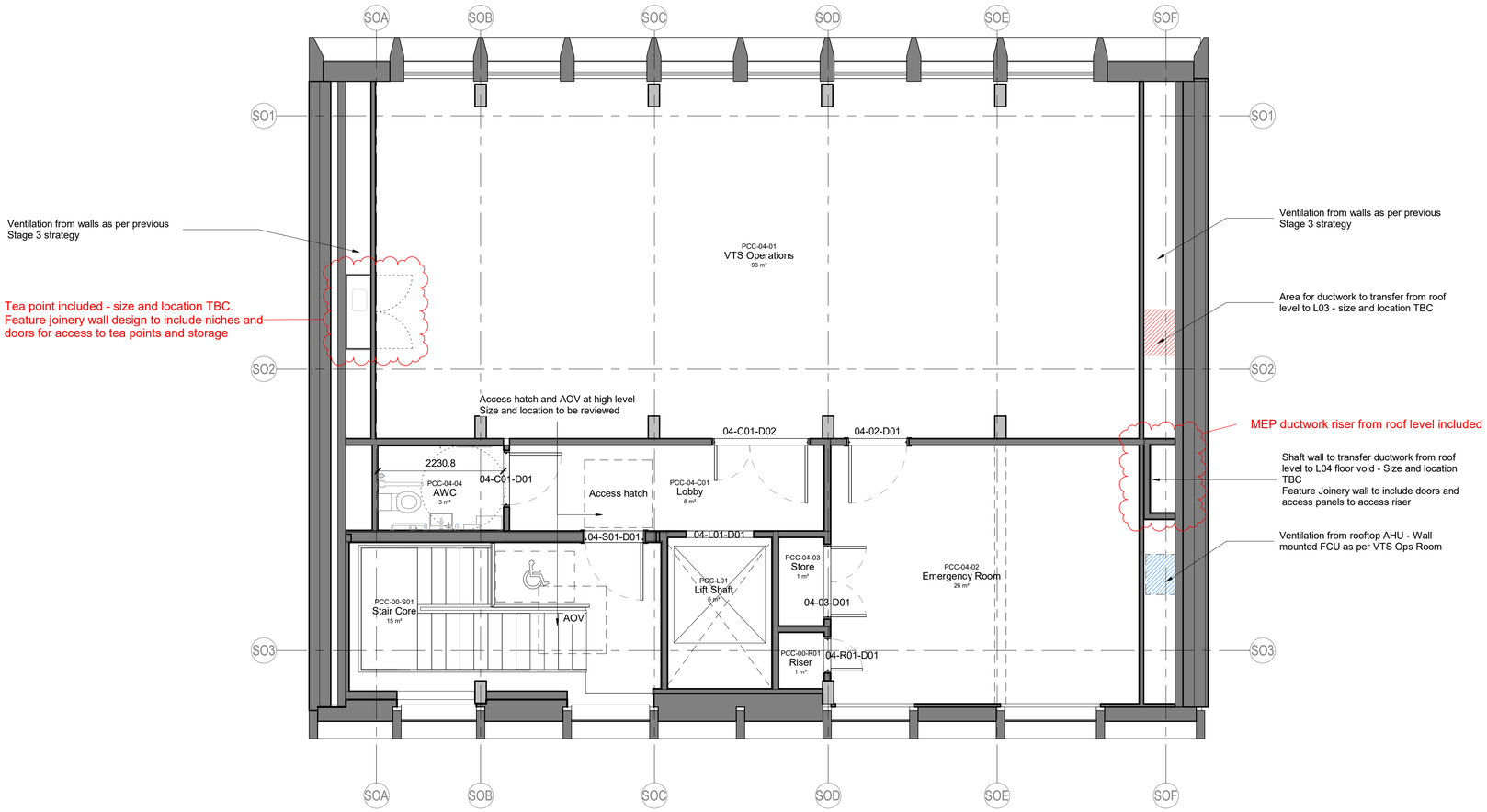
Revision/Suitability
P10 S4

Scale @ A3
1:100

Scale @ A1
1 : 50

Revision Date
250214

YY MM DD



1 Level 04 Floor Plan

1 : 50

Rev	Date	Revision	By	Chk
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P3	220923	WIP - Draft Issue	KL	AB
P4	221007	Stage 3 Issue	KL	AB
P5	240119	Stage 3 Update for Coordination	TD	AB
P6	240206	Stage 3 Issue For SQ Tender	TD	AB
P7	240412	Issued for ITT	TD	AB
P8	250207	Updated Stage 3 - Draft Issue	TD	AB
P9	250214	Updated Stage 3	TD	AB

Notes

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Indicative ceiling mounted ducted FCU locations

Indicative ceiling raft location

Indicative duct routing

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Project
Port Control Centre Gravesend
Port of London Authority

Project No. 2204

Drawing Title
General Arrangement
Level 4 Floor Plan

Drawing Number
PCC-BA-20-L4-D-A-0

Revision/Suitability
P9 S4

Scale @ A3
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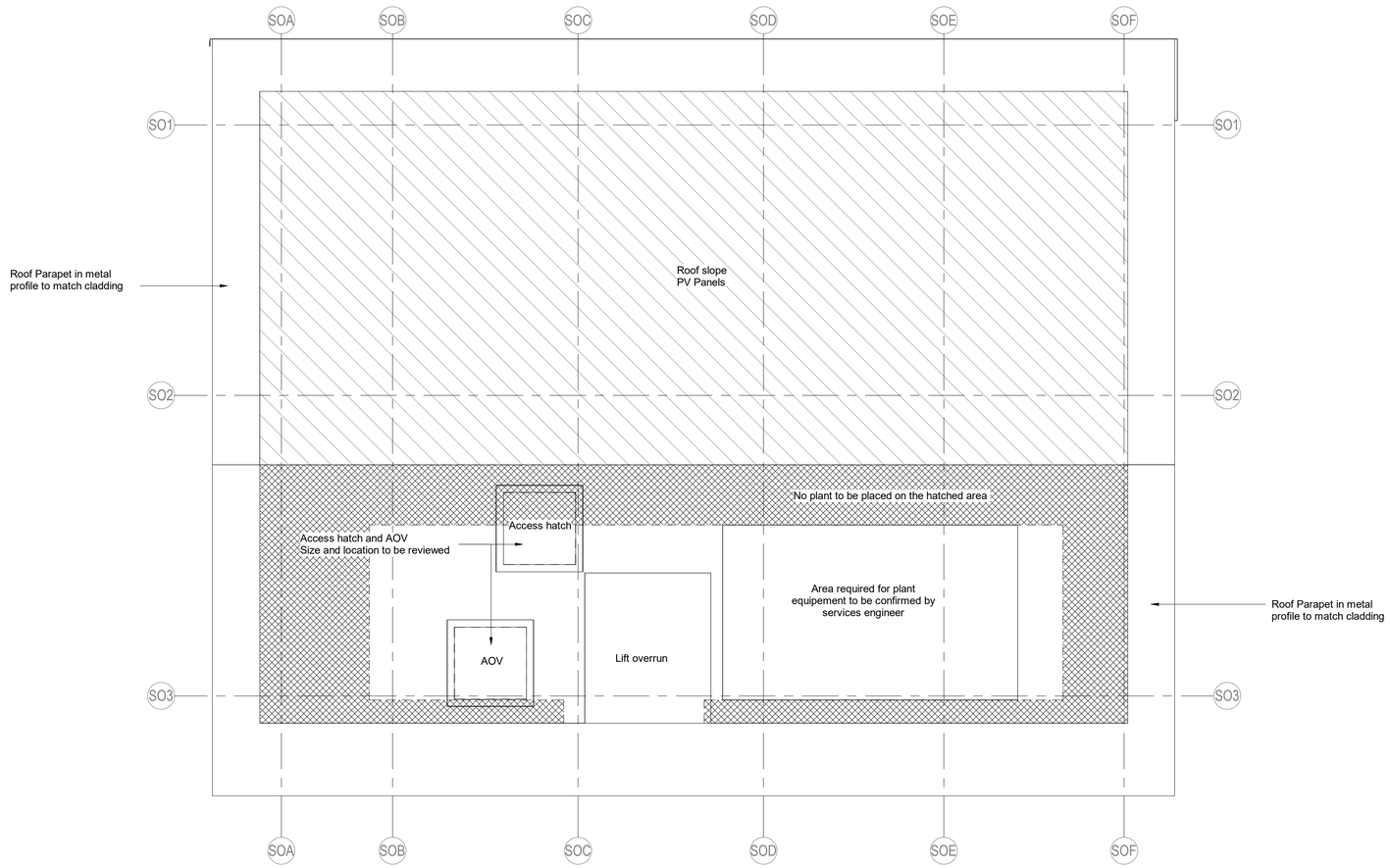
Scale @ A1
1 : 50

Revision Date
250214
YY MM DD



2 Roof Plan

1 : 50

Rev	Date	Revision	By	Chk
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P2	220916	WIP - Draft Issue	KL	AB
P3	220923	WIP - Draft Issue	KL	AB
P4	221007	Stage 3 Issue	KL	AB
P5	240119	Stage 3 Update for Coordination	TD	AB
P6	240206	Stage 3 Issue For SQ Tender	TD	AB
P7	240412	Issued for ITT	TD	AB
P8	250207	Updated Stage 3 - Draft Issue	TD	AB
P9	250214	Updated Stage 3	TD	AB

Notes

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DRAFT ISSUE

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Indicative duct routing

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Project
Port Control Centre Gravesend
Port of London Authority

Project No. 2204

Drawing Title
General Arrangement
Roof Plan

Drawing Number
PCC-BA-20-R1-D-A-0

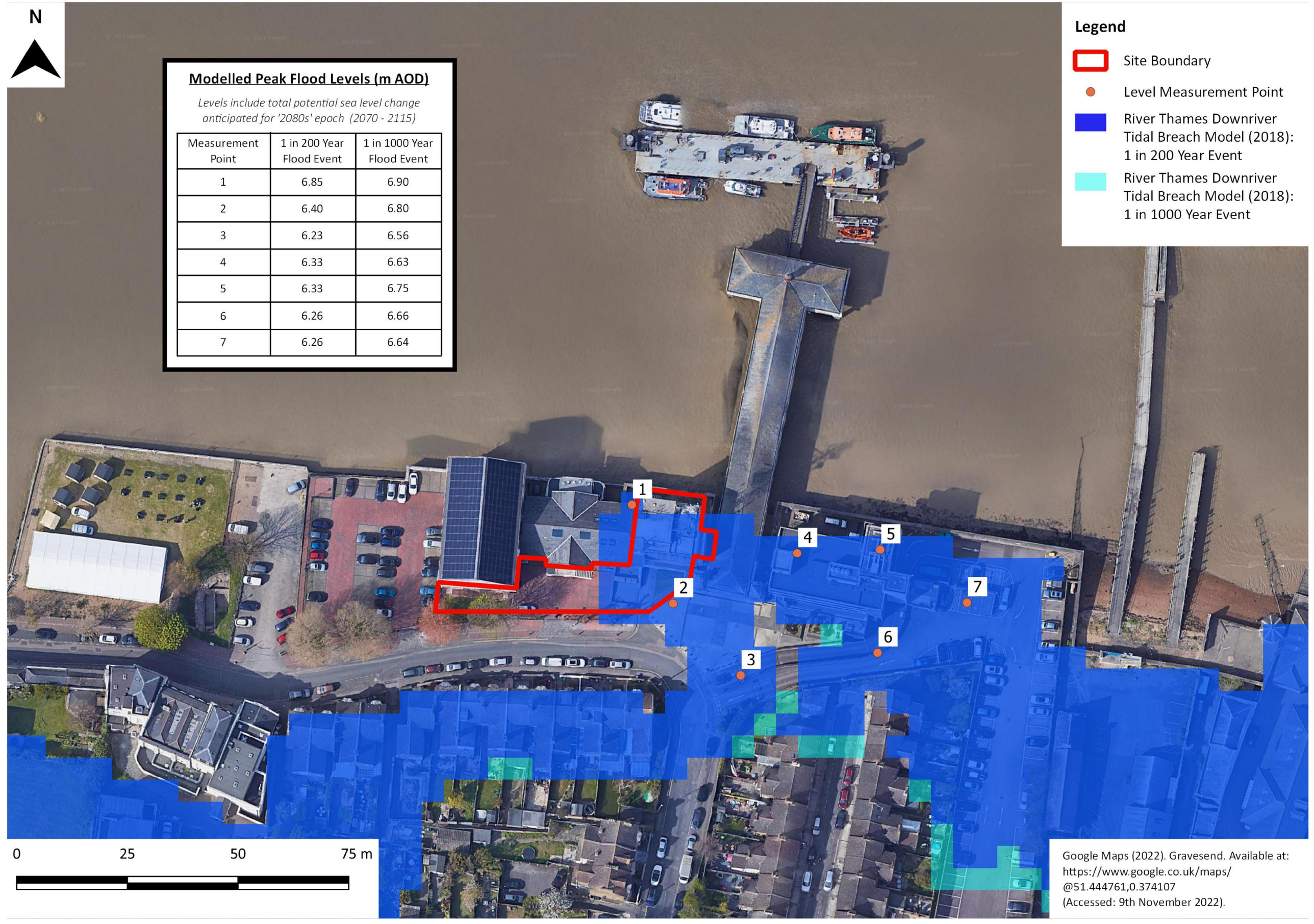
Revision/Suitability
P9 S4

Scale @ A3
1:100

Scale @ A1
1 : 50

Revision Date
250214
YY MM DD

A2 Breach Flood Mapping



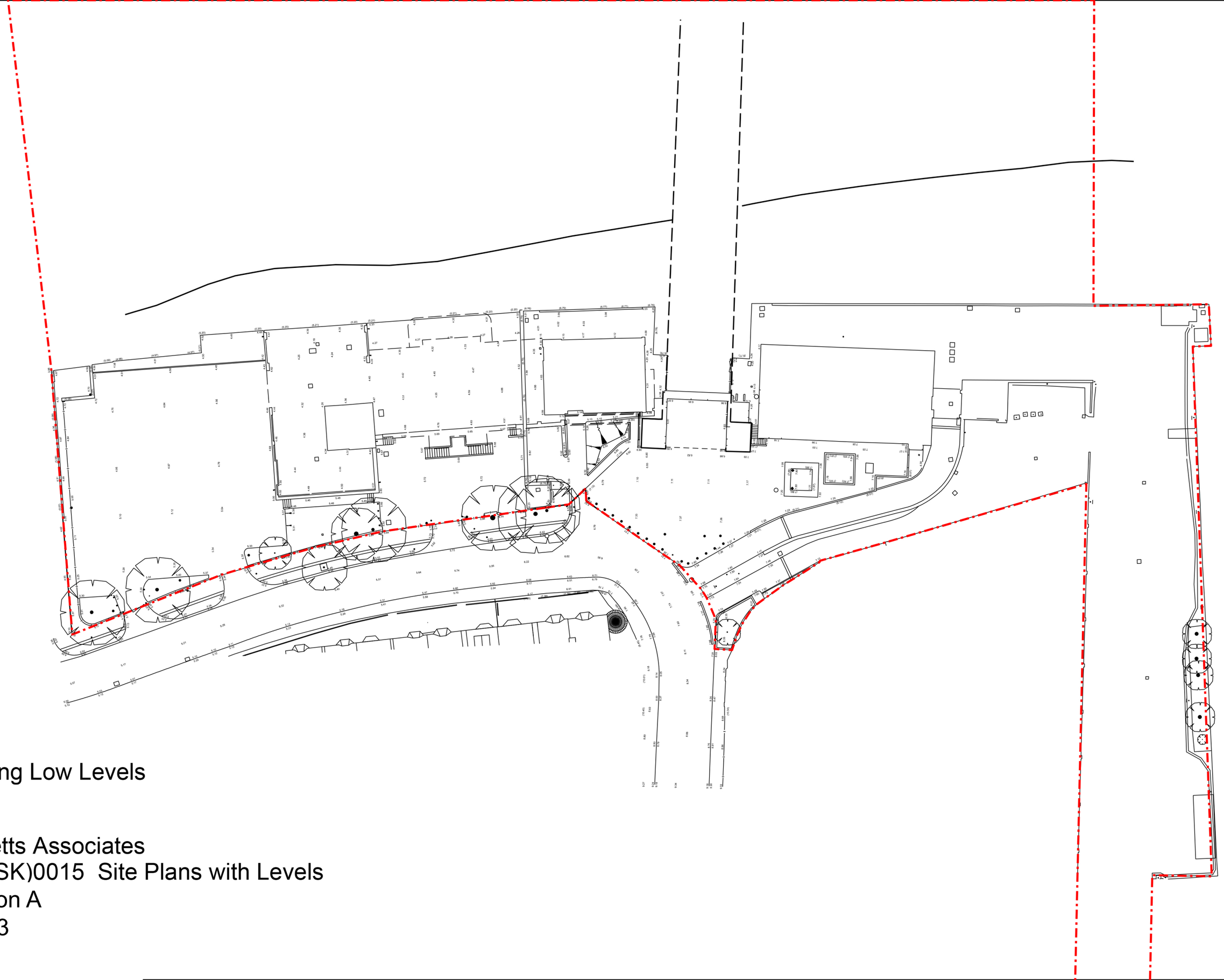
Modelled Peak Flood Levels (m AOD)

Levels include total potential sea level change anticipated for '2080s' epoch (2070 - 2115)

Measurement Point	1 in 200 Year Flood Event	1 in 1000 Year Flood Event
1	6.85	6.90
2	6.40	6.80
3	6.23	6.56
4	6.33	6.63
5	6.33	6.75
6	6.26	6.66
7	6.26	6.64

Google Maps (2022). Gravesend. Available at: https://www.google.co.uk/maps/@51.444761,0.374107 (Accessed: 9th November 2022).

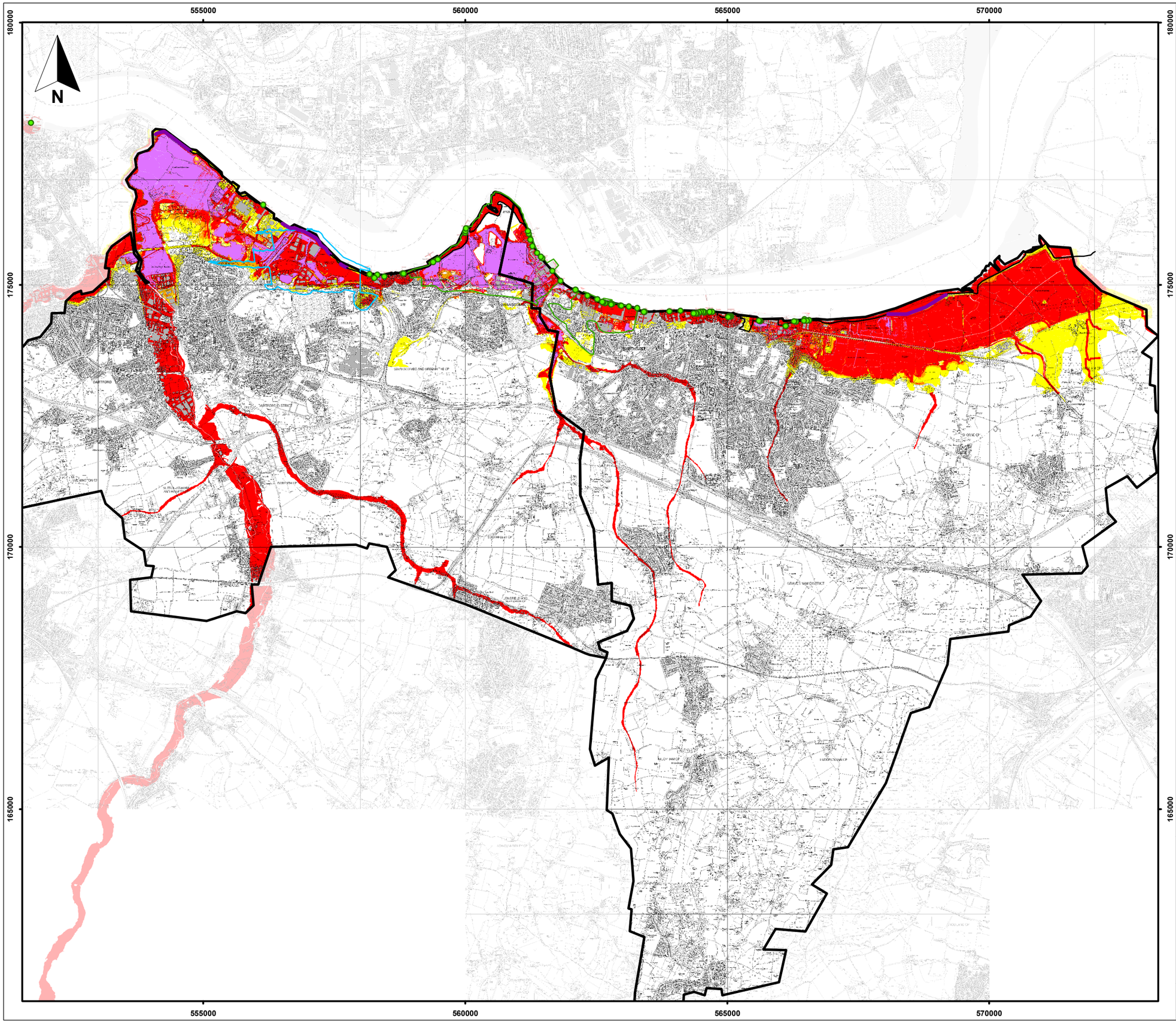
A3 Existing Levels Plan



Existing Low Levels

Bennetts Associates
2204(SK)0015 Site Plans with Levels
Revision A
220923

A4 Strategic Flood Risk Assessment Figures



Key:

- Flood Gates
- District Boundary

Thames Defences

- Elevation Above Flood Design Level
- Elevation Below Flood Design Level

- Groundwater Risk Areas
- Photogrammetry Extent

Residual Risk Areas

- Very High Risk
- High Risk
- Medium Risk
- Low Risk

Note:

Topographical information used to produce this map was

- 2 m spacing LiDAR data flown in April 2001 east of Crossways business park
- 1 m spacing LiDAR data flown in February 2003 west of Crossways business park.
- 1997 photogrammetry at Crossways business park

Changes in landform that have taken place after those dates have not been taken into account due to lack of eliable information. For more details please refer to the Stage 2 Report in Appendix B.

This map should be used as an **indication** of residual flood risk **only.** It does not preclude the requirement for a detailed assessment of flood risk at site specific level. It should not be used exclusively and further information should always be acquired by referring to the Environment Agency.

1,000 500 0 1,000 2,000 Meters

1:70000 @ A3

Project Path: G:/MODEL/PROJECTS/HM-250/15974/ArcGIS/Figures/Stage 3 Figures/Residual Risk.mxd

Kent Thameside SFRA

Figure 7.3
Residual Flood Risk Map

September 2005
15974-B27 wrigt

Entec

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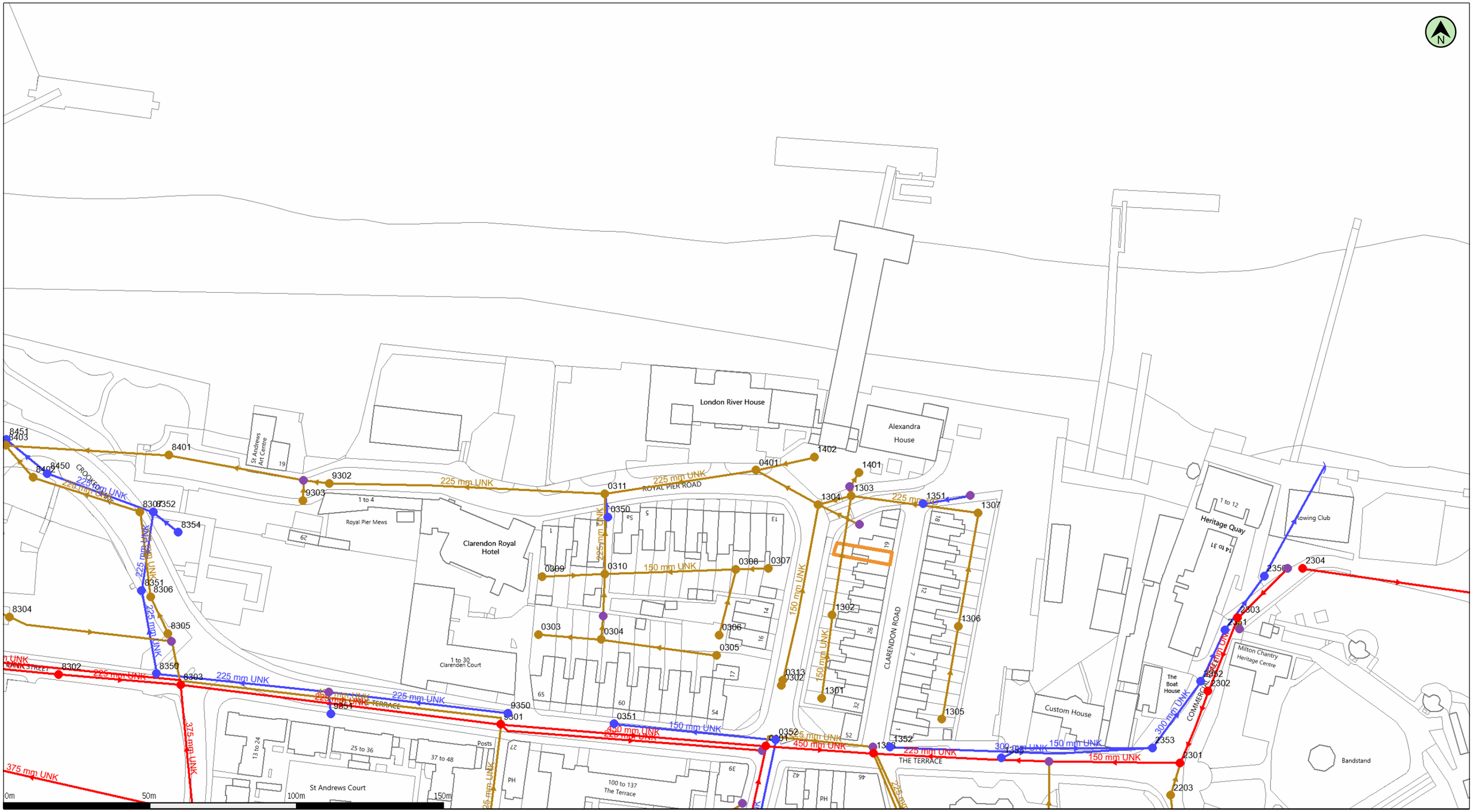
A5 Southern Water Asset Records



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The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2022 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Foul Gravity Sewer
Combined Gravity Sewer
Culverted Water Course or Treated Effluent
Surface Water Gravity Sewer
Rising Main, Vacuum or Syphon
Combined Outfall
Surface Water Outfall
Foul Outfall
Surface Water Inlet
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
WWTW Water Treatment Works
Section 104 Area
Building Over Agreement Area
Foul Manhole
Combined Manhole
Surface Water Manhole
Side Entry Manhole, Decarcation Chamber, Dummy Manhole or Surface Water Soakaway

sophiemccabe@logikaconsultants.co.uk

Port Control Centre

WATER for LIFE from Southern Water.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0301	C	12.64	0.00	
1308	C	11.76	0.00	
2301	C	6.82	0.00	
2302	C	5.67	0.00	
2303	C	5.31	0.00	
2304	C	0.00	0.00	
8302	C	12.29	0.00	
8303	C	12.35	7.06	
9301	C	13.76	6.68	
0302	F	0.00	0.00	
0303	F	0.00	0.00	
0304	F	0.00	0.00	
0305	F	0.00	0.00	
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0308	F	0.00	0.00	
0309	F	7.35	5.66	
0310	F	6.93	0.00	
0311	F	5.21	0.00	
0313	F	0.00	0.00	
0401	F	6.37	3.50	
1301	F	0.00	0.00	
1302	F	0.00	0.00	
1303	F	0.00	0.00	
1304	F	7.62	0.00	
1305	F	0.00	0.00	
1306	F	0.00	0.00	
1307	F	0.00	0.00	
1401	F	7.21	0.00	
1402	F	0.00	0.00	
2203	F	7.47	5.97	
8304	F	0.00	0.00	
8305	F	11.29	8.52	
8306	F	10.03	7.68	
8307	F	8.49	6.64	
8401	F	4.73	2.55	
8402	F	6.15	5.34	
8403	F	5.42	0.00	
9302	F	4.54	2.79	
9303	F	4.79	4.25	
0350	S	5.44	4.61	
0351	S	13.50	0.00	
0352	S	12.49	10.84	
1351	S	5.66	0.00	
1352	S	0.00	0.00	
1353	S	9.29	6.74	
2350	S	0.00	0.00	
2351	S	5.32	3.01	
2352	S	5.81	4.09	
2353	S	7.29	5.08	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
8350	S	12.18	10.77	
8351	S	10.02	8.47	
8352	S	8.50	6.83	
8354	S	9.12	0.00	
8450	S	5.99	4.57	
8451	S	5.54	0.00	
9350	S	13.77	12.40	
9351	S	13.74	13.12	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

A6 Port of London Authority Tide Tables

CHART DATUMS & STANDARD LEVELS IN THE PORT OF LONDON

1. Chart Datum is set to approximately the level of Lowest Astronomical Tide (L.A.T.)
2. Low Water levels in the upper reaches of the tidal Thames are greatly affected by the land water flow at Teddington Weir. **They frequently fall below chart datum** when this flow is significantly reduced, typically during the summer months.
3. Maintained level and chart datum above Richmond half tide weir are both 1.72 metres above Ordnance Datum (Newlyn).
4. Trinity High Water (T.H.W.) is deemed, by the Port of London Act, 1968, to be a level having a value of 11.4 feet **(i.e. 3.475 metres)** above Ordnance Datum (Newlyn).

Tidal Station	Level of Chart Datum below Ordnance Datum (Newlyn) m	Standard levels above local C.D.				
		Mean Low Water Springs MLWS	Mean Low Water Neaps MLWN	Mean High Water Neaps MHWN	Mean High Water Springs MHWS	Highest Astronomical Tide (HAT)
WALTON	2.16	0.5	1.1	3.5	4.3	4.7
MARGATE	2.50	0.6	1.3	4.0	4.8	5.1
SHIVERING SAND	-	0.6	1.4	4.4	5.4	5.7
SOUTHEND	2.90	0.6	1.4	4.8	5.9	6.3
CANVEY	2.97	0.6	1.4	5.0	6.1	6.6
CORYTON	3.05	0.6	1.5	5.1	6.2	6.7
TILBURY	3.12	0.6	1.5	5.4	6.6	7.0
GREENHITHE	3.20	0.6	1.6	5.6	6.7	7.2
DAGENHAM	3.28	0.6	1.6	5.8	7.0	7.5
NORTH WOOLWICH	3.35	0.6	1.6	5.9	7.2	7.7
LONDON BRIDGE	3.20	0.5	1.5	5.9	7.1	7.6
BLACKFRIARS	3.05	0.5	1.4	5.8	7.0	7.5
WESTMINSTER	2.90	0.5	1.3	5.7	6.9	7.4
VAUXHALL	2.59	0.3	1.0	5.4	6.6	7.1
VICTORIA RAIL	2.44	0.3	0.9	5.3	6.5	6.9
ALBERT BRIDGE	2.29	0.3	0.9	5.1	6.3	6.8
WANDSWORTH	2.13	0.3	0.9	5.0	6.2	6.7
PUTNEY	1.98	0.3	0.8	4.9	6.1	6.6
HAMMERSMITH	1.68	0.3	0.7	4.7	5.8	6.4
BARNES	1.37	0.2	0.6	4.4	5.5	6.1
CHISWICK	1.22	0.2	0.5	4.3	5.3	6.0
KEW	1.07	0.2	0.5	4.2	5.2	5.9
BRENTFORD	0.91	0.1	0.4	4.0	5.0	5.7
RICHMOND	0.61	0.1	0.2	3.8	4.8	5.5
TWICKENHAM	Note 3	-		1.5	2.5	3.2