

IMPERIAL PARK SUBSTATION, NEWPORT

Flood Consequence Assessment and Conceptual Surface Water Drainage Strategy



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REPORT

Quality Management

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Contents

1	INTRODUCTION	1
2	PLANNING POLICY	2
3	CONSULTATION	7
4	SITE DESCRIPTION	8
5	PROPOSED DEVELOPMENT	10
6	HYDROLOGICAL SETTING.....	11
7	HYDROGEOLOGICAL SETTING.....	27
8	FLOOD RISK AND MITIGATION	28
9	FLOOD RISK VULNERABILITY CLASSIFICATION	31
10	SURFACE WATER MANAGEMENT.....	32
11	SUMMARY AND CONCLUSIONS	36

Tables

Table 1. Change to extreme rainfall intensity compared to a 1961-90 baseline	5
Table 2. Changes to river flood flows by river basin district (use 1961-90 baseline)	6
Table 3. Estimated mean sea level rise (in metres)	6
Table 4. Modelled Flood Levels (mAOD) and Site Specific Flood Depths (m) - River Ebbw Model.....	15
Table 5. Extreme Sea levels near the site extracted from the 2018 Coastal Flood Boundary Conditions for the UK Study	18
Table 6. Welsh Government Guidance Uplifts for the Year 2100 (published September 2021).....	19
Table 7. Extreme Sea Levels Near the Site with the Upper End Allowance Scenario (95th Percentile) Year 2100 Uplift of 1.11m Applied	19
Table 8. Extreme Water Levels Comparison Between 2016 NRW Model and 2025 FCA.....	20
Table 9. Modelled Scenario Results Used as Proxy for the required 2025 FCA Scenarios	21
Table 10. Modelled Flood Levels (mAOD) and Flood Depths (m) for a Defended Scenario	22
Table 11. Modelled Flood Levels (mAOD) and Flood Depths (m) for an Undefended Scenario	23
Table 12. Flood events in which a development must remain flood free	31
Table 13. Equivalent greenfield runoff rates.....	32
Table 14. Pollution Hazard Mitigation Indices	35
Table 15. Proposed mitigation	36

Figures

Figure 1. Site Location.....	8
Figure 2. Nearby Watercourses.....	11
Figure 3. NRW Flood Map for Planning (Fluvial / River Flooding)	12
Figure 4. NRW Flood Risk from Rivers Map	13
Figure 5. Site Node Locations	14
Figure 6. NRW Flood Map for Planning (Tidal / Sea Flooding)	16
Figure 7. NRW Flood Risk from the Sea Map	17
Figure 8. NRW Flood Map for Planning (Pluvial / Surface Water Flooding)	24
Figure 9. NRW Surface Water Flood Risk Map.....	25

Appendices

Appendix A NRW Responses and Detailed Flood Data
Appendix B IDB Response
Appendix C Topographic Survey and Geotechnical Survey
Appendix D Development Plans
Appendix E Greenfield Runoff Rates
Appendix F General Arrangement - Existing
Appendix G Conceptual Drainage Strategy
Appendix H Causeway Flow Calculations
Appendix I SPEL Management Data Sheet
Appendix J Maintenance Plan

1 INTRODUCTION

Project Brief

- 1.1 RPS Consulting Services Ltd ('RPS') has been commissioned to prepare a Flood Consequence Assessment (FCA) to support a proposed substation in Newport, approximate postcode NP10 8BE.

Assessment Procedure

- 1.2 The aim of the FCA is to outline the potential for the site to be impacted by flooding, the impacts of the proposed development on flooding in the vicinity of the site, and the proposed measures which could be incorporated into the development to mitigate the identified risk.
- 1.3 The report has been prepared in accordance with the guidance detailed in the Planning Policy Wales and Technical Advice Note 15 (TAN15): Development and Flood Risk. Reference has also been made to the CIRIA SuDS manual (C753), the Newport City Council Preliminary Flood Risk Assessment (PFRA) and Local Flood Risk Management Strategy (LFRMS).
- 1.4 This report has been prepared in consultation with Natural Resources Wales (NRW) and Newport City Council as Lead Local Flood Authority (LLFA). The site is located within the Caldicot and Wentlooge Levels Internal Drainage Board (IDB) District.
- 1.5 The desk study was undertaken by reference to information provided / published by the following bodies:
- Natural Resources Wales (NRW);
 - Newport City Council;
 - British Geological Survey (BGS);
 - Ordnance Survey (OS); and
 - Dŵr Cymru Welsh Water.

2 PLANNING POLICY

National Planning Policy

Technical Advice Note (TAN) 15: Development Flooding and Coastal Erosion (2025)

- 2.1 TAN 15 provides technical guidance to supplement the policy set out within Planning Policy Wales in relation to development and flooding and coastal erosion. It provides a framework within which the flood risks arising from rivers, the sea and surface water, and the risk of coastal erosion can be assessed. It also provides advice on the consequences of the risks and adapting to and living with flood risk. It does not take precedence over other Technical Advice Notes and should be considered alongside other planning policies. This document replaces Technical Advice Note 14, published in 1998 and Technical Advice Note 15, published in 2004.
- 2.2 In relation to flood risk, TAN 15 indicates that the Assembly has a duty to ensure that development is sustainable and does not create problems for future generations. Managing flooding has an important role to ensure sustainable development by: guiding developments to locations with little or no risk from river, tidal or coastal flooding, managing consequences of flooding where developments can be justified and making provision for climate change.
- 2.3 The Flood Map for Planning is the starting point for consideration of flood risk in the planning system. The map uses flood zones to indicate the degree to which land is at risk of flooding from rivers, the sea, surface water and small watercourses. TAN15 outlines the actions that should be taken when considering development in the different flood zones. The Flood Map for Planning displays predicted future flood risk under the central climate change estimate.
- 2.4 FCA is required for any development proposal located fully or partly in Surface Water and Small Watercourses - Flood Zones 2 and 3. An assessment should also be undertaken for development on sites outside of these zones, but which has the potential to affect the course of surface water and/or excess water from ordinary watercourses. Planning authorities may provide specific local advice on this issue in Development Plans. Planning authorities should ensure any new development adjacent to Flood Zones 2 and 3 for Surface Water and Small Watercourses is appropriately set back to allow for extreme flood events. Detailed Flood Consequences Assessments, will be required to consider a range of climate change scenarios, including upper end estimates, making reference to the Welsh Government guidance on climate change allowances for planning purposes.
- 2.5 TAN 15 sets out the prime objectives of FCAs as developing full appreciation of;
- The risk and consequences of flooding on the development; and
 - The risk and consequences (i.e. the overall impacts) of the development on flood risk elsewhere.
- 2.6 FCAs must allow for a range of potential flooding scenarios up to and including the flood probability of 0.1% in any year. An allowance for climate change must be made in line with current Welsh Government Guidance.
- 2.7 The FCA can also be used to establish whether appropriate avoidance or mitigation measures could be incorporated within the design of the development to ensure that over its lifetime, development minimises risk to life, damage to property and disruption to people living and working on the site, and does not increase flood risk elsewhere.
- 2.8 The approval of SuDS for a new development by the SAB is independent of the planning process. New developments of more than one dwelling or where the area covered by construction work equals or exceeds 100m² require approval from the SAB before construction can commence.

Adoption and management arrangements, including a funding mechanism for maintenance of SuDS infrastructure and all drainage elements, must be agreed by the SAB as part of this approval. This will ensure that SuDS infrastructure is properly maintained and functions effectively for its design life.

Planning Policy Wales Edition 12, 2024

2.9 Planning Policy Wales Edition 12 sets out the land use planning policies of the Welsh Government. Chapter 6 – Distinctive and Natural Places outlines the Welsh Government's objectives in terms of addressing water and flood risk.

2.10 Section 6.6 of Planning Policy Wales addresses water and floor risk. The relevant guidance is summarized below:

- The planning system should:
 - protect and improve water resources and quality by promoting and encouraging increased efficiency and demand management of water as part of new developments;
 - ensure that the infrastructure networks, including nature based solutions on which communities and businesses depend is adequate to accommodate proposed development, and takes into consideration the impacts of climate change, so as to minimise risk to human health and the environment and prevent pollution at source;
 - ensure sustainable drainage systems are an integral part of design approaches for new development; and
 - ensure the protection of the quantity and quality of surface and ground water supplies is taken into account as part of development proposals.
- Water resources and quality must be taken into account from an early stage in the process of identifying land for development and redevelopment.
- Ensuring the implementation of nature based solutions through green infrastructure provision is a key preference and protecting river corridors should be maximised. The identification of managed wetland and riparian buffer zones should be a key output of assessments to improve water quality, by reducing pollution and securing a net benefit for biodiversity and improving the attributes of ecosystem resilience.
- New development should be located and implemented with sustainable provision of water services in mind, using design approaches and techniques which improve water efficiency and minimise adverse impacts on water resources, including the ecology of rivers, wetlands and groundwater and thereby contributing towards ecological resilience.
- Planning authorities should secure better management of drainage and surface water so as to tackle these issues by:
 - ensuring sustainable drainage systems are incorporated into development enabling surface water to be managed close to or at source; and
 - ensuring connection to the sewer in sewered areas and by minimising the proliferation of private sewage systems.
- New developments of more than one dwelling or where the area covered by construction work equals or exceeds 100 square metres also require approval from the SuDS Approval Body (SAB) before construction can commence. This will ensure that SuDS infrastructure is properly maintained and functions effectively for its design life.
- The provision of SuDS must be considered as an integral part of the design of new development and considered at the earliest possible stage when formulating proposals for new development.

- Planning authorities should adopt a precautionary approach of positive avoidance of development in areas of flooding from the sea or from rivers. Surface water flooding will affect choice of location and the layout and design of schemes, and these factors should be considered at an early stage in formulating development proposals.
- Development should reduce, and must not increase, flood risk arising from river and/or coastal flooding on and off the development site itself. The priority should be to protect the undeveloped or unobstructed floodplain from development and to prevent the cumulative effects of incremental development.
- In areas of flood plain currently unobstructed, where water flows in times of flood, built development should be wholly exceptional and limited to essential transport and utilities infrastructure.
- Development should not cause additional run-off, which can be achieved by controlling surface water as near to the source as possible by the use of SuDS.
- The ability of emergency services to respond to flood events should be taken into account when considering if a development in a flood risk area is appropriate. This may involve consultation with emergency planners, local resilience forums and other professional partners such as fire rescue, police and ambulance services.

2.11 Planning Policy Wales is supplemented by a series of Technical Advice Notes (TAN). TAN15 provides technical guidance on development and flood risk.

Local Planning Policy

Newport Local Development Plan

2.12 The Newport Local Development Plan 2011-2026 was published in January 2015, and contains the following Policies relating to flood risk and drainage:

“SP3 Flood Risk

2.13 *Newport’s coastal and riverside location necessitates that development be directed away from areas where flood risk is identified as a constraint and ensure that the risk of flooding is not increased elsewhere. Development will only be permitted in flood risk areas in accordance with national guidance. Where appropriate a detailed technical assessment will be required to ensure that the development is designed to cope with the threat and consequences of flooding over its lifetime. Sustainable solutions to manage flood risk should be prioritised.*

SP4 Water Resources

2.14 *Development proposals should minimise water consumption, protect water quality during and after construction and result in no net increase in surface water run-off through the sustainable management of water resources by:*

- The use of sustainable drainage systems;*
- The reuse of water and reduction of surface water run-off through high quality designed developments;*
- Careful consideration of the impact upon finite water resources, particularly in terms of increased pressures on abstraction and the impact of climate change.*
- Ensuring development is appropriately located and phased so that there is capacity in the waste water, sewerage and water supply as well as the protection of water quality.”*

2.15 An update to the Newport Local Development Plan is currently being prepared however it has not been adopted.

Preliminary Flood Risk Assessment

- 2.16 A Preliminary Flood Risk Assessment (PFRA) was produced by URS/Scott Wilson in 2011 for Newport City Council and was reviewed in 2017. The PFRA is aimed at providing high-level overview of flood risk from all sources of flooding within the local area, including consideration of surface water, groundwater and ordinary watercourses. Relevant information has been referenced throughout this report.

Local Flood Risk Management Strategy

- 2.17 A Local Flood Risk Management Strategy (LFRMS) was produced in 2014 by Newport City Council as the designated LLFA. The LFRMS aims to understand the risks of various flooding sources that Newport may face, take proactive steps to mitigate these risks, raise awareness across communities and prepare for any such event. Local flood risk is any flood risk that derives from surface runoff, groundwater, or ordinary watercourses. Relevant information has been referenced throughout this report.
- 2.18 A draft LFRMS 2024-2030 has been released containing updated information on flooding from the various sources in Newport.

Climate Change

- 2.19 The Technical Advice Note 15: Development and Flood Risk (TAN15)¹ states that when considering new development proposals, it is necessary to take account of the potential impact of climate change over the lifetime of development. Residential development is assumed to have a lifetime of 100 years, while a lifetime of 75 years is assumed for non-residential developments. To ensure future development can provide a safe and secure living and /or working environment throughout its lifetime, national planning policy requires proposals in areas of high flood risk to be accompanied by an assessment of flooding consequences to and from the development, taking into account the impacts of climate change.

Peak Rainfall Intensity

- 2.20 Both the central and upper end allowances should be assessed to understand the range of impact. As a minimum, proposals should be assessed against the central allowance to inform design levels. It is recommended that the 2080s changes be used when considering a lifetime of a development that extends beyond 2115.
- 2.21 Table 1 presents both the central and upper end estimates for climate change associated with rainfall intensity to understand the range of impact.

Table 1. Change to extreme rainfall intensity compared to a 1961-90 baseline

Applies across all of Wales	Total potential change anticipated for '2020s' (2015- 39)	Total potential change anticipated for '2050s' (2040- 2069)	Total potential change anticipated for the '2080s' (2070-2115)
Upper Estimate	10%	20%	40%
Central Estimate	5%	10%	20%

¹ [Flood Consequences Assessments: Climate change](#)

Peak River Flows

- 2.22 The projected peak river flow change is a range, with the highest estimate equally likely to occur as the lowest estimate. For this reason, it is recommended that the central estimate, or change factor, for the 2080s for the relevant river basin district is used to assess the potential impact of climate change as part of a flood consequence assessment (FCA) and to inform design levels.
- 2.23 In addition to the change factor, an assessment of risk should be made using the upper end estimate. The information derived from this assessment should be used to inform mitigation measures that help to ensure the long-term resilience of the development.

Table 2. Changes to river flood flows by river basin district (use 1961-90 baseline)

Severn	Total potential change anticipated for '2020s' (2015- 39)	Total potential change anticipated for '2050s' (2040- 2069)	Total potential change anticipated for the '2080s' (2070-2115)
Upper Estimate	25%	40%	70%
Central Estimate	10%	20%	25%

Sea Level Allowances

- 2.24 The science behind climate change projections for sea level rise has changed substantially in recent years. The guidance was updated in September 2021² to reflect the higher central allowance (70th percentile) and upper end allowance (95th percentile) of RCP28.5. This reflects an increase in global mean surface temperature of around 4.3°C by 2100.
- 2.25 Table 3 displays the estimates of cumulative uplift for sea level rise for Neath Port Talbot local authority area to 2100 and 2120 (to reflect the 100yr lifetime of development for residential development). The allowances are derived using the UKCP18 2100 dataset.

Table 3. Estimated mean sea level rise (in metres)

Newport	Allowance Percentile	Mean sea level rise (metres) by 2100 (UKCP18 baseline 1981-2000)	Mean sea level rise (metres) by 2120 (UKCP18 baseline 1981-2000)
	70 th	0.85	1.01
	95 th	1.11	1.33

- 2.26 Guidance states that development proposals should be assessed against the relevant regional 70th percentile to inform design levels. An assessment should also be made against the 95th percentile to inform mitigation measures, access and egress routes and emergency evacuation plans.

² [Flood Consequences Assessments: Climate change](#)

3 CONSULTATION

Natural Resource Wales

- 3.1 The FCA has been produced in consultation with the Partnership and Strategic Overview Team at NRW.
- 3.2 NRW has provided the Caldicot and Wentlooge (2016) model as well the River Ebbw (2018) Integrated Catchment Model. The information provided by NRW is included in Appendix A and is summarised in Section 6.
- 3.3 NRW confirm the site benefits from flood defences in the form of an Embankment (EMB1501349), last inspected on the 9th January 2025 and was graded at Condition Grade 3 (Fair).

Internal Drainage District

- 3.4 The site is located within the Caldicot and Wentlooge Levels Internal Drainage District (IDD). Consultation with the IDD has been undertaken as part of the assessment. A response was received on the 18th June 2025, is summarised below and included in Appendix B.
 - As the site is located in the Gwent Levels Internal Drainage District (IDD), there may be a requirement to seek a Land Drainage Consent for works within c.8m of a IDD watercourse.
 - For the FCA they will need to consider the requirements of TAN 15 Technical Advice Note 15: Development, flooding and coastal erosion where Figure 2 sets out the technical requirements of a FCA.

Newport City Council

- 3.5 Newport City Council has been contacted regarding flood risk at the site and requirements for the development. At the time of writing a response is awaited.

4 SITE DESCRIPTION

Site Description

- 4.1 The site is located south of Newport at National Grid Reference ST 28525 83639, is rectangular in shape and occupies an area of approximately 0.2 hectares (ha). The site location is presented in Figure 1.
- 4.2 The site sits within the wider Imperial Park 400kV national grid substation compound. The substation is defined by a private flood defence (set to 6.50m AOD) with flood doors providing access to the site.



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Figure 1. Site Location

- 4.3 The site is currently brownfield land, occupied by energy generating infrastructure. The site is currently 100% hardstanding.
- 4.4 Access to the site is obtained via Duffryn Lane from the North.

Surrounding Land Uses

- 4.5 To the east of the site is Imperial Park 400kV National Grid Substation, also accessible via Duffryn Lane. To the southeast of the site is the Percoed Reen, beyond this appear to be agricultural fields on aerial imagery.
- 4.6 To the west and northwest of the site is well vegetated land with mature trees found to the north. Beyond this the land is seen to be industrial.
- 4.7 The site is located within the Gwent Levels- St Brides Site of Special Scientific Interest (SSSI). The site is not within a Special Area of Conservation (SAC) or Special Protection Area (SPA).

4.8 Approximately 450m west of the site is the Nant-y-Moor Reen.

Topography

4.9 A topographic survey is available for the site in Appendix C. It shows levels along the southern boundary of the site sit between 5.90m AOD and 5.96m AOD.

4.10 A Geotec survey has also been undertaken for the site and wider National Grid Imperial Park substation area, completed by Geotec Surveys Ltd in October 2012. More levels are provided within the site boundary on this survey, included also in Appendix C.

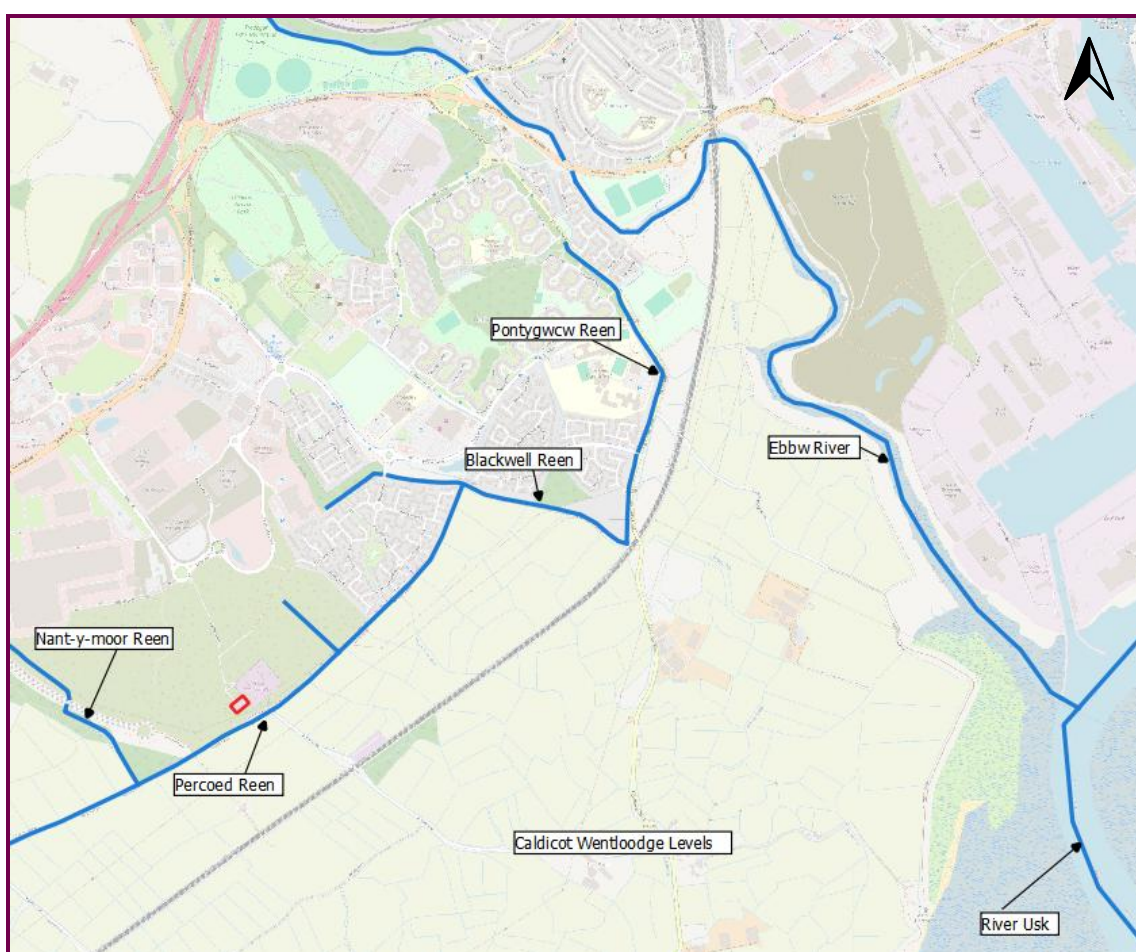
5 PROPOSED DEVELOPMENT

- 5.1 It is proposed to install a substation within the walls of an existing National Grid Substation to the east. The cable route has been submitted as a separate application and is not included in this assessment. Development plans are shown in Appendix D.
- 5.2 The proposed development would comprise the following elements:
- Substation Building, including: Cable Basement, GIS Hall, Control Room, Battery Room, Relay Room, LVAC and Record Room.
 - Transformers; and
 - Extension of Flood Wall;
- 5.3 The proposed use of the site is classified as 'Highly Vulnerable' within TAN 15.
- 5.4 The potential to provide surface water attenuation, including the use of Sustainable Drainage Systems (SuDS), has been considered within Section 10 of this report.

6 HYDROLOGICAL SETTING

Nearby Watercourses

- 6.1 The nearest surface watercourse to the site is the Percoed Reen, located approximately 60m south of the site. The Nant-y-Moor Reen is located approximately 450m west of the site.
- 6.2 The River Ebbw is located approximately 2.2km northeast of the site. This flows in a southerly direction into the Usk Estuary, located approximately 2.8km east of the site.
- 6.3 The Caldicot and Wentlooge Levels, which comprise a series of drainage channels and reens, is located to the south of the site. The reen network is shown to discharge into the River Usk/ Usk Estuary. OS mapping indicates elevation within the Caldicot and Wentlooge Levels is approximately between 5 – 7 m AOD.
- 6.4 Nearby watercourses are shown below in Figure 2.

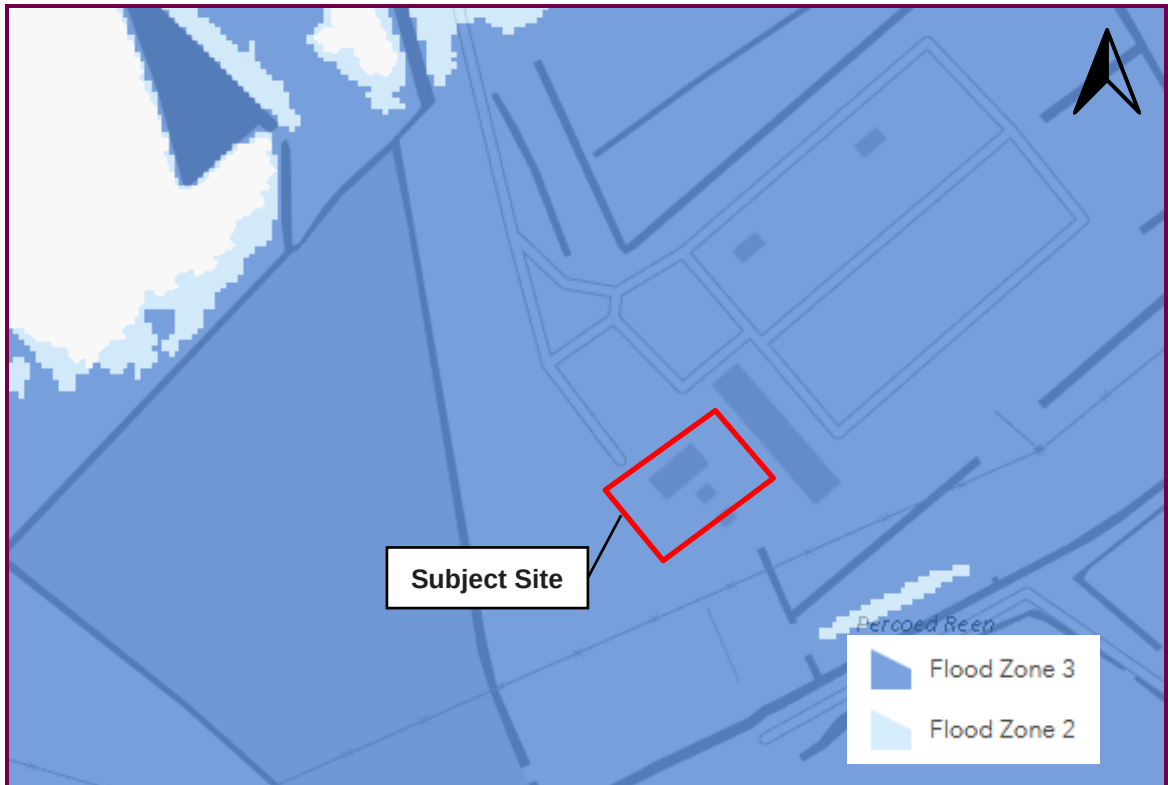


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Figure 2. Nearby Watercourses

Fluvial Flood Risk Classification

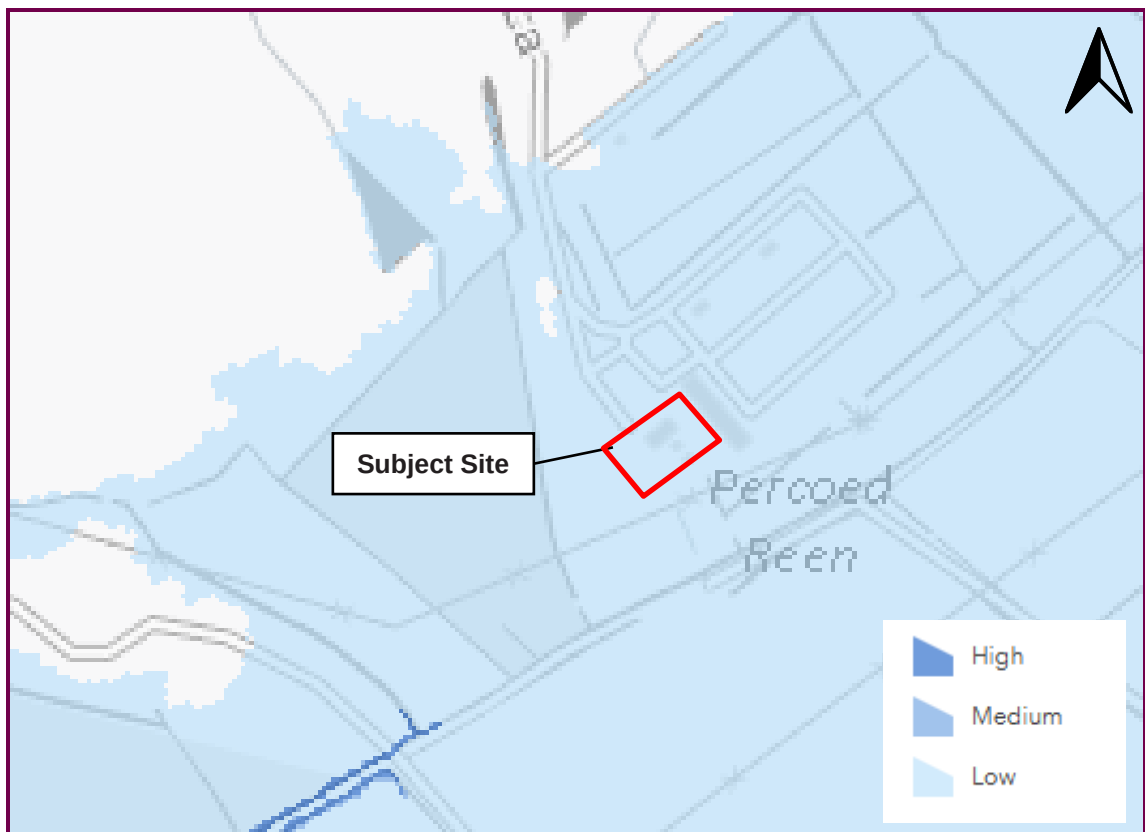
- 6.5 The NRW Flood Map for Planning (FMfP) (for rivers) identifies that the site is classified as Flood Zone 3, whereby the annual probability of fluvial flooding is classified as being greater than 1 in 100 (1%). These Flood Zone take account of the anticipated impacts of climate change.
- 6.6 The NRW FMfP is included as **Figure 3**.



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Figure 3. NRW Flood Map for Planning (Fluvial / River Flooding)

- 6.7 The NRW's Flood Risk Assessment Wales Mapping indicates that the site is at low risk (chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%)) of flooding from fluvial sources when flood defences are taken into consideration. The NRW Flood Map for Fluvial Flooding is included in Figure 4.



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Figure 4. NRW Flood Risk from Rivers Map

- 6.8 The site is shown on NRW mapping to be in a TAN15 defended zone where defences are shown to have a standard of protection of 100 years (2023) against rivers.

NRW Fluvial Flood Modelling

- 6.9 As part of the assessment, NRW provided the River Ebbw (2018) Fluvial Model which included gridded results for the following design scenarios:
- Present day: 1 in 2 year, 1 in 5 year, 1 in 10 year, 1 in 30 year, 1 in 50 year, 1 in 75 year, 1 in 100 year, 1 in 200 year and 1 in 1000 year defended scenarios. The undefended 1 in 100 year and 1 in 1000 year were also provided.
 - Future scenario (2117): 1 in 100 year +25% (central allowance) and the 1 in 100 year +70% (upper end allowance) defended scenarios.
- 6.10 The model outputs are included in Appendix A and summarised below.
- 6.11 The site is shown to be flood free during the defended 1 in 100 year +25% (2117 central allowance). Flooding is confined to the Percoed Reen 150m east of the site. Depths near the Reen sit between 0.25m and 1m.
- 6.12 During the defended 1 in 100 year +70% (2117 upper end allowance) scenario, the site is completely inundated with flood water. Depths are shown to be up to 0.25m in the west of the site where the substation is proposed. In the east of the site, depths remain below 1m, generally sitting between 0.3m and 0.4m.
- 6.13 Flood levels during the 1 in 100 year +70% (2117 upper end allowance) defended scenario sit at approximately 6.29m AOD in the west of the site and reach 6.33m AOD in the east.

- 6.14 No climate change scenarios are available for the undefended scenarios. During the present day 1 in 100 year undefended scenario depths in the site range between 0.25m and 0.4m. During the undefended 1 in 1000 year scenario, depths on site are shown to be between 0.25m and 1m.
- 6.15 Using the topographic ground levels shown on the Geotec survey in Appendix C, modelled flood levels have been compared to onsite ground levels at onsite nodes to provide a more site-specific estimate of depths on site. Figure 5 displays the locations of on-site nodes that flood levels have been extracted for.



Figure 5. Site Node Locations

- 6.16 Table 4 below summarises the modelled flood levels for the above nodes during the defended 1 in 100 year +70% (2117 upper end allowance) scenario and the present day undefended 1 in 100 and 1 in 1000 year events.

Table 4. Modelled Flood Levels (mAOD) and Site Specific Flood Depths (m) - River Ebbw Model

Nodes	1 in 100 year +70% (2117 upper end allowance) defended		1 in 100 present day <u>undefended</u>		1000-year present day <u>undefended</u>	
	Flood level (mAOD)	Approximate Flood Depth (m)**	Flood level (mAOD)	Approximate Flood Depth (m)**	Flood level (mAOD)	Approximate Flood Depth (m)**
1	6.29	0.17	6.28	0.16	6.69	0.57
2	6.29	0.19	6.27	0.17	6.68	0.58
3	6.29	0.16	6.28	0.15	6.69	0.56
4	6.3	0.23	6.28	0.21	6.69	0.62
5	6.3	0.13	6.29	0.12	6.69	0.52
6	6.31	0.15	6.29	0.13	6.69	0.53
7	6.32	0.34	6.3	0.32	6.7	0.72
8	6.32	0.26	6.3	0.24	6.71	0.65
9	6.33	0.24	6.31	0.22	6.71	0.62
10	6.32	0.26	6.3	0.24	6.71	0.65
11	6.32	0.20	6.3	0.18	6.7	0.58
12	6.31	0.22	6.29	0.2	6.7	0.61
13	6.31	0.2	6.29	0.18	6.69	0.58

*** Based on nearest topographic ground level (Geotec Survey, Appendix C).*

- 6.17 Overall, the highest depths and levels are seen in the northwest corner of the site. As the site benefits from defences with a fair condition, the defended 1 in 100 year +25% and 1 in 100 + 70% climate change scenarios should be assessed, in line with Welsh Government Guidance³.

Fluvial Inundation Times

- 6.18 Raw model outputs for the defended 1 in 100 2117 +25% (central allowance) and defended 1 in 1000-year present day scenarios from the River Ebbw (2018) model were provided by NRW. As the site is not impacted by the 1 in 100 year +25% climate change event, the present day 1 in 1000 year results were used to gain an understanding of inundation times on site.
- 6.19 During the defended 1 in 1000 year scenario, flood waters do not reach the site until the 14 hour 40minute after the start of the event. This shows that the lag time of the flood event is relatively long.

³ [Flood Consequences Assessments: Climate change](#)

Tidal Flood Risk Classification

- 6.20 The NRW's FMfP (for the sea) identifies that the site is classified as Flood Zone 3, whereby the annual probability of flooding is greater than 1 in 200-year (0.5%).
- 6.21 The NRW Flood Map for Planning (Tidal/Sea) is included as Figure 6.

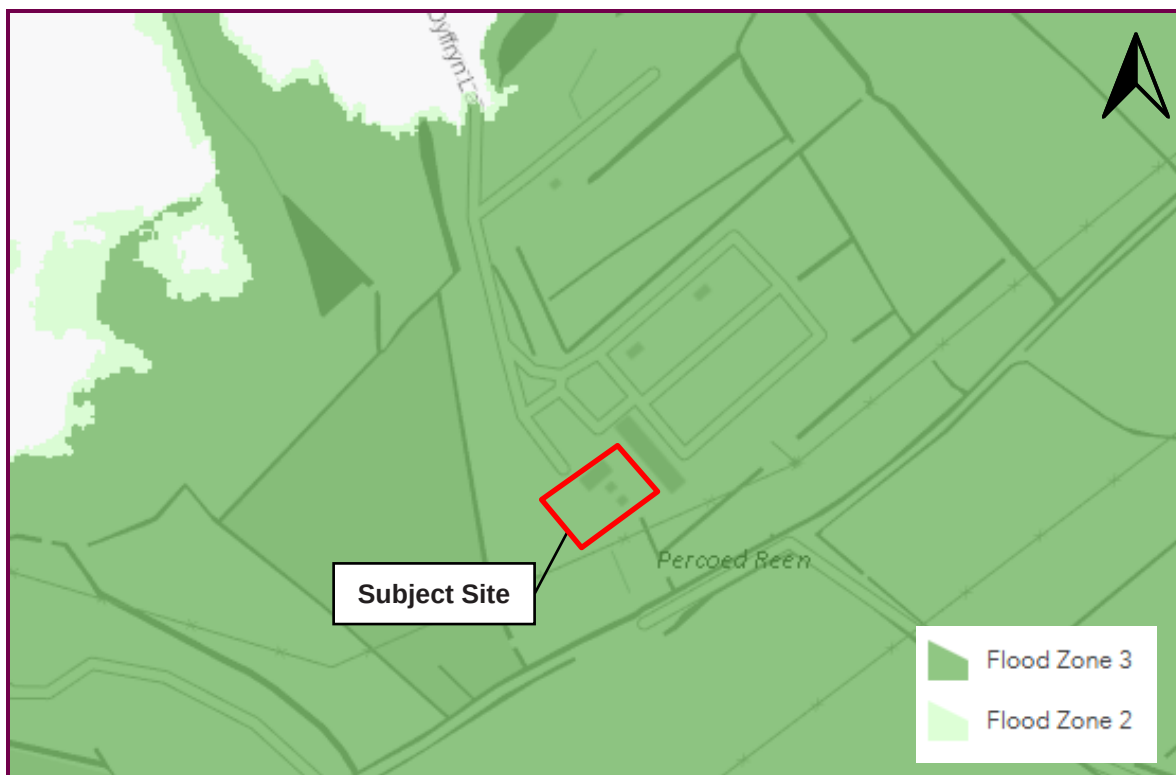


Figure 6. NRW Flood Map for Planning (Tidal / Sea Flooding)

- 6.22 NRW's Flood Risk Assessment Wales Mapping is included in Figure 7 and shows that the majority of the site is at low risk of tidal flooding when flood defences are taken into account.
- 6.23 This corresponds with an annual probability of flooding of between 1 in 1000-year (0.1%) and 1 in 200-year (0.5%).

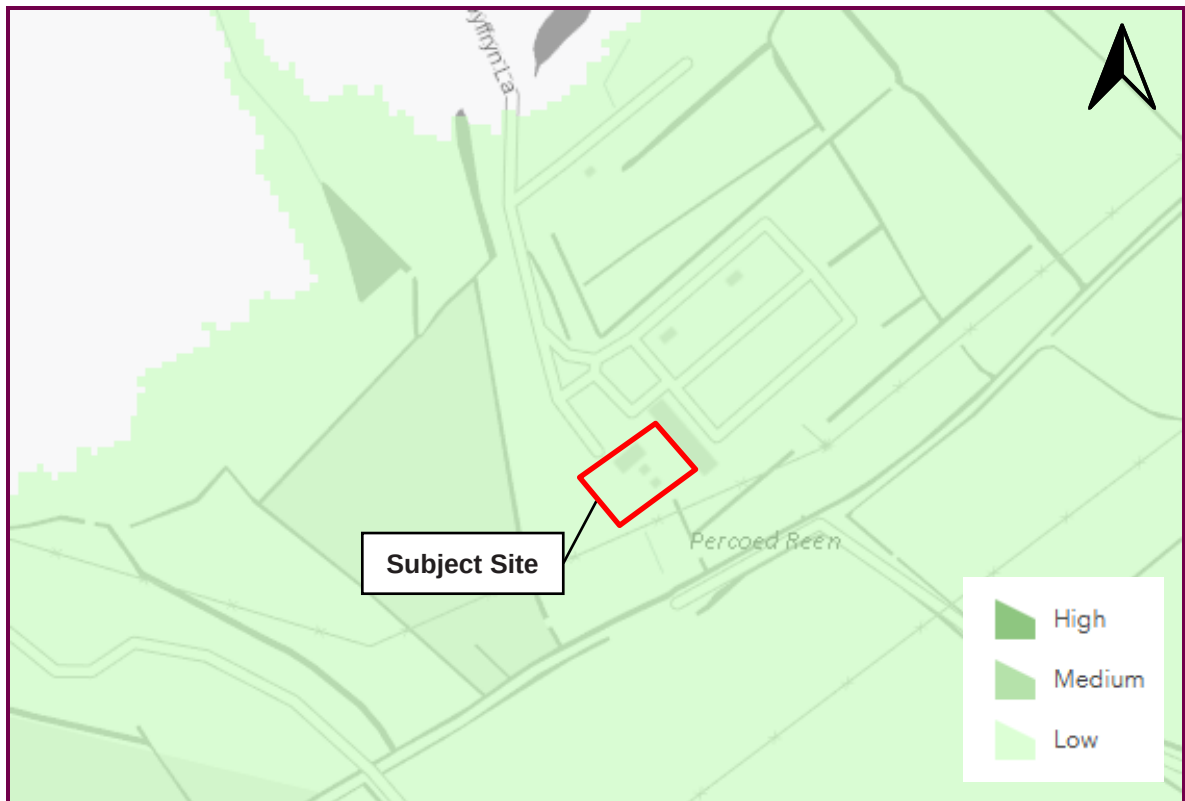


Figure 7. NRW Flood Risk from the Sea Map

- 6.24 The site is shown on NRW mapping to be in a TAN15 defended zone where defences are shown to have a standard of protection of 1000 years (2023) against the sea.

NRW Tidal Flood Modelling

- 6.25 NRW has been consulted for additional information relating to the tidal flood risk to the site. They have provided the Caldicot and Wentlodge (2016) modelling results which RPS has processed and produced flood level mapping. Key information of relevance to this assessment is summarised later in this section, but a formal response regarding modelled flood levels is provided in Appendix A.
- The site is not located within an area where historic flooding has been recorded.
 - The site benefits from protection in the form of an Embankment, assessed in January 2025 to have the condition 'fair'.
 - Modelled flood levels have been extracted for a series of node points within the site boundary. The model results for each scenario are presented in the following sections along with a discussion of how they have informed proposed development design and mitigation measures.

Tidal Flood Levels On Site

- 6.26 Tidal flooding on a site can be seen as the consequence of offshore Extreme Sea Levels (comprising underlying astronomical 'tide' and the passage of a large-scale storm 'surge') being subject to wave action and overtopping then inundating the coastal land.

- 6.27 Extreme Sea Levels are produced from the Coastal Flood Boundary Conditions for the UK Study. The latest study was published in 2018. The Extreme Sea Levels are available as an online dataset⁴.
- 6.28 Table 5 below shows the 1 in 200-year and 1 in 1,000-year Extreme Sea Levels at the nearest nodes for the site.

Table 5. Extreme Sea levels near the site extracted from the 2018 Coastal Flood Boundary Conditions for the UK Study

Node Chainage	200-year Extreme Sea Level (m AOD)	1000-year Extreme Sea Level (m AOD)	Node Chainage Location Map:
396	8.33	8.67	
398	8.25	8.59	
400	8.18	8.52	
402	8.11	8.45	

- 6.29 An allowance must be made for the effect of future climate change on tidal flood risk. The way in which climate change should be considered within a FCA is outlined in the Welsh Government Guidance published September 2021⁵.
- 6.30 The guidance states that an appropriate uplift should be applied to the Extreme Sea Levels. The site has a development lifetime of 75 years. The Guidance provides uplift values for the year 2100 therefore this uplift value has been adopted. There are different uplift values for the higher central allowance scenario (70th percentile) and upper end allowance scenario (95th percentile). These uplifts are presented in Table 6 below.

⁴ Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels (2018); Published by the Environment Agency; Last updated: 15 November 2024 ([Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels \(2018\) - data.gov.uk](https://data.gov.uk/dataset/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018))

⁵ Flood Consequences Assessments: Climate change allowances; Welsh Government; September 2021 (available at https://www.gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf)

Table 6. Welsh Government Guidance Uplifts for the Year 2100 (published September 2021)

Newport	Allowance Percentile	Mean sea level rise (metres) by 2100 (UKCP18 baseline 1981-2000)
	70 th	0.85
	95 th	1.11

6.31 Table 7 below shows the 200 year and 1,000 year Extreme Sea Levels with the Upper End allowance scenario (95th percentile) year 2100 uplift of 1.11 m applied.

Table 7. Extreme Sea Levels Near the Site with the Upper End Allowance Scenario (95th Percentile) Year 2100 Uplift of 1.11m Applied

Node Chainage	200-year Extreme Sea Level (mAOD) for the climate change horizon year 2100 (Upper End 95 th percentile scenario)	1000-year Extreme Sea Level (mAOD) for the climate change horizon year 2100 (Upper End 95 th percentile scenario)
396	9.44	9.78
398	9.36	9.70
400	9.29	9.63
402	9.22	9.56

6.32 The next stage of the analysis would be to “translate” these Extreme Sea Levels into on-site flood levels by undertaking wave action and overtopping analysis and inundation assessment. As an alternative to doing this process, the opportunity to use existing hydraulic modelling data results has been investigated as described in the following sections.

6.33 The NRW has provided the 2016 Caldicot and Wentlooge Coastal Model⁶. The hydraulic modelling exercise uses a detailed approach to assess how Extreme Sea Levels manifest into tidal flood levels in-land (i.e. on the site). The modelling considers the way in which offshore waves morph into the nearshore, calculates volumes of wave overtopping, and simulates flood inundation of the land (taking into account the presence or absence of defences). In this way, the modelling can capture how offshore Extreme Sea Levels are modified by the time they reach the site.

6.34 Due to the age and purpose of the modelling, it does not contain exact equivalent scenarios to those which are required for this 2025 FCA. Since the production of the modelling (in 2016) both the Extreme Sea Levels have changed (these are derived from the Coastal Flood Boundary Conditions for the UK Study which was originally undertaken in 2011 and then updated in 2018) and the climate change uplift magnitudes have been subject to revision. However, there is an opportunity to use the 2016 model results as a proxy for the required 2025 FCA scenarios. A comparison of the events and scenarios in the modelling and the FCA is presented in Table 8, along with the Extreme Water Levels for each.

⁶ Caldicot and Wentlooge Coastal Modelling, 2016, JBA and HT Wallingford for Natural Resources Wales.

Table 8. Extreme Water Levels Comparison Between 2016 NRW Model and 2025 FCA

	2016 Caldicot and Wentlooge Coastal Model (values quoted have been extracted from the model reports)	2025 Flood Consequence Assessment for BESS development
Version of the Coastal Flood Boundary Conditions for the UK Study dataset from which Extreme Water Levels are taken	2011 (note: that the modelling approach did undertake a minor revision to the EWL values)	2018
200-year Extreme Water Level at Newport (node 398)	8.61 m AOD (includes 95% confidence interval of 0.2 m)	8.25 m AOD
1000-year Extreme Water Level at Newport (node 398)	9.13 m AOD (includes 95% confidence interval of 0.4 m)	8.59 m AOD
<i>The above rows show that the 2018 update to the Coastal Flood Boundary Conditions for the UK Study produced lower Extreme Water Levels at Newport compared to the original 2011 version of the Study</i>		
Source of Climate Change Allowance uplift values	Latest guidance available at the time	Welsh Government Guidance published September 2021
Climate Change Horizon considered	Year 2115	Year 2100
Climate Change Confidence Level	95 th percentile	95 th percentile (Upper End)
Climate Change uplift value applied to the Extreme Water Level	1.06 m	1.11 m
<i>The above rows show that the 2016 modelling applies a lower magnitude of uplift than that required for the 2025 FCA.</i>		
200-year Extreme Water Level at Newport (node 398) with Climate Change uplift value applied	9.67 m AOD	9.36 m AOD
1000-year Extreme Water Level at Newport (node 398) with Climate Change uplift value applied	10.19 m AOD	9.70 m AOD
<i>The above rows show that the 2016 modelling uses higher Extreme Water Levels than those required for the 2025 FCA.</i>		

- 6.35 It can be seen that the 2016 modelling uses higher Extreme Water Levels than those required for the FCA assessment. As such it can be concluded that were the 2025 FCA Extreme Water Levels to be put through the model (i.e. be subjected to wave action and overtopping analysis and inundation modelling) to produce tidal flood risk data at the site, the resulting on-site flood levels would be lower than those provided within the 2016 modelling results. As such, it is appropriate to consider the provided model results in a suitable (conservative) proxy for the required data to inform the 2025 FCA.
- 6.36 Table 9 displays which modelled scenario results have been used as a proxy for the required 2025 FCA scenarios.

Table 9. Modelled Scenario Results Used as Proxy for the required 2025 FCA Scenarios

FCA 2025 Required Scenarios	Caldicot and Wentlooge Coastal Model (2016) Proxy Scenario
200-year present day scenario	200-year
200-year Climate Change horizon year 2100 Upper End 95th percentile confidence level scenario	200-year Climate Change horizon year 2115 95th percentile confidence level scenario
1000-year present day scenario	1000-year
1000 year Climate Change horizon year 2100 Upper End 95th percentile confidence level scenario	1000-year Climate Change horizon year 2115 95th percentile confidence level scenario

- 6.37 As discussed in the section above, the model results are being used as a proxy for this 2025 FCA required scenarios. The model results for each scenario are presented in the following sections along with a discussion of how they have informed proposed development design and mitigation measures.
- 6.38 Table 10 and Table 11 summarise the modelled flood levels for the site nodes (Figure 5) during the defended and undefended 1 in 200-year present day, 1 in 200-year Climate Change horizon year 2100 Upper End 95th percentile confidence level, 1 in 1000-year present day and 1 in 1000-year Climate Change horizon year 2100 Upper End 95th percentile confidence level events.

Table 10. Modelled Flood Levels (mAOD) and Flood Depths (m) for a Defended Scenario

Nodes	200-year present day defended scenario		200-year Climate Change horizon year 2100 Upper End 95th percentile confidence level defended scenario		1000-year present day defended scenario		1000-year Climate Change horizon year 2100 Upper End 95th percentile confidence level defended scenario	
	Flood level (mAOD)	Approximate Flood Depth (m)**	Flood level (mAOD)	Approximate Flood Depth (m)**	Flood level (mAOD)	Approximate Flood Depth (m)**	Flood level (mAOD)	Approximate Flood Depth (m)**
1	null	null	6.13	0.01	null	null	8.40	2.28
2	null	null	6.13	0.03	null	null	8.40	2.3
3	null	null	6.13	null	null	null	8.40	2.27
4	null	null	6.13	0.06	null	null	8.40	2.33
5	null	null	6.13	null	null	null	8.40	2.23
6	null	null	6.13	null	null	null	8.40	2.24
7	null	null	6.13	0.15	null	null	8.40	2.42
8	null	null	6.13	0.07	null	null	8.40	2.34
9	null	null	6.13	0.04	null	null	8.40	2.31
10	null	null	6.13	0.07	null	null	8.40	2.34
11	null	null	6.13	0.01	null	null	8.40	2.28
12	null	null	6.13	0.04	null	null	8.40	2.31
13	null	null	6.13	0.02	null	null	8.40	2.29

"Null" = Node location can be considered outside or above the flood extent.

*** Based on nearest topographic ground level (Geotec Survey, Appendix C).*

Table 11. Modelled Flood Levels (mAOD) and Flood Depths (m) for an Undefended Scenario

Nodes	200-year present day undefended scenario		200-year Climate Change horizon year 2100 Upper End 95th percentile confidence level undefended scenario		1000-year present day undefended scenario		1000-year Climate Change horizon year 2100 Upper End 95th percentile confidence level undefended scenario	
	Flood level (mAOD)	Approximate Flood Depth (m)**	Flood level (mAOD)	Approximate Flood Depth (m)**	Flood level (mAOD)	Approximate Flood Depth (m)**	Flood level (mAOD)	Approximate Flood Depth (m)**
1	8.41	2.29	9.70	3.58	8.82	2.70	10.38	4.26
2	8.41	2.31	9.70	3.60	8.82	2.72	10.38	4.28
3	8.41	2.28	9.70	3.57	8.82	2.69	10.38	4.25
4	8.41	2.34	9.71	3.64	8.82	2.75	10.39	4.32
5	8.41	2.24	9.71	3.54	8.82	2.65	10.39	4.22
6	8.41	2.25	9.71	3.55	8.82	2.66	10.39	4.23
7	8.41	2.43	9.71	3.73	8.82	2.84	10.39	4.41
8	8.41	2.35	9.71	3.65	8.82	2.76	10.39	4.33
9	8.41	2.32	9.71	3.62	8.82	2.73	10.39	4.30
10	8.41	2.35	9.71	3.65	8.82	2.76	10.39	4.33
11	8.41	2.29	9.71	3.95	8.82	2.70	10.39	4.27
12	8.41	2.32	9.71	3.62	8.82	2.73	10.39	4.30
13	8.41	2.30	9.71	3.60	8.82	2.71	10.39	4.28

"Null" = Node location can be considered outside or above the flood extent.

*** Based on nearest topographic ground level (Geotec Survey, Appendix C).*

- 6.39 For sites at risk of tidal flooding, the 1 in 200 year plus climate change scenario should be used to assess levels in line with TAN15 guidance. The site is within a TAN 15 defended zone and the condition is confirmed as 'Fair' with a standard of protection of 1000 years against tidal sources. As the SOP exceeds the lifetime of the development and condition is deemed as fair, the defended 200-year climate change scenario will be taken forward to assess levels at the site

Velocities

- 6.40 The NRW Caldicot and Wentlodge (2016) model included velocity data files. RPS processed and produced flood velocity mapping using GIS. The maps are provided in Appendix A.
- For the defended 1 in 200-year and 1 in 1000-year event, no flooding is modelled on site, therefore no velocities are available.

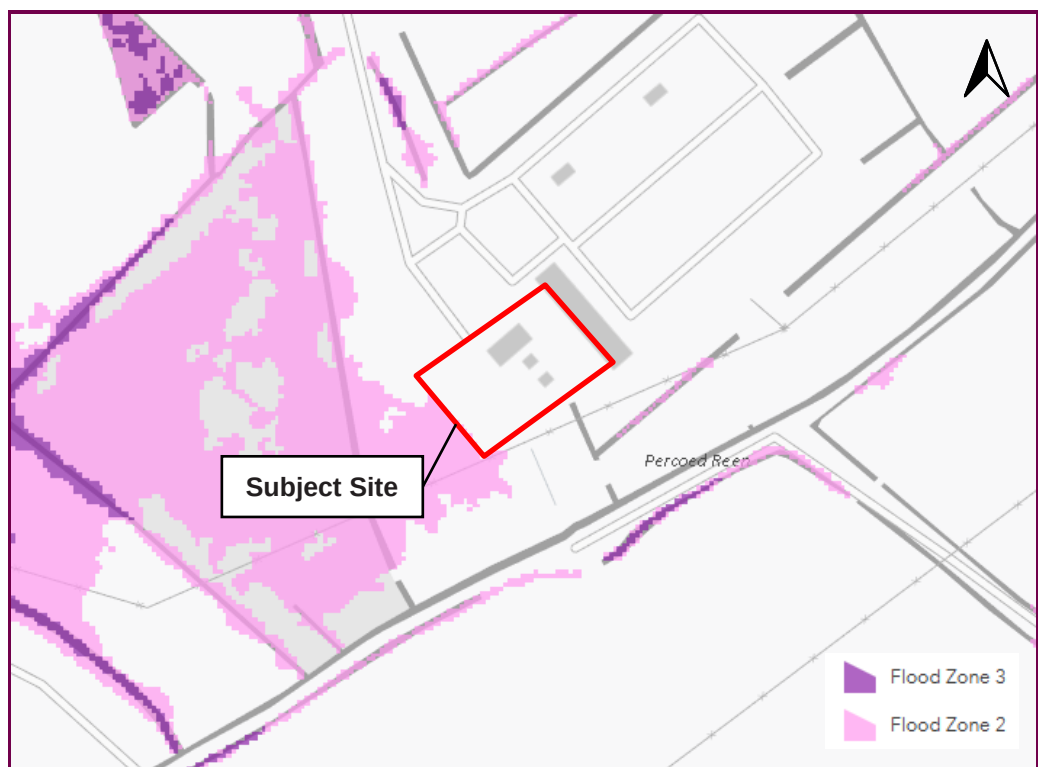
- For the defended 1 in 200-year Climate Change horizon year 2100 Upper End 95th percentile confidence level event, the majority of the site is expected to experience flood velocities that remain below 0.3m/s.
- For the undefended the 1 in 1,000-year Climate Change horizon year 2100 Upper End 95th percentile confidence level event, the southwest corner of the site is expected to experience flood velocities that are between 0.3 to 1.0 m/s. The remaining areas of the site experience flood velocities below 0.3m/s.

Time of Inundation Modelling

- 6.41 The NRW Caldicot and Wentlodge (2016) model included inundation raw data files for defended climate change scenarios only. RPS processed and produced flood inundation mapping using GIS and TUFLOW.
- 6.42 Inundation mapping shows that for the 1 in 200-year Climate Change horizon year 2100 Upper End 95th percentile confidence level event, flood waters from the coast flow through small drains and rivers within the Wentlodge Levels. Water begins to spill out of the Percoed Reen to the south of the site 16hours after the start of the event however, water does not encroach the site until the 21hour 30 minute. Most of the site is inundated with flood waters by 27hours.

Surface Water Flood Risk Classification

- 6.43 The NRW's Flood Map for Planning includes Flood Zones for surface water and small watercourses with consideration for climate change and how it will affect flood risk extents over the next century and is provided in Figure 8.
- 6.44 The NRW's Flood Map identifies that the site is classified as Flood Zone 1, whereby the annual probability of flooding is less than 1 in 1,000-year (0.1%).



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Figure 8. NRW Flood Map for Planning (Pluvial / Surface Water Flooding)

- 6.45 NRW's Flood Risk Assessment Wales Mapping provides surface water flood extents for the 1 in 30, 1 in 100 and 1 in 1,000-year return periods.
- 6.46 The mapping indicates that the site has a negligible risk of surface water flooding.
- 6.47 The NRW Flood Risk from Surface Water Map is provided in Figure 9.



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Figure 9. NRW Surface Water Flood Risk Map

Reservoir Flood Risk Classification

- 6.48 NRW's Flood Risk Assessment Wales Mapping also indicates that the site is not located within an area potentially at risk from reservoir flooding.

Flood Warning and Flood Alert Areas

- 6.49 The site is in the Flood Warning Area for Coast at the Wentlooge Levels in the Newport Area, and the Flood Alert Area for Coast from Aberthaw to Severn Bridge.

Local Authority Flood Risk Documents

- 6.50 The Newport City Council PFRA was published in April 2011 with an addendum in 2017 confirming no significant flood events or new information regarding future climate change has occurred since the first publication. It provides an overview of flood risk from various sources within the borough. Information relevant to this assessment is summarised below:
- One Welsh Water sewer flood incident was recorded approximately 500m north of the site.

-
- On a strategic scale in Newport, groundwater is not considered to be a significant flood risk and is considered to rise and fall relatively slowly. In addition, the local geology is not considered to yield significant volumes of groundwater;
 - Newport City Council own and maintains two reservoirs within their authority boundary, however, there are no records of flooding from these water bodies.

7 HYDROGEOLOGICAL SETTING

- 7.1 British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is situated on Tidal Flat Deposits comprising clay and silt. This is underlain by Mercia Mudstone Group comprising mudstone.
- 7.2 The nearest BGS borehole records to the site are private and could not be accessed. The nearest available borehole (BGS Reference: ST28SE170) is approximately 120m southwest of the site confirms the presence of clay and silt, and also peat approximately 3.5m below ground level (bgl). The record states no groundwater was encountered.
- 7.3 The soils are described as 'loamy and clayey soils of coastal flats with naturally high groundwater' by the National Soils Research Institute.
- 7.4 According to the BGS GeoIndex Aquifer Designation Mapping, the Tidal Flat Deposits at the surface are classified as Unproductive Strata. These formations have a low permeability and have negligible significance for water supply or base flow. The bedrock deposits are classified as a Secondary B Aquifer. These formations are generally formed of lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
- 7.5 NRW online groundwater Source Protection Zone (SPZ) mapping indicates that the site is not located within a groundwater SPZ.
- 7.6 NRW online groundwater vulnerability mapping shows that the site can be considered to have 'Low' vulnerability.

8 FLOOD RISK AND MITIGATION

- 8.1 The key sources of flooding that could potentially impact the site are discussed below:

Fluvial Flooding

- 8.2 The NRW Flood Map for Planning, as seen in Figure 2, indicates that the site is located within Flood Zone 3. The annual probability of flooding is classified as being greater than 1 in 100 (1%) in the absence of any defences.
- 8.3 The NRW's Flood Risk Assessment Wales Mapping indicates that the site is at low risk (chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%)) of flooding from fluvial sources when flood defences are taken into consideration.
- 8.4 The site is located within the TAN15 defended zone, defended from rivers. The standard of protection is shown on NRW mapping to be 100 years for fluvial flooding. There are culverts along the Percoed Reen to the south of the site, these are classified as fluvial defences.
- 8.5 NRW provided the fluvial River Ebbw (2018) model as part of the assessment, and outputs of the data received are included in Appendix A.
- 8.6 The site is shown to be flood free during the defended 1 in 100 year +25% (2117 central allowance) scenario. When considering the upper end allowance of 70%, depths are shown to be up to 0.25m in the west of the site where the substation is proposed. In the east of the site, depths remain below 1m, generally sitting between 0.3m and 0.4m.
- 8.7 Flood levels during the 1 in 100 year +70% (2117 upper end allowance) scenario sit at approximately 6.29m AOD in the west of the site and reach 6.33m AOD in the east.
- 8.8 No climate change scenarios are available for the undefended scenarios. During the present day 1 in 100 year undefended scenario depths in the site range between 0.25m and 0.4m, with levels of between 6.27m AOD and 6.31m AOD. During the undefended 1 in 1000 year scenario, depths on site are shown to be between 0.25m and 1m, with levels between 6.68m AOD in the west and reach 6.71m AOD in the east.
- 8.9 The site is not located within an area where historic fluvial flooding has been recorded on NRW mapping.
- 8.10 The access to the site is shown to be within the fluvial flood extents. It is not expected that the site will have site users regularly. Any site users should sign up to NRW flood warnings and alerts prior to accessing the site, if a warning is issued, they should avoid accessing the site.
- 8.11 Alternatively, if a warning is issued whilst users are on site, they should leave the site via Duffryn Lane. Within 200m, users should be outside of the modelled flood extent. It is anticipated that there will be sufficient time to do this based on inundation time results discussed in 6.18.

Tidal Flooding

- 8.12 The NRW's FMfP (for the sea) identifies that the site is classified as Flood Zone 3, whereby the annual probability of flooding is more than 1 in 200-year (0.5%). However, NRW's Flood Risk Assessment Wales Mapping shows that the majority of the site is at low risk of tidal flooding when flood defences are taken into account.
- 8.13 No historical flood records are held at the site.
- 8.14 As the site is in the presence of defences in 'fair' condition and with a standard of protection of 1000 years for tidal flooding, the defended scenario flood levels and these figures have been used to inform development design and mitigation measures.

-
- 8.15 As outlined in Section 6, the Caldicot and Wentlooge Coastal Modelling (2016) results are being used as a (conservative) proxy for the required 2022 FCA scenarios. As the site benefits from defences, the defended scenarios have been summarised below.

200-year present day defended scenario

- The site remains flood free.

200-year Climate Change horizon year 2100 Upper End 95th percentile confidence level defended scenario

- Flood depths of up to 0.14m may be seen in the northeast of the site.
- Levels are shown to be 6.13m AOD.

1000-year present day defended scenario

- The site remains flood free.

1000-year Climate Change horizon year 2100 Upper End 95th percentile confidence level defended scenario

- Flood depths of up to 2.41m may be seen in the northeast of the site.
- Levels are shown to be 8.40m AOD

- 8.16 Proposed measures detailed below explain how the development will incorporate flood resilience and resistance mitigation measures to reduce the flood risk to the proposed development within the site.

Proposed mitigation

- 8.17 The site benefits from a flood wall surrounding the entire area, set to a level of 6.50m AOD. This is above the modelled defended 1 in 200 year +CC tidal level (6.13m AOD) and is above the 1 in 100 +70% fluvial level (6.33m AOD) with a 370mm and 170mm freeboard respectively.
- 8.18 The flood wall is to be extended to incorporate additional areas as part of the development. The gates along the flood wall are fitted with flood resilient measures to prevent ingress of water.
- 8.19 The final design will be developed cognisant of the Electrical Networks Association ETR138: Resilience to Flooding of Grid and Primary Substations.
- 8.20 Site users should sign up to receive flood warnings and avoid accessing the site if a flood warning is received.
- 8.21 It is recommended that a Flood Management Plan is produced for site management and operational staff, with instructions on appropriate measures to take in the instance of a flood. This will ensure the safeguarding of personnel in the event of a potential inundation. This will be produced in association with the detailed drainage design.

Flooding from Sewers

- 8.22 Sewer flooding can occur during periods of heavy rainfall when a sewer becomes blocked or is of inadequate capacity.
- 8.23 There are no historic flood incidences from sewers recorded at the site.
- 8.24 The risk from sewer flooding can be considered low.

Surface Water Flooding (Overland Flow)

- 8.25 This can occur during intense rainfall events when water cannot soak into the ground or enter drainage systems.

-
- 8.26 The NRWs surface water flood mapping indicates that the site has a negligible risk of surface water flooding.
- 8.27 A conceptual surface water strategy to manage surface water discharge from the site has been prepared and is discussed in Section 10 of this report.
- 8.28 Therefore, the risk of surface water flooding can be considered low.

Groundwater Flooding

- 8.29 This can occur in low-lying areas when groundwater levels rise above surface levels, or within underground structures.
- 8.30 BGS mapping indicates the site is underlain by superficial Tidal Flat Deposits which are described as comprising Clay and Silt. The site is shown to be further underlain by bedrock deposits from the Mercia Mudstone Group which is described as comprising Mudstone.
- 8.31 The Newport City Council Preliminary Flood Risk Assessment suggests that groundwater is not considered to be a significant risk and is considered to rise and fall relatively slowly. In addition, the PFRA notes the local geology is not considered to yield significant volumes of groundwater.
- 8.32 Based on the above the risk associated with groundwater flooding is assessed as low.

Other Sources

- 8.33 There is a limited risk of flooding occurring as a result of a break in a water main.
- 8.34 The risk of flooding associated with reservoirs, canals and other artificial structures is considered to be low given the absence of any such structures in the site vicinity.

Event Exceedance

- 8.35 The mitigation measures proposed as part of the development scheme are considered appropriate to help mitigate against event exceedance scenarios.

9 FLOOD RISK VULNERABILITY CLASSIFICATION

Vulnerability Classification

- 9.1 In accordance with TAN 15 (2025), the proposed development is classified as a ‘Highly Vulnerable’ (All other types) development in flood risk terms.
- 9.2 The required design standard for new development is to be flood free during the 1% river flood (i.e. a flood with a 1 in 100 chance of occurring in any year) and the 0.5% flood from the sea (i.e. a flood with a 1 in 200 chance of occurring in any year), plus an allowance for climate change over the lifetime of development.

Table 12. Flood events in which a development must remain flood free

Vulnerability Classification		Flood Event Type	
		Rivers	Sea
Highly Vulnerable	Emergency Services	0.1% +CC	0.1% +CC
	All other types	1% +CC	0.5% +CC
Less Vulnerable Development			
Water Compatible Development that may be occupied by people		1% +CC	0.5% +CC

Key: 0.1% = 1 in 1000, 1%= 1 in 100, 0.5%= 1 in 200

- 9.3 As the site is classed as ‘Highly Vulnerable’ (all other types) and is shown on the Flood Map for Planning to be at risk of Tidal flooding, the development will need to remain flood free during the 0.5% +CC event. The site is also shown to be at risk of fluvial flooding, therefore it needs to remain flood free during the 1% +CC event from this source.
- 9.4 The existing flood wall surrounding the development is set to 6.50m AOD. This is elevated above the defended 1 in 200+CC tidal level (6.13m AOD) and is above the 1 in 100 +70% defended fluvial level (6.33m AOD). The site will therefore remain flood free during the required events.

10 SURFACE WATER MANAGEMENT

Introduction

- 10.1 The proposed development comprises a substation building and associated transformers. The site is currently predeveloped brownfield land with some hardstanding, the proposed new infrastructure makes up approximately 620m²/ 0.062ha.
- 10.2 It is assumed transformers proposed as part of the development will be appropriately bunded.
- 10.3 Generally, this type of development is considered to have a design life of 50 years. Therefore, for the purposes of this assessment, taking into account the Welsh Government's climate change allowances (published in September 2021), a 40% increase in peak rainfall intensity has been included as climate change allowance, which caters up to the year 2115. No climate change guidance is available beyond 2115.

Existing Surface Water Runoff Rates

Greenfield Runoff Rate

- 10.4 Although the site is considered brownfield due to having previously been developed for energy infrastructure, greenfield rates have been considered in surface water calculations for best practise.
- 10.5 The impermeable area has been taken as the substation building and new proposed transformers, making up 0.062ha.
- 10.6 Greenfield runoff rates for the site have been calculated using the FEH Statistical Method, based on the impermeable area of 0.62ha. The calculation has been included for reference within Appendix E. and outputs are summarised within Table 13.

Table 13. Equivalent greenfield runoff rates

Return Period (years)	Runoff Rate (l/s)
1 in 1	0.18
Q_{BAR}	0.21
1 in 30	0.37
1 in 100	0.45

Q_{BAR} = mean annual flood low
l/s = litres per second

Proposed Runoff Discharge Rates

- 10.7 The 1 in 1 greenfield rate is 0.18l/s. To minimise the risk of flow control blockage, it is proposed to restrict to 2l/s. As the site is considered to be brownfield, this rate is considered a betterment on existing conditions.

Proposed Runoff Discharge Rates

- 10.8 Existing surface water drainage on site is shown in the general arrangement drawing (B2494900-JAC-ZZ-XX-DR-C-003) prepared by Jacobs shown in Appendix F, plans are also shown in the Geotec survey in Appendix C. The plans show that surface water from existing infrastructure outfalls into a ditch to the south of the site.

Consideration of Drainage Hierarchy

10.9 The Welsh Government advises of the following hierarchy for the disposal of surface water;

1. Infiltration;
2. To a surface water body;
3. To a surface water sewer, highway drain or another drainage system; or
4. To a combined sewer.

10.10 The drainage hierarchy has been considered as follows.

Infiltration

10.11 Reference to BGS mapping indicates the site is underlain by clay, silt and mudstone as described in Section 7. Given the reported geological conditions beneath the site, it is considered that soakaways or other infiltration-based SuDS techniques are unlikely to provide a feasible method for the disposal of surface water runoff from the site.

To a Surface Water Body

10.12 The existing surface water drainage discharges into a ditch to the south of the site, it is proposed to connect to this network.

To a Surface Water Sewer, Highway Drain or Another Drainage System

10.13 Surface water is proposed to discharge to the existing drainage network which subsequently discharges into a ditch present to the south of the site.

To a Combined Sewer

10.14 As the hierarchy has been followed, discharge to a combined sewer is not considered further.

Consideration of Sustainable Drainage Systems

10.15 The potential for the use of Sustainable Drainage Systems (SuDS) to provide attenuation within the development has been considered as follows:

Infiltration SuDS Features

10.16 In line with paragraph 10.6 above, the use of infiltration-based SuDS techniques is unlikely to be suitable at the site.

Rainwater Harvesting

10.17 The attenuation benefits provided through the use of rainwater harvesting are considered to be limited and would only be realised when the storage tank was not full. There are limited opportunities for water re-use at the site and therefore, rainwater harvesting has not been proposed at the site as part of this initial attenuation strategy.

Green Roofs

10.18 Due to the type of development on site, being a substation and transformers, the potential use of green roofs is not feasible due to their weight and design. The inclusion of green roofs has not been investigated further.

Swales, Detention Basins and Ponds

- 10.19 Due to the nature of the existing and proposed site, the use of above ground green suds is unfeasible.

Permeable / Porous Paving

- 10.20 The site is currently brownfield developed land with industrial uses. Permeable paving is not proposed as the surrounding land will not be changed as part of the development.

Modular Underground Attenuation Tanks

- 10.21 An underground attenuation tank has been considered to store runoff from the new proposed areas.

Conceptual Surface Water Drainage Strategy

- 10.22 Following the Drainage Hierarchy, the potential for storage and infiltration of runoff has been considered. Infiltration is not considered feasible due to the underlying geology therefore it is proposed to utilise existing drainage infrastructure where feasible. Surface water run-off generated within the proposed development will therefore discharge to the existing drainage ditches.
- 10.23 The Conceptual Drainage Strategy illustrating drainage proposals based upon a discharge to the existing drainage system is presented within Appendix G. The strategy has been designed based on the following parameters:
- Total Site Area = 0.2 ha
 - Total Impermeable Area = 0.062 ha
 - 1 in 1 Greenfield Runoff Rate = 0.18 l/s
 - Proposed Restriction Rate = 2l/s.
 - Attenuation Requirement for 1:100+20%CC design storm event: 26m³
- 10.24 Attenuation requirements were calculated using Causeway Flow, these are included in Appendix H.
- 10.25 Surface water will be conveyed by gravity pipes to a Geocellular attenuation crates. The Geocellular crate has a 95% porosity, area 70m² and depth of 0.4m, and will provide 26.6m³ of storage prior to discharge into the existing drainage network.
- 10.26 Surface water will be restricted to 2l/s via a suitable flow control device before discharging into the existing system. A petrol/silt interceptor is also proposed prior to discharge to the existing system to filter out any possible pollutants.
- 10.27 It should be noted that both the Conceptual Drainage Strategy indicated within Appendix G, and supporting calculations within Appendix H, are preliminary, and as such, subject to further detailed design and approval by the relevant authorities. However, the designs illustrate that surface water arising from the development may be sustainably managed such that it does not pose a flood risk, either to proposed or existing development, to the 1:100+20% climate change storm event
- 10.28 Existing concrete roads and buildings will be left to drain as per existing arrangements. Any necessary amendments to the existing drainage networks will be reviewed at detailed design stage.

Event Exceedance

- 10.29 The proposed indicative surface water drainage concept provides storage up to the 1 in 100 year plus climate change event. In an event exceeding this magnitude, detailed drainage design will identify mitigation measures to ensure that the resulting above-ground flooding will be confined to temporary shallow flooding of the on-site road network and will not affect the buildings on site or significantly increase flood risk to off-site locations.

- 10.30 Event exceedance planning will be undertaken as part of the final design process. Suitable mitigation measures will be incorporated into the development to ensure water is retained on-site should surcharging of on-site drains occur during extreme rainfall events.

Pollution Mitigation

- 10.31 Surface water run-off should be managed by SuDS that are designed to attenuate flows and to avoid water quality impacts downstream. To demonstrate that surface water arising from the development will be appropriately treated prior to discharge, the Simple Index Approach, as outlined within the SuDS Manual (CIRIA C753) has been followed.
- 10.32 As stated in the SuDS Manual 2015 (C753), the risk posed by surface water runoff to the receiving environment is a function of:
- the pollution hazard at a particular site (i.e. the *pollutant source*)
 - the effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels, groundwater (i.e. the *pollutant pathway*)
 - the sensitivity of the receiving environment (i.e. the *environmental receptor*).
- 10.33 The pollution hazard level for the proposed infrastructure is 'Low'. This type of development has identified pollutant hazard indices as per the SuDS Manual (CIRIA C753) Table 26.2 and 26.3 are outlined in Table 14 below.

Table 14. Pollution Hazard Mitigation Indices

Land Use / SuDS Feature	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Proposed Land Uses			
Other roofs (typically commercial/industrial roofs)	0.3	0.2	0.05
Mitigation			
Petrol/Silt interceptor*	0.8	0.6	0.9

* Mitigation indices have been calculated using the Stormceptor Class 1 by-pass Separator ESR manufactured by SPEL (Appendix I)

Maintenance of Sustainable Drainage Systems

- 10.34 As described in the CIRIA SuDS Manual C753, regular inspection and maintenance will be required following construction to allow effective operation of the proposed surface water drainage network and SuDS features. A SuDS Maintenance Plan for the SuDS features is included as Appendix J. A detailed maintenance programme will be required as part of the detailed drainage design for the site.

11 SUMMARY AND CONCLUSIONS

- 11.1 The aim of the FCA is to outline the potential for the site to be impacted by flooding, the potential impacts of the development on flooding both onsite and in the vicinity, and the proposed measures which can be incorporated into the development to mitigate the identified risks and any consequences. The report has been produced in accordance with the guidance detailed in the emerging TAN15. Reference has also been made to the CIRIA SuDS manual (C753) and following consultation with NRW.
- 11.2 The potential flood risks to the site, and the measures proposed to mitigate the identified risks, are summarised in Table 15.

Table 15. Proposed mitigation

Source of Flooding	Identified Risk			Mitigation Proposed	Residual Risk		
	L	M	H		L	M	H
Fluvial		✓		Existing Flood Wall to be retained as part of the development.	✓		
Tidal		✓		Flood Management Plan for Operational Site Users	✓		
Sewers	✓			Not considered to be at significant risk	✓		
Surface Water	✓				✓		
Groundwater	✓				✓		
Other Sources (e.g. reservoirs, water mains)	✓				✓		

- 11.3 The site is located in Tidal and Fluvial Flood Zone 3 and is shown to be defended by coastal flood defences. The site is shown to be flood free during the defended 1 in 100 year +25% (2117 central allowance). During the defended 1 in 100 year +70% (2117 upper end allowance) scenario, the site is inundated with flood water.
- 11.4 The existing flood wall surrounding the site is set above the flood level associated with the 200-year Climate Change horizon year 2100 Upper End 95th percentile confidence level defended scenario. The wall is also set above the modelled 1 in 100 +70% (upper end allowance) defended fluvial flood level.
- 11.5 NRW flood mapping shows currently the site is at little/no risk of surface water flooding.
- 11.6 Overall, it has been demonstrated that the development would be safe, without increasing flood risk elsewhere, and that a positive reduction in flood risk would be achieved through the proposed drainage system.

APPENDICES

Appendix A

NRW Responses and Detailed Flood Data

Evans, Caitlin

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: Thursday, June 12, 2025 10:16 AM
To: Evans, Caitlin
Subject: RE: ATI-28483a P5&6, Imperial Park, Newport, NP10 8BE

⚠ CAUTION: This email originated from an external sender. Verify the source before opening links or attachments. **⚠**

Dear Caitlin,

In relation to your most recent email, please note

EMB1501349 was last inspected on 9th January 2025 and was graded at Condition Grade 3 (fair).

Other NRW Maintained assets in this area were inspected at the same time and were also found to be at condition grade 3.

Flood Defences: EMB1501349

Asset Reference EMB1501349

Type	Defence
Subtype	Embankment
Protection Type	Fluvial
Length (metres)	879.00
Maintained By	Natural Resources Wales
Last Updated	5/22/2025, 1:00 AM

The culverts in the area are LA owned, so you would need to contact them, for more information on the condition/status of these.

I trust this is helpful.

Yn gywir/ Yours sincerely

Enw / Name Michelle Lewis

Teitl swydd / Job title Data Licensing Officer

Adran / Department Customer, Communications and Commercial

Rhif ffôn / Phone number 07917243096

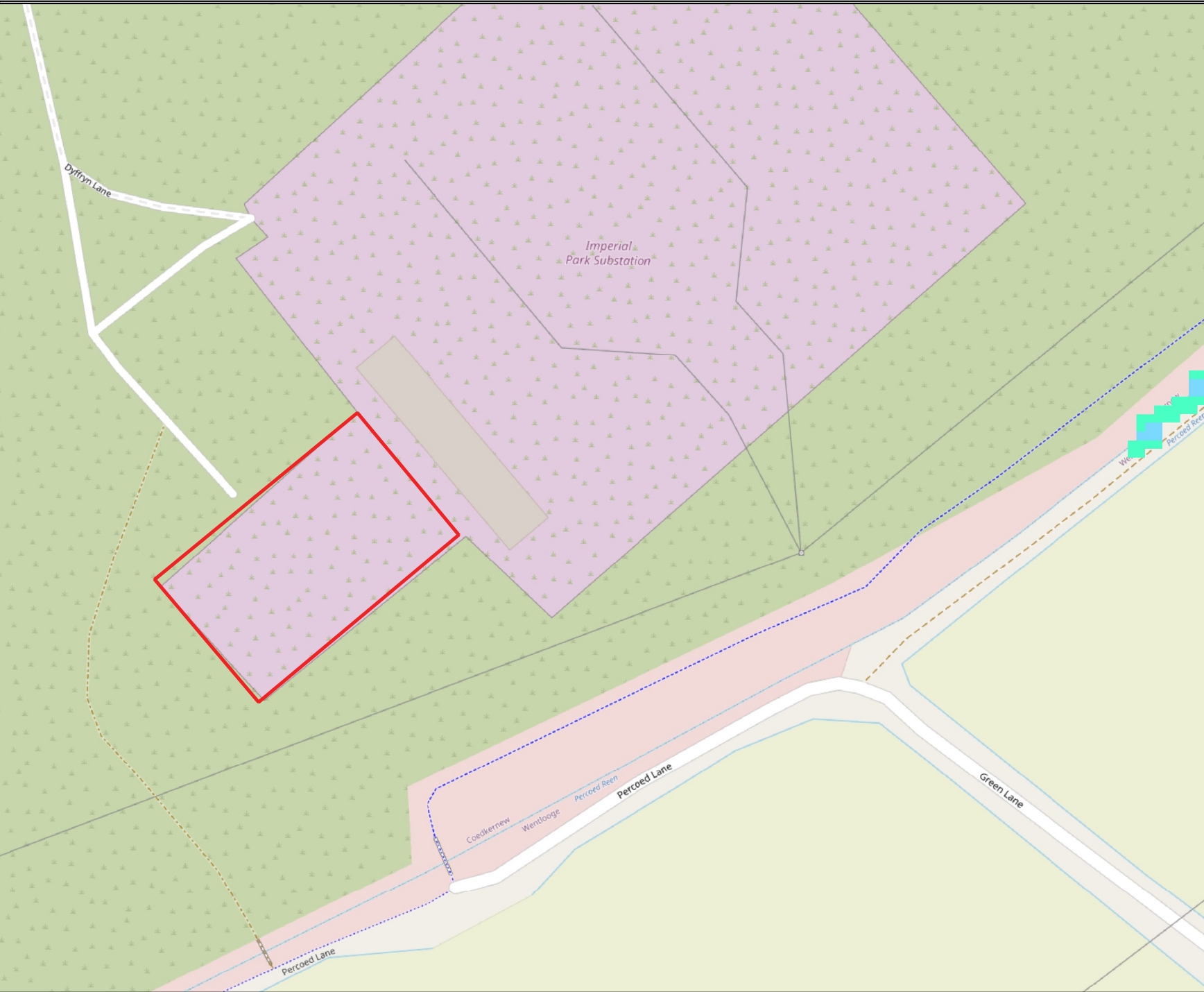
Dyddiau gweithio (os yn berthnasol) / Working days Mon-Fri

Yn Ardystiedig o ran Llythrennedd Carbon/Certified Carbon Literate

Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn

Gymraeg, heb i hynny arwain at oedi.

Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay.



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Red Line Boundary

Depth (m)

<= 0.0000

<0.25

0.25 - 0.5

0.5 - 0.75

0.75 - 1.0

>1.0

**rps**
A TETRA TECH COMPANY

20 Farringdon Street
London, EC4A 4AB
E:rpshydrologyservices
@rpsgroup.com

Client: SSE

Title: Defended 1 in 100 year +25%
CC Depths and Levels- River Ebbw

Site: Imperial Park

Date: 23-06-2025

Scale:1:1,200

Size: A4

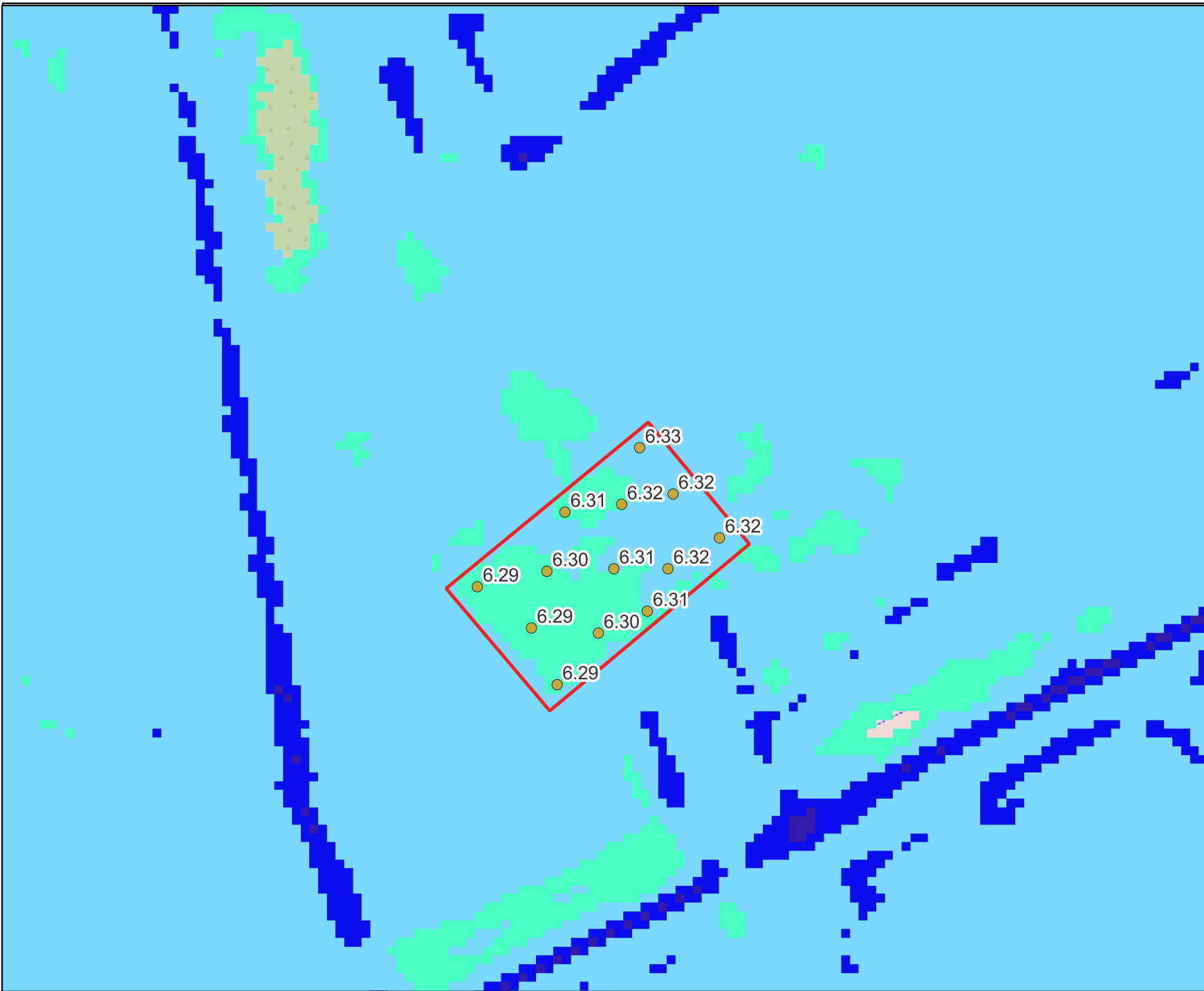
Job Ref: ENV-HYD-22018

Rev: 01

Drawn
CE

Checked
AV

Approved
JM



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2. If received electronically it is the recipients responsibility to print to the correct scale. Only written dimensions should be used.

Depth (m)

	<= 0.0000
	<0.25
	0.25 - 0.5
	0.5 - 0.75
	0.75 - 1.0
	>1.0

Level (m AOD)

rps 20 Farringdon Street
London, EC4A 4AB
E:rpshydrologyservices
@rpsgroup.com
A TETRA TECH COMPANY

Client: SSE

Title: Defended 1 in 100 year +70%
CC Depths and Levels- River Ebbw

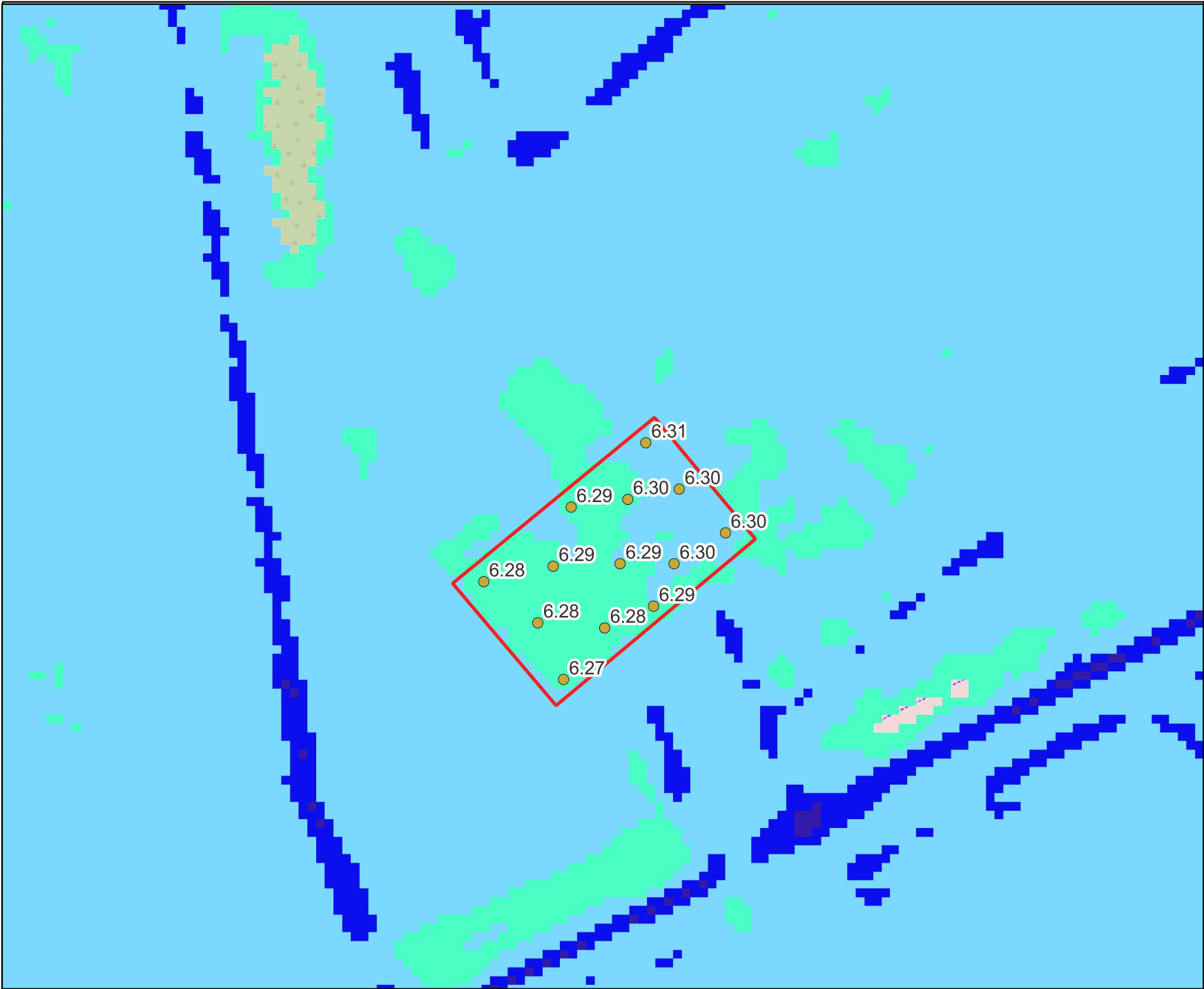
Site: Imperial Park

Date: 23-06-2025

Scale:1:1,200	Size: A4
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Job Ref: ENV-HYD-22018	Rev: 01
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Drawn CE	Checked AV	Approved JM
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2. If received electronically it is the recipients responsibility to print to the correct scale. Only written dimensions should be used.

- Red Line Boundary
- Depth (m)
- <= 0.0000
 - <0.25
 - 0.25 - 0.5
 - 0.5 - 0.75
 - 0.75 - 1.0
 - >1.0
- Level (m AOD)

rps 20 Farringdon Street
London, EC4A 4AB
E:rps hydrologyservices
@rpsgroup.com
A TETRA TECH COMPANY

Client: SSE		
Title: Undefended 1 in 100 year Present Day Depths and Levels- River Ebbw		
Site: Imperial Park		
Date: 23-06-2025		
Scale:1:1,200	Size: A4	
Job Ref: ENV-HYD-22018	Rev: 01	
Drawn CE	Checked AV	Approved JM