

MARGAM FLOOD CONSEQUENCE ASSESSMENT REPORT

NG Margam

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P03 – Incorporation of completed hydraulic modelling with site specific data & amended in accordance with recent TAN15 requirements.

P04 - Update to section 8.0 – Vulnerability to flooding, defining in further detail & context in regards to development vulnerability.

P05 - Update to reflect revised site boundary & amendments in accordance with National Grid / Stantec comments.



Flood Consequence Assessment

Proposed extension of the Margam Substation

BakerHicks Limited

BakerHicks, One Warwick Technology Park, Gallows Hill, Warwick, CV34 6YL

Prepared by:

SLR Consulting Limited

Treenwood House, Rowden Lane, Bradford on Avon, BA15 2AU

SLR Project No.: 402.065363.00001

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10	17 July 2025	Chris Middleton	Brian Dunlop	Travis Malsheimer
11	26 August 2025	Ian Walton	Travis Malsheimer	Ian Walton

Basis of Report

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Acronyms and Abbreviations

AEP	Annual Exceedance Probability
aOD	Above Ordnance Datum
BGS	British Geological Survey
BSI	British Standards Institution
CIRIA	Construction Industry Research and Information Association
DTM	Digital Terrain Model
EAf	Electric Arc Furnace
FCA	Flood Consequence Assessment
FMC	Flood Map for Planning
FMfP	Flood Maps for Planning
GIS	Gas Insulated Switchgear
LPA	Local Planning Authority
NGR	National Grid Reference
NPTCBC	Neath Port Talbot County Borough Council
NRW	Natural Resources Wales
PPW	Planning Policy Wales
PU	Policy Unit
SAB	SuDS Approving Body
SINC	Site of Importance for Nature Conservation
SMP2	Shoreline Management Plan 2
SPZ	Source Protection Zone
SuDS	Sustainable Drainage Systems
TAN15	Technical Advice Note 15



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1.0 Introduction

SLR Consulting Limited (SLR) has been appointed by BakerHicks Ltd. (the 'Client') to complete a Flood Consequence Assessment (FCA) for the proposed extension of the Margam Distribution Substation (the 'Site'). Details of the proposed development are provided in 3.0. The extension will facilitate additional electrical supply and distribution capacity to TATA Steel's new Electric Arc Furnace (EAF) at the nearby TATA Steel Facility.

This FCA has been prepared by SLR Consulting Ltd (SLR) under the direction of an SLR Technical Director of Hydrology who specialises in flood risk and is familiar with Welsh planning policy in so far as it relates to flood risk and drainage matters.

1.1 Site Location

The Site is located directly adjacent to the existing Margam Distribution Substation to the west and is centred on National Grid Reference (NGR) SS 78575 86379. The proposed extension to the substation extends to an area of some 1.73ha.

The Site is located on the east periphery of the TATA Steel Facility approximately 800m to the south of Margam. The Site is accessible via a maintenance access road that leads to the existing substation from the A48 Margam Interchange located west of the M4 motorway.

A Site location plan is included in **Appendix A-1**.

1.2 Aims and Objectives

With reference to the Flood Maps for Planning¹, the Site lies within Flood Zone 3. An extract of the Flood Maps for Planning has been provided **Appendix A-2**

With reference to the Planning Policy Wales² (PPW) and its associated Technical Advice Note 15³ (TAN15), any planning application submitted for the proposed development must be supported by an FCA.

The objective of this FCA is to:

- Identify sources of flood risk at the Site;
- Determine an appropriate design level for the mitigation measures required to ensure that the proposed and existing substation remain free from flooding up the 0.1% Annual Exceedance Probability (AEP) flood event including an allowance for climate change, and;
- To consider the impact of the proposed development on the flood risk elsewhere.

The FCA also considered how the proposed development complies with the requirements of TAN15 in terms of its siting, and the management of flood consequences including the effects of flood risk elsewhere.

1.3 Administrative Context

The Site lies within the Neath Port Talbot County Borough Council (NPTCBC) administrative area. NPTCBC are also the SuDS Approving Body (SAB).

1 Natural Resources Wales (2025) Flood map for planning (April 2025). [Natural Resources Wales / Flood map for planning](#)

2 Planning Policy Wales (Edition 12, February 2024)

3 Technical Advice Note 15: Development and Flood Risk to Planning Policy Wales (March 2025)



1.4 Best Practice

This report has been prepared in accordance with the advice and requirements prescribed in current best practice documents relating to the management of flood risk in development published by the Construction Industry Research and Information Association (CIRIA)⁴, the British Standards Institution (BSI) BS8533⁵ and TAN15³.

4 CIRIA Report C624, Development and flood risk – guidance for the construction industry (October 2004)

5 BS8533:2017, Assessing and managing flood risk in development – Code of Practice (December 2017)



2.0 Site Details

2.1 Existing Site Description

The site of the substation extension lies within the Junction 38 Wetland Complex Site of Importance for Nature Conservation (SINC)⁶, designated for its complex of wetland habitats and woodland, with the footprint of the proposed development being dominated by reedbed and willow/birch scrub⁷. Satellite imagery of the Site and surrounding area has been provided in **Appendix A-3**.

Adjacent to the west boundary of the proposed substation extension is the existing Margam Substation, which comprises of hardstanding raised to 4.15m above Ordinance Datum (aOD), a maintenance access road, ancillary buildings, and electrical infrastructure which includes distribution pylons. These pylons lie outside the Site's northern and southern boundaries.

165m to the east is a woodland area which is partially designated as a Restored Ancient Woodland⁸. It separates the Site and surrounding marsh from three industrial plant facilities: a renewable energy plant operated by Western Bio-Energy Limited, another renewable energy plant operated by Schroders Greencoat Limited, and an industrial gas plant operated by BOC Gas & Gear Limited.

Harbour Way (A4241) is situated 220m to the northeast of the Site, which links to the M4, 1km to the east. 75m to the west is a rail line that separates the existing substation from the TATA Steel Facility. The TATA Steel Facility consists of large open areas of hardstanding, roads, buildings, warehouses, and heavy industrial plant.

2.2 Topography

Regional 2m Digital Terrain Model (DTM) topographic data was downloaded from the National Resources Wales (NRW) LiDAR data viewer⁹ and is reproduced in **Appendix A-4**. The data shows that the Site is located within an area of low-lying land on the fringes of the coastal flats.

Land in the vicinity of the proposed substation slopes generally from the southeast to the northwest. East of Margam the land rises steeply to an elevation of circa. 220m aOD. The TATA Steel Facility to the west is raised on levelled ground at an average elevation of circa. 14.0m aOD. The rail line is raised on an embankment to circa. 5.35m aOD.

Based on a review of the LiDAR data, land within the Site appears to have relatively little topographic variation with an average elevation of circa. 3.37m aOD. The existing substation platform is raised to 4.15m aOD and has several shallow depressions around the platform that are understood to be associated with local drainage features.

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- 6 Neath Port Talbot County Borough Council (2024) Margam and Tai-bach <https://beta.npt.gov.uk/leisure-parks-and-culture/countryside-and-wildlife/npt-wildlife/whats-in-my-ward/margam-and-tai-bach/> (Accessed: 24 July 2024)
 - 7 Stantec (December 2024) Preliminary Ecological Appraisal Report. Margam, National Grid. Prepared for National Grid.
 - 8 NRW (2021) Ancient Woodland Inventory <https://experience.arcgis.com/experience/dd852f0e12864928973e3e165a1b4631/page/English/?views=Layers> (Accessed: 15 August 2024)
 - 9 Natural Resources Wales (2024) Data Map Wales: LiDAR viewer <https://datamap.gov.wales/maps/lidar-viewer/> (Accessed: 24 July 2024)



2.3 Hydrological Context

2.3.1 Hydrology

The Site is located 1.8km inland from the Swansea Bay coastline and lies within a catchment comprising the low-lying coastal strip between the coast and the land just to the east of the M4. The area is known locally as Margam Moors.

The higher ground to the east of the Site, the western flanks of Mynydd Margam, is drained by the Nant Cwm Philip, Nant Cwmcaetrearn and Nant Ffrwdwyllt.

Nant Ffrwdwyllt flows through Port Talbot to the Swansea Bay 2.5km to the north. The Nant Cwmcaetrearn is a tributary of the Nant Cwm Philip which drains south to Margam Duck Pond 1.77km east of the Site. The Nant Cwm Philip then continues to flow south through the pond where it confluences with the Afon Cynffig 3.85km to the south of the Site before finally discharging into the Swansea Bay 3.7km southwest.

The low-lying land in the vicinity of the proposed substation between the elevated railway line to the west and higher ground to the east is drained by a network of ditches to the central 'Upper Mother Ditch' 80m to the east of the substation extension. The ditch drains through a culvert beneath the railway line before passing through a large Sluice Structure 320m to the northwest (NGR: SS 78299 86666). The Structure is comprised of a series of flow controls before leading to a culvert beneath the TATA Steel Facility (the "TATA Upper Mother Outlet").

It is anticipated that the TATA Upper Mother Outlet discharges into Swansea Bay or is routed through a large reservoir on the western side of the facility, which then drains into the bay. The outfall to the sea is protected by a tide flap.

The Eglwys Nunydd Reservoir is located in the southern end of the low-lying land circa 1.0km south of the Site. It receives flow from the Nant Cwm Philip via a sluice-controlled brook and drains to the network of ditches.

2.3.2 Drainage Regime

The Site is undeveloped and is not serviced by a formal drainage network as shown by plans provided by NRW enclosed in **Appendix B**. The plans show that Harbour Way to the north drains to the Upper Mother Ditch via a series of balancing ponds and discharge west to the Sluice Structure.

2.4 Geological and Hydrogeological Context

2.4.1 Geology

The National Soils Resources Institute, Soilscales website¹⁰, identifies '*Loamy and clayey soils of coastal flats with naturally high groundwater*' across the entire Site and much of the wider area.

British Geological Survey (BGS) mapping¹¹ indicates that the area is underlain by superficial Tidal Flat Deposits consisting of clay, silt and sand. The solid bedrock geology underlying the Site and local area is indicated to be South Wales Middle Coal Measures Formation consisting of mudstone, siltstone and sandstone.

10 Soilscales online soil map, Cranfield Soil and Agrifood Institute, <http://www.landis.org.uk/soilscales/> (Accessed: 24 July 2024)

11 BGS Geology of Britain Viewer, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> (Accessed: 24 July 2024)



Intrusive ground investigations were completed at the development Site and local area by Geotechnics Ltd¹² in September 2024. The scope included drilling of boreholes and excavation of trial pits. The plans and records have been provided in **Appendix C**.

The records broadly confirm that the Site is underlain by tidally deposited superficial geologies overlaid onto mudstone bedrock. A summary of BH108 bored to a depth of 14.66m below ground level (3.05m aOD) and located centrally at the development Site has been provided in Table 2-1.

Table 2-1: Summary of Geological Data Observed in BH108

Geological Description	Depth blg (m)
Top Soil	0.40
Blue CLAY	1.00
PEAT	4.30
Gravelly CLAY	5.50
Sandy GRAVEL	7.70
Gravelly brown CLAY	12.00
Sandy gravelly CLAY	12.90
Weak MUDSTONE	14.66
END OF RECORD	

2.4.2 Hydrogeology

The Tidal Flat Deposits has been designated as a ‘*Secondary Undifferentiated*’ Aquifer¹³, defined as “*lower permeability layers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value*”.

The South Wales Middle Coal Measures Formation has been designated as a *Secondary A* Aquifer, defined as “*permeable layers capable of supporting local water supplies and, in some cases, forming an important source of base flow to rivers.*”

The simplified groundwater vulnerability of underlying aquifers at the Site is classified as having *medium to high* vulnerability and is not located within a Source Protection Zone (SPZ).

Groundwater was encountered in BH108 at a depth of 5.80m bgl, corresponding to -2.75m aOD, within sandy gravel strata. The groundwater level subsequently rose by 5.40m, stabilising at approximately 2.65m aOD. This suggests the groundwater table is confined beneath the overlying clayey strata and the peat layer.

Other records contained within **Appendix C** indicate the presence of water within the topsoil; however, this is likely attributable to recent rainfall and is not considered to represent the true groundwater table.

12 Geotechnics Ltd (2025) Ground Investigation Phase 1 [101677 Margam TATA Steel Connection]. REP003 Rev 11.2. Project No.: PC248745. [Accessed 08/07/2025].

13 Natural Resources Wales (2024) Interactive Map Viewer [Interactive Map Viewer \(arcgis.com\)](https://arcgis.com) (Accessed: 24 July 2024)



3.0 Development Proposals

3.1 Project Description

This FCA has been prepared to support the Full planning application for the extension of the Margam 275kV substation including the erection of a gas insulated switchgear hall (GIS hall) and the demolition of the existing control and amenities buildings to enable the erection of a new amenities building. Works to include earthworks, surface water management and drainage infrastructure, lighting, CCTV, boundary treatment, car parking, ecological improvements including a wildlife tower and gabion baskets, improved internal access roads, diesel generator and storage buildings, water storage tank, flood defence wall including flood gates, access road and appropriate landscaping and other associated engineering operations.

A detailed overview of the proposed works to the existing Margam 275kV substation compound is provided below:

- Construction of a GIS hall to house 275 kV electrical switchgear and ancillary equipment;
- The GIS hall to include 12 bays with the provision of 3 spare bays;
- Mechanically Switched Capacitor with Damping Network;
- Realignment of the existing downleads and Super Grid Transformer circuits to new bays within the GIS hall;
- New amenities building to include welfare facilities, meeting room and ancillary office space;
- Hardstanding for the freestanding diesel generator to be used in a backup situation only;
- Security fencing;
- Surface water management and drainage infrastructure including internal drainage systems;
- Flood defence wall (1150mm high and depth 1000mm) and flood gates at existing access points into the existing substation;
- Water storage tank (6m high and 6.1m diameter);
- CCTV;
- Lighting to include 6m medium duty, tilt down tubular steel constructure (exact location to be agreed), 27no. 'label C', 18no. 'label E' and 13no. 'label EX1), dark sky approved.
- Creation of new designated car parking area (four standard bays and two accessible bays).
- Landscaping to incorporate native planting / wildflowers.
- Ecological mitigation to include a wildlife tower and gabion baskets.

The development layout is provided Drawing No. MARPT-BHK-01-ZZ-DG-A-130023 / 13_LOR_0066 enclosed at **Appendix D**.

3.2 Anticipated Lifetime of Development

The proposed development has a 40-year lifetime. However, a conservative approach has been taken in this assessment and a 50-year design lifetime has been assumed. The



development is due to commence operation in 2027 and therefore the flood risk has been considered up to 2077.

3.3 Planning Context

3.3.1 TAN15

PPW² sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales.

TAN15³ provides technical guidance relating to development planning and flood risk in Wales.

A review of the proposed development's compliance with TAN15 is provided in Sections 9.0 and 10.0.

3.3.2 Neath Port Talbot County Borough Council, Local Development Plan

The Local Development Plan (2016–2026)¹⁴ (LDP) was adopted in January 2016 and is the development plan for Neath Port Talbot that provides the basis for decisions on land use planning in the County Borough up to 2026.

Policies that are relevant to flood risk and drainage matters are summarised below.

Overarching Policies

Policy SP1, Climate Change

'In relation to the consequences of climate change:

Likely increased flood risk will be taken into account and addressed by ensuring that there is greater resilience by avoiding development on land that is at risk from flooding in the first instance in accordance with the sequential approach set out in national guidance or in locations that could increase the risk of flooding elsewhere.'

Paragraph 3.0.5

'New developments will be expected to avoid unnecessary flood risk and to meet the requirements of TAN 15: Development and Flood Risk. No highly vulnerable development will be permitted within Development Advice Map (DAM) Zone C2(8) and development will only be considered in areas at risk of flooding where it can be demonstrated that the site can comply with the justification and assessment requirements set out in the TAN'.

Topic Based Policies

Policy BE1 Design

'Proposals will only be permitted where all of the following criteria, where relevant, are satisfied:

9. Its drainage systems are designed to limit surface water run-of and flood risk and prevent pollution'.

Paragraph 5.5.13

14 Neath Port Talbot County Borough Council Local Development Plan (2011-2026) Adopted January 2016 (Accessed: 04 August 2024)



Drainage systems should be designed to ensure that developments have no detrimental effects on the water environment or on flood risk. Normally this will involve the use of Sustainable Drainage Systems (SuDS) techniques.

This assessment will demonstrate how the development complies with the LDP in so far as it relates to flood risk and drainage matters.



4.0 Potential Sources of Flooding

4.1 Screening Study

There are a number of potential sources of flooding, and these include:

- Flooding from rivers or fluvial flooding;
- Flooding from the sea or tidal flooding;
- Flooding from surface water or pluvial flooding;
- Flooding from groundwater;
- Flooding from sewers;
- Flooding from reservoirs, canals, and other artificial sources, and;
- Flooding from infrastructure failure.

4.1.1 Flooding from Rivers or Fluvial Flooding

With reference to the Flood Maps for Planning¹, the detailed map for flooding from Rivers, (reproduced as **Appendix A-2**), shows the proposed extension to the substation to lie wholly within Flood Zone 3. The existing substation lies within Flood Zone 2.

Flooding from this source has therefore been considered in further detail in Section 6.0.

4.1.2 Flooding from the Sea or Tidal Flooding

The Flood Map for Planning indicates that Site is not at risk of tidal flooding. However, given the proximity to Swansea Bay, flooding from this source has been considered in further detail in Section 6.0.

4.1.3 Flooding from Surface Water and Small Watercourses

With reference to the Flood Map for Planning, the detailed map for flooding from Surface Water or Pluvial Flooding and Small Watercourses shows the Site to be at risk of flooding from Surface Water and Small Watercourses.

Flooding from this source has therefore been considered in further detail in Section 6.0

4.1.4 Flooding from Groundwater

Groundwater flooding can occur when a Site is underlain by permeable strata. After a prolonged period of rainfall and groundwater recharge, a rise in groundwater levels above the ground surface can result in flooding. Due to the slow response of groundwater systems, groundwater flooding can persist for an extended period.

High groundwater levels are typically observed close to the coast, where superficial geologies are saturated by the ingress of brackish seawaters and catchment runoff. As the proposed substation is low lying at an elevation of circa. 3.37m aOD, there is a risk of groundwater emergence.

Flooding from this source has therefore been considered in further detail in Section 6.0.

4.1.5 Flooding from Sewers

Data provided by NPT enclosed at **Appendix B** shows that there are no sewers located within the Site boundary. It is understood that the existing Margam Substation and TATA Steel Facility to the west are service by foul and surface water drainage networks. Should



either system surcharge, floodwaters are highly unlikely to propagate to the east and inundate the Site.

Flooding from the source has not been considered further.

4.1.6 Flooding from Reservoirs, Canals and Other Artificial Sources

The Flood Maps for Planning show that the Site is at risk of flooding from the Eglwys Nunydd reservoir located circa.1.0km to the south.

However, reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the regulation authority for the Reservoirs Act 1975 in Wales, NRW ensure that reservoirs are inspected regularly, and essential safety work is carried out.

There are no canals or other artificial sources of within the vicinity of the Site that could give rise to a flood risk

Therefore, the likelihood of flooding from these sources is low and has not been considered further.

4.1.7 Flooding from Infrastructure Failure

During an extreme tidal flood event, overtopping of the flood defences could result in flooding of the land to their rear. Overtopping can significantly increase the potential for scour and erosion of the landward side of a flood defence resulting in the development of a breach through which significant volumes of floodwater would propagate across the coastal flats.

As discussed above, the Flood Map for Planning from the Sea indicates that the Site is not at risk of flooding from the sea, nor does it fall within a TAN15 Defended Zone. However, this is not consistent with the extract of the policy map from the SMP2 enclosed at **Appendix E**. This figure shows a significant extent of flood risk from a 0.1% AEP event originating from the sea, impacting a large portion of the TATA Steel Facility.

In addition, the Upper Mother Ditch drains via the Sluice Structure that discharges catchment runoff to the Swansea Bay via the TATA Upper Mother Outlet under the facility. Should the Structure become blocked, water upstream of the Upper Mother Ditch could back up onto the Site.

Flooding from this source has therefore been considered in further detail in Section 6.0.

4.2 Flood Risk Summary

A summary of the potential sources of flooding and the flood risk arising from them is presented in Table 4-1.



Table 4-1: Potential Sources of Flooding

Potential Source of flooding	Significant Flood Risk at the Site (Y/N)
Rivers or Fluvial Flooding	Y
Sea or Tidal Flooding	Y
Surface Water or Pluvial Flooding	Y
Groundwater	Y
Sewers	N
Reservoirs, Canals and other Artificial Sources	N
Infrastructure Failure	Y

The flood screening assessment has shown that Site is potentially at flood risk from multiple sources, and these are considered in detail in Section 6.0.



5.0 Climate Change

In September 2021, Welsh Government published Flood Consequences Assessments: Climate change¹⁵. This guidance advises that peak rainfall intensity, sea level, peak river flow, and extreme wave heights are all expected to increase in the future as a result of climate change.

The guidance acknowledges that there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios. Uplifts have only been applied where datasets are derived from non-site-specific datasets or where local hydraulic modelling has not included climate change allowances.

The impact of climate change on offshore wind speed and wave height are only of relevance when considering locations in direct proximity to the open coast or other large open bodies of water.

The climate change allowances applicable to the Site relate to peak river flow, peak rainfall intensity, and sea level rise.

5.1 Peak River Flow Allowance

The Site lies within the Western Wales River Basin District.

An extract of Flood Consequences Assessments: Climate change allowances, *Table 1: peak river flow allowances by river basin district* for the Western Wales River Basin District is reproduced in Table 5-1.

NRW recommends that the central allowance for the 2080s is used to assess the potential impact of climate change in FCA reporting and to inform design levels.

Table 5-1: Peak River Flow Allowances by River Basin District (Using 1961 to 1990 Baseline¹⁶)

River basin district (using 1961 to 1990 baseline)	Change Factors	Total potential change anticipated by the 2020s (2009 – 2019)	Total potential change anticipated by the 2050s (2021 – 2049)	Total potential change anticipated by the 2080s (2050 – 2079)
Western Wales	Upper end estimate	25%	40%	75%
	Central estimate	15%	25%	30%
	Lower end estimate	5%	10%	15%

5.1.1 Design Flood Event

Based on NRW guidance¹³ and assuming a development lifetime of 50 years, uplifts in peak fluvial flows of 30% have been adopted to inform the design flood level for the development.

15 Welsh Government, (2021). Flood Consequences Assessments: Climate Change allowance

16 UK Climate Projections (2009) published June 2009 by the UK Government Department for Environment, Food and Rural Affairs.



5.1.2 Impact of Development on Flood Risk to Third Parties

NRW recommends¹³ that FCAs should apply the upper-end climate change allowance when assessing the potential increase in flood risk to third parties arising from development. However, the guidance also states:

“The upper end estimate may not be applicable to every site but will need to be considered depending upon the scale and nature of the site in question.”

Section 10.1 of the hydraulic modelling report enclosed at **Appendix G** confirms that the displacement of floodwaters by the proposed development would result in a minor increase in the flood extent within adjacent industrial premises.

Table 4 of TAN15 considers such sites as *less vulnerable*, i.e. the impacts of flooding are unlikely to present a significant risk to lives or livelihoods.

It is therefore considered appropriate to adopt the central estimate evaluating the potential impact of the development on third parties.

5.2 Peak Rainfall Intensity Allowances

An extract of Flood Consequences Assessments: Climate change allowances *Table 2: Change to extreme rainfall intensity* is reproduced in Table 5-2.

Both the central and upper estimates should be assessed to estimate the range of impacts. The central estimate should be used to inform design levels; however, where the assessment indicates a significant residual flood risk for the upper end estimate, the FCA should include appropriate mitigation measures.

Table 5-2: Change to Extreme Rainfall Intensity (Compared to 1961-90 baseline)

Allowance Category	Total potential change anticipated for 2020s (2015-2039)	Total potential change anticipated for 2050s (2040-2069)	Total potential change anticipated for 2080s (2070-2115)
Upper End	10%	20%	40%
Central	5%	10%	20%

With reference to Table 5-2 the FCA has considered increases in rainfall intensity of 40% over the lifetime of the development.

5.3 Sea Level Rise Allowances

An extract of Flood Consequences Assessments: Climate change allowances *Table 3: Estimated mean sea level rise (in metres) for relevant local authority areas by 2100 and 2120. Allowances are based on RCP8.5 70th and 95th percentiles* is reproduced as Table 5-3.

Development proposals should be assessed against the relevant regional 70th percentile (Higher Central allowance) presented in Table 3 to inform design levels. The 95th percentile (Upper End allowance) should also be assessed to inform any mitigation measures that may be required, access and egress routes and emergency evacuation plans.



Table 5-3: Table 3: Estimated mean sea level rise (in metres) for relevant local authority areas by 2100 and 2120. Allowances are based on RCP8.5 70th and 95th percentiles

Local Authority Area	Allowance Percentile	Mean Sea Level Rise (metres) by 2100 *(UKCP18 baseline 1981-2000)	Mean Sea Level Rise (metres) by 2120 *(UKCP18 baseline 1981-2000)
Neath Port Talbot	70 th (Higher Central)	0.84	1.00
	95 th (Upper End)	1.11	1.32

The review of the tidal flood risk to the Site will therefore consider the 0.84m uplift associated with the 70th percentile up until 2100. However, this is for a considerably greater lifetime than that of the development of 50 years.

To consider the impact of climate change on sea levels over a shorter lifespan, it is appropriate to refer to the Sea Level Allowances published by the Environment Agency¹⁷ for the 'South West', which are presented in Table 5-4. This table shows the estimated annual uplifts to mean sea level over a number of epochs. These uplifts apply to coastal areas in the Bristol Channel, including Swansea Bay.

Table 5-4 Sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline)

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (meters)
South West	Higher Central	5.8 (203)	8.8 (264)	11.7 (351)	13.1 (393)	1.21
	Upper End	7.0 (245)	11.4 (342)	16.0 (480)	18.4 (546)	1.62

Clearly, there is some discrepancy in the cumulative rise to 2120 between the Welsh Government and Environment Agency guidance, however, by adopting the Environment Agency guidance provides a conservative estimate for the shorter lifetime of development.

A higher allowance for the increase in sea levels of 0.51m to 2077 was therefore estimated. Calculations are provided in **Appendix G**.

17 <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#sea-level-allowances>



6.0 Assessment of Flood Risk

6.1 Potential Sources of Flood Risk

The flood screening assessment reporting in Section 4.0 and summarised in 4.2 indicates that Site may be at risk of flooding from the following sources:

- Rivers or Fluvial Flooding
- Sea or Tidal Flooding
- Surface Water or Pluvial Flooding
- Groundwater Flooding
- Infrastructure Failure

The risk of flooding from these sources is considered in detail below.

6.2 Data Sources

6.2.1 Introduction

In considering the flood risk to the Site, the following data sources have been reviewed:

- Flood Map for Planning
- Hydraulic models
- Flood Risk Management Plan¹⁸
- Strategic Flood Consequence Assessment¹⁹
- Shoreline Management Plan 2

Hydraulic modelling output data was sampled and analysed using the baseline run used for NRW Flood Maps for Planning in Section 6.0. Datasets were mapped onto the Site using Geographic Information System software for accurate determination of flood levels, depths and velocities.

6.2.2 Flood Map for Planning

The Flood Map for Planning published on the NRW¹ website indicates that:

- Rivers – the Site is in Flood Zone 3. Areas with more than 1% (1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.
- Sea – the Site is in Flood Zone 1. Areas with less than 0.1% (1 in 1,000) chance of flooding from the sea in a given year, including the effects of climate change.
- Surface Water and Small Watercourses – the Site is in Flood Zones 2 and 3. Areas with 0.1% to 1% (1 in 1000 to 1 in 100) and more than 1% (1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change respectively.
- TAN15 Defended Zone – the Site does not benefit from river or tidal flood defences.

18 Neath and Port Talbot (2015) Flood Risk Management Plan 2015 (Accessed 12 August 2024)

19 Neath and Port Talbot (2014) Strategic Flood Consequences Assessment Stage 1 & 2 (September 2014) (Accessed: 12 August 2024).



6.2.3 Hydraulic Models

In response to a formal data request, NRW provided outputs from a hydraulic model developed to consider the flood risk arising from the Margam Duck Pond.

The Margam_FMC_5_V1.0 2023 Model was completed to support a formal Flood Map Challenge (FMC) to the flood mapping previously published by NRW. The FMC was accepted by NRW and integrated into the updated Flood Map for Planning, for Rivers and Sea.

It should be noted that the FMC Model did not consider breaches of the existing tidal defences.

The Port_Talbot_5_V3.1_2021 hydraulic model, which covers the wider coastal catchment to the north of the Site was also reviewed alongside the FMC Model. It was concluded that the Port Talbot model had no significant impact on flood risk to the Site and was thus excluded from further analysis.

The FMC Model run 093 represents the baseline scenario where the initial water level in the Margam Duck Pond (referred to as 'Ty Du'), located 1.77km east of the Site, is set at 44.12m aOD with the sluice gate closed to reflect the 'default' conditions without pre-storm 'interventions'. By comparison, FMC Model run 094 incorporates a sensitivity test with the sluice gate open and the initial water level lowered to 43.0m aOD to simulate pre-storm drawdown to mitigate potential flooding.

It was clear from a review of the FMC model outputs that the representation of high probability fluvial flood events did not correlate well with observed local flood risk history. Data provided by The NPTCBC Highways Authority and the Welsh Government indicated that the FMC model was significantly overstating the flood risk to the M4 Motorway.

The FMC model report provided by NRW included a number of suggested recommendations for improvement of the model and so, given the clear issue with higher probability flood events, it was licensed from NRW and updated to inform this FCA.

Principal improvements to the FMC model carried out by SLR were:

- Review of hydrology
- Detailed topographic survey of the Margam Duck Pond and downstream culvert
- Inclusion of major culvert beneath Harbour Way
- Inclusion of culvert beneath TATA Steel that drains the Mother Ditch
- Contribution of the catchment between the Margam Duck Pond and the Site

A copy of the hydraulic modelling report for the updated model upon which this FCA has been based is enclosed at **Appendix H** and the results summarised in Section 6.4.

6.2.4 Flood Risk Management Plan

NPTCBC is a Lead Local Flood Authority (LLFA) and prepared its Local Flood Risk Management Plan to comply with the European Floods Directive in June 2013.

This strategy provides a high-level overview of the flood risk to the borough rather than a detailed assessment on a site-by-site basis; however, it does provide a chronology of flood events which suggests that there was a major tidal flood event in 1910, however, it is not clear if this affected the Site.



6.2.5 Strategic Flood Consequence Assessment

A Strategic Flood Consequence Assessment was completed for NPTCBC in 2014. This document is largely focused on the key urban centres and does not include specific reference to the Site other than confirming the Site's location within Zone C2, as defined by the previous version of TAN15²⁰.

6.2.6 Shoreline Management Plan

The Shoreline Management Plan outlines strategies for managing the coastline and defences over the next 100 years. It provides information on coastal defence policies, condition of defences and considers future sea level rise.

6.3 Tidal Flood Risk

6.3.1 Overview

The Site falls within the Shoreline Management Plan (SMP2) Policy Development Zone 8 (Sker Point to Swansea Docks)²¹. Although the data is considered outdated, the SMP2 policy map 8 shows that the Site is at risk of flooding for the 0.1% AEP undefended scenario.

A copy of the policy map is enclosed in **Appendix E** and indicates that the formal defences along Swansea Bay to the west of the TATA Steel Facility (Policy Unit 8.2) are 'outflanked' by floodwater via the Afon Cynffig and flowing north towards the Site along the line of the railway from the Afon Cynffig estuary, some 3.0km to the South.

6.3.2 Flood Defences

The Site benefits from coastal defences to the west of the TATA Steel Facility as shown in **Appendix A-5** which shows the variation in crest level along the line of the existing defences based on NRW LiDAR⁹ and SMP2 data²². These defences consist of raised revetments which protect the TATA Steel Facility and wider coastal flats.

The short to long policy for Policy Unit 8.2 that covers these raised revetments is to 'Hold the Line' by: "*maintaining and upgrading existing defences (privately funded) in response to future climate change/ sea level rise as required*".

National Coastal Erosion Risk Management (NCERM) data²³ indicates that by 2077 (Long Term Epoch) revetment crest levels will be raised by 3.4 - 6.6m to provide a minimum crest level of 12.4m aOD within the Policy Unit.

Clearly, these policies currently rely on private funding in the future that cannot be guaranteed; however, they afford protection to substantial industrial assets, principally the TATA Steel Facility.

20 Welsh Government (2004) Technical Advice Note 15: DEVELOPMENT AND FLOOD RISK

21 Swansea and Carmarthen Bay Engineering Group (2012) Laverock Point to St. Ann's Head Shoreline Management Plan SMP2 Main Document [Accessed 30 July 2024].

22 Swansea and Carmarthen Bay Engineering Group (2012) Lavernock Point to St Ann's Head SMP2 Appendix C: Baseline Process Understanding Annex C: Defence Assessment p1-50. [Accessed 01 August 2024]

23 Natural Resources Wales (2023) National Coastal Erosion Risk Management (NCERM), DataMapWales National Coastal Erosion Risk Management (NCERM) | DataMapWales (gov.wales) [Accessed 01 August 2024]



6.3.3 Sea Levels

Coastal Design Extreme Sea Level data published by the Environment Agency¹⁷ indicates that current day still-water tidal flood levels for the 0.5% AEP event are 6.38m aOD and 6.71m aOD for the 0.1% AEP event.

When considering the impact of climate change up to 2122, the 0.1% AEP still water tidal flood level is predicted to increase by 1.32m to 8.03m aOD. As discussed in Section 5.3, assuming a 50-year development lifetime to 2077, the sea level is predicted to rise by 0.51m to 7.22m aOD.

6.3.4 Evaluation of Tidal Flood Risk

It is clear that the existing flood defences to the west of the TATA Steel Facility are unlikely to be overtopped; however, as discussed in Section 6.3.1, they are at risk of being outflanked.

This was explicitly considered by the FMC Model. When tidal flood levels exceed the level of the higher ground between Margam Moors and Afon Cynffig estuary to the south of the Site, floodwaters spill into the low-lying Moors as illustrated by **Appendix A-6**. However, the modelling indicates that the floodwater would not propagate as far as the Site.

It is therefore concluded that the proposed substation extension is not at significant risk of tidal flooding.

6.4 Fluvial Flood Risk

6.4.1 Overview

With reference to NRW TAN15 Defended Zones data, the Site does not formally benefit from fluvial defences and is shown by the Flood Map for Planning, Rivers, to be at a greater than 1% AEP risk of fluvial flooding when considering the impact of climate change. This is shown in **Appendix A-7**.

As discussed above, the Flood Map for Planning has been informed by the FMC Model that has been revised to inform this FCA. The FMC Model indicated that the primary source of flood risk to the Site is from overtopping from Margam Duck Pond.

6.4.2 Flood Mechanism

Whilst the improvements to the FMC model indicate the frequency of flooding along the M4 from the overtopping of the Margam Duck Pond is significantly reduced, the flood flow path for lower probability flood events is broadly similar.

Floodwater overtopping the Margam Duck Pond that cannot be accommodated in the culvert spills over the west bank of the spillway. Here, it travels downstream of the Pond across Margam Park and onto the surface of the M4. It then continues to spill on to the land to the north of Harbour Way before flowing beneath Harbour Way via existing culverts and accumulating in the lower lying vicinity of the Site. This is shown broadly by **Appendix A-8**.

The TATA Upper Mother Outlet has a limited discharge capacity when compared to flood flows arising from the Margam Duck Pond. This results in a gradual increase in flood level at the Site as the floodwaters continue to progress onto the Site.

As shown by **Appendix A-8**, the updated FMC Model indicates that assuming the central estimate of the impact on climate change, the existing substation platform would be inundated in addition to the area that will accommodate the proposed extension.



6.4.3 Fluvial Flood Levels

Modelled flood levels at the location of the proposed substation extension are summarised in Table 6-1.

Table 6-1: Summary of Modelled Levels

Fluvial Event Scenario	Flood Level (m aOD)
3.3 % AEP	3.82
1.0% AEP	4.13
1.0% AEP + 30% Climate Change	4.35
1.0% AEP + 75% Climate Change	4.68
0.1% AEP	4.59
0.1% AEP + 30% Climate Change	4.96
0.1% AEP + 75% Climate Change	5.46

When considering the impact over the 50-year lifetime of the development, the maximum flood level in the vicinity of the proposed substation extension will be 4.96m aOD for the 2077 0.1% AEP fluvial flood event when accounting for the central climate change allowance.

6.4.4 Design Flood Level

The original hydraulic modelling report highlighted that the flood risk from the Margam Duck Pond, which affects the Site, was a major uncertainty that was ultimately included in NRW's Flood Maps for Planning from Rivers. The update to the FMC model aimed to reduce the uncertainty with respect to the estimated flood levels in the vicinity of the Site and provides an up to date representation of the likely flood mechanisms and return period.

However, there remains a degree of uncertainty with respect to the capacity of the TATA Upper Mother Culvert that provides the only 'outlet' for floodwaters accumulating in the vicinity of the Site.

The proposed substation will not be a permanently manned facility. Therefore, the level of risk the operator is willing to accept regarding the impacts of climate change over the lifetime of the development is ultimately a matter of their professional judgment.

Therefore, as discussed in Section 5.1.1, the design of the flood mitigation measures to protect the existing and proposed substation extension has been based on the central estimate of 30%.Surface Water and Small Watercourses

Due to the locally low-lying topography, surface water runoff naturally drains towards the Site which is at the lowest point in the catchment as shown in **Appendix A-9**.

In the absence of site specific modelling data for the flood risk from Surface Water and Small Watercourses, an estimate of the flood level for the 0.1% AEP flood event was made by comparing the flood outline to the local topography. The outermost extent of Flood Zone 2, shown by **Appendix A-9**, was sampled from the local LiDAR data to derive an estimation of the peak flood level. Statistical analysis was used to filter any anomalous values to improve the accuracy of the estimate.

The maximum flood level for the 0.1% AEP event including an allowance for climate change (implicit in Flood Zone 2) in the vicinity of the proposed substation extension using this method was estimated as 3.565m aOD.



6.5 Groundwater Flood Risk

As discussed at Section 2.4.1, the Site is underlain by superficial deposits of Tidal Flat Deposits consisting of clay, silt and sand. The solid geology underlying the Site confirmed to be South Wales Middle Coal Measures Formation consisting of mudstone, siltstone and sandstone.

Drilling was completed in September 2024. The Tidal Flat Deposits encountered are likely to be of low permeability, but drilling identified a high-permeability gravel aquifer located at a depth of 5.80m bgl. This aquifer is confined by layers of low-permeability peat and clay, which restrict groundwater movement.

The Site is low-lying and could be susceptible to groundwater flooding, particularly during periods of high groundwater levels due to its coastal proximity and topography. However, the well-developed drainage system, including the network draining Margam Moor to the south of the TATA Steel facility, is expected to help regulate and attenuate shallow groundwater flooding.

Groundwater emergence flow rates are expected to be relatively slow, and flood levels would likely be moderated by the extensive local drainage network.

Therefore, whilst there is a risk from groundwater flooding, in terms of flood levels, it is not considered significant compared to the fluvial flood risk discussed above.

6.6 Infrastructure Failure

6.6.1 Breach of the Tidal Defences

The Site is well protected by the existing tidal flood defences to the west of the TATA Steel Facility designated Policy Unit 8/2 by the SMP2. The short to long term policy is 'Hold the Line'. With reference to the SMP policy statement for Sker Point to Swansea Docks:

"The policy is to (...) maintain and upgrade existing defences (privately funded) in response to future climate change/ sea level rise as required. This will continue to manage the risk of coastal erosion and flooding to the industrial area and minimise the risk of potentially contaminated material from being released into the coastal zone."

No breach modelling has been completed for these defences; however, given the important industrial assets they protect and the ongoing monitoring and maintenance, they are considered unlikely to fail.

In the unlikely event that the defences were to be breached or outflanked at locations vulnerable to scour and erosion, a simple estimate of the impact is to project the peak tide levels across the coastal flats to assess the flood level. This in effect creates an undefended tidal flood scenario where water fills the floodplain and rises up to the peak water level. When accounting for climate change up to 2077, the flood level for the 0.1% AEP event could reach a theoretical maximum of 7.37m aOD. **Appendix E** approximates the extent of flooding under such an undefended scenario.

In practice, the volume of water that can propagate inland following a breach is limited by the width of the breach and the duration of the peak of the tidal cycle. Therefore, the simple projection based on the complete absence of defences, as detailed in **Appendix E**, is a significant overestimate of the extent of the flooding.

Additionally, such a simplistic analysis ignores the topographic variation between the defences and the Site, which includes the raised development platform within the TATA Steel Facility and the protection afforded by the railway embankment.



In summary, the risk of a breach of the defences is considered very low and even if it were to occur, it is unlikely that resulting flood levels would reach the proposed crest level of the flood defence wall for the substation discussed in Section 6.7.

6.6.2 Upper Mother Ditch Sluice Blockage

A blockage of the Sluice Structure controlling the outfall of the Upper Mother Ditch is a potential risk to the Site. In a scenario where water is unable to drain, water would back up onto the Site and overtop the banks of the Upper Mother Ditch. Given the importance to the local drainage regime as the primary outlet, it is considered that the structure is likely to be regularly maintained, and as such the risk of a blockage is considered low.. It is also noted that the capacity of the culvert is influenced by the tide locking of the outfall to the Severn Estuary,

Residual risk is considered to be analogous to the mechanism described by the updated FMC Model in Section 6.4.2. The Site would slowly fill before the sluice can be repaired or water overtops the railway at 5.35m aOD and floods west.

6.7 Design Flood Level

The analysis set out above concludes that based on the best available data, the Site is predominantly at risk of fluvial flooding and to a lesser extent flooding from Surface Water and Small Watercourses.

The tidal, groundwater and infrastructure flood risks have been discounted.

National Grid's design criteria for the development (BP 213) requires that it remains free from flooding during a 0.1% AEP flood event, considering the central estimate for climate change over the development's 50-year lifetime up to 2077. As shown by Table 6-1, the updated FMC Model predicts a flood level of 4.96m aOD for this event.

The crest level of flood defences to exclude flood waters from the existing substation and proposed extension has been designed to include 300mm freeboard resulting in a crest level of **5.3m aOD**.

Given the design flood event adopted and the freeboard provided, the residual risk of flooding to the proposed development from fluvial sources and from Surface Water and Small Watercourses with the proposed flood defences in place is considered very low.

6.8 Impact on the Flood Risk Elsewhere

The updated FMC Model predicts that exclusion of floodwaters from the area protected by the proposed flood defences will increase the depth of flooding locally for the 0.1% AEP flood allowing for the central estimate of climate change.

This is discussed in more detail in Section 10.0.



7.0 TAN15 Flood Zone

The description of the flood Zones defined by Figure 1 of TAN15 are reproduced in Table 7-1.

Table 7-1: TAN15 Flood Zones

Zone	Flooding from river	Flooding from the sea	Flooding from surface water and small watercourses
1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year		
2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 100 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.	A greater than 1 in 200 (1%) chance of flooding in a given year, including climate change.	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.
TAN 15 Defended Zones	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard).	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard).	Not applicable.

Based on the review set out in Section 6.0, it is clear that the proposed substation extension lies within **Flood Zone 3**.



8.0 Vulnerability to Flooding

With the proposed defences in place, in the unlikely event occur that Margam Substation were to flood to an extent to which it went offline, the operational impact would likely be limited in scale and manageable. There is no current indication that such an event would result in a widespread blackout or pose a significant risk to Tata Steel's operations. Furthermore, the connection offer for the new EAF, accepted by TATA, is based on this single substation connection. TATA accept this risk and will mitigate appropriately.

The electric arc furnace is not as sensitive to cessation as the blast furnace operation was, the furnace can easily be restarted with little effect on production in the event of a loss of power. The worst case scenario is that the refractories would need to be removed and this is completed on a two week cycle under normal operations.

BP 213 (Substation Flood Risk Assessment and Flood Risk Monitoring) is the appropriate National Grid procedural reference which sets out the technical and procedural requirements for flood resilience and has been followed in the design of the flood mitigation measures for the substation and proposed extension.

National Grid Electricity transmission substations do not directly feed any residential properties – this includes Margam. Margam 275kV substation currently feeds Grange substation which provides a feed to Tata Steel. The proposed extension to Margam substation provides a supply to the new Port Talbot substation which then feeds the EAF at Tata Steel in addition to Grange

The guidance under TAN15 defines “*highly vulnerable*” development as that which, if flooded, would pose a risk to life, the environment, or critical services. In contrast, “*less vulnerable*” development is where the consequences of flooding are more manageable and do not pose such risks.

In conclusion:

- There is no evidence of a direct risk to life or the environment from a flood at Margam.
- Tata Steel appears to have sufficient backup arrangements in place.
- The substation's role in the grid does not suggest it would trigger a regional blackout if temporarily offline.

Therefore, from an operational standpoint, the Margam Substation can reasonably be considered '**less vulnerable**' in the context of TAN15.



9.0 Flooding and the Plan-led System

9.1 Substation Extension

As discussed in Sections 7.0 and 8.0 the proposed substation extension lies within **Flood Zone 3** and is considered a “**Less Vulnerable**” development.

For planning applications in Flood Zone 3, TAN15 Paragraph 10.23 states:

“Other proposals will only be appropriate if they are essential to the Development Plan Strategy to regenerate an existing settlement or achieve key economic or environmental objectives. Any redevelopment proposal must be consistent with the acceptability considerations in section 11. In addition, proposals which include residential development must ensure that such uses do not occur at ground floor level. Proposals that address national security or energy security needs, mitigate the impacts of climate change, that are necessary to protect and promote public health may also, by exception, be appropriate provided that their locational need is clear and the potential consequences from flooding have been considered and found to be acceptable.”

9.2 Justification

National Grid has undertaken a Siting Study conducting a thorough back check to ensure that no other reasonable alternative sites were overlooked. This process is essential to validate the decision and confirm that the current proposal remains the most appropriate choice. National Grid’s ‘*Our Approach to Options Appraisal*’ reflects its statutory duties by underpinning a set of overarching principles which assist in decision making and help to achieve an appropriate balance between competing interests that must be considered in options appraisal. Options are considered to have an advantage if they can use or adapt existing infrastructure, or where National Grid can negotiate different commercial arrangements with its customers to achieve a need, rather than building new infrastructure. Options are also considered to have an advantage if they are shorter, compared with longer routes.

The topics and subtopics considered are presented below:

Table 9-1: topics and subtopics considered for Site location

Topic	Subtopic
Environmental	Landscape and Visual Amenity; Ecology; Historic Environment; Local Air Quality; Noise and Vibration; Soils and Geology; Water.
Socio-economic	Local Economic Activity; Traffic and Transport.
Cost	Technical Feasibility; Approximate capital cost of connecting from the new substation back to the existing Main Interconnected System, including considerations of existing infrastructure and length.

The Siting Study undertakes a comprehensive assessment of sites within the Siting Study Area, identifying potential sites and going on to assess these against defined criteria to a shortlist of sites. The shortlisted sites are then assessed in detail to identify the optimum site.

Following a detailed Siting Study the proposed Site was considered the preferred Site for the below reasons:



- The Site is located directly adjacent to the existing Margam Substation, allowing for easier integration with current electrical systems.
- This proximity reduces the need for extensive new construction and minimises environmental impacts associated with longer cable routes.
- The ability to leverage existing infrastructure means lower overall construction costs compared to options that require building entirely new facilities in greenfield locations.
- The existing infrastructure allows for quicker development timelines, enabling the project to address energy demands more rapidly.
- Being close to the proposed Port Talbot Substation enhances operational reliability and efficiency. Shorter cable connections improve the overall reliability of the electrical supply.
- The Site is already within an industrial area, which means it is less likely to disrupt natural habitats. The established industrial character of the region helps mitigate potential noise impacts.
- The established industrial landscape surrounding helps to minimise visual impacts, making it less intrusive compared to other options that may be more visible from surrounding areas.
- Being located in an already industrialised area may lead to greater community acceptance, as residents are more accustomed to industrial activities compared to options situated in more rural or residential settings.
- Access can be achieved via existing roads, minimizing the need for new access routes that could disrupt local traffic and communities. This is particularly important during the construction phase, where increased traffic could affect nearby residential and commercial properties.
- The distance from significant heritage sites and the natural landform provide adequate screening, ensuring that there will be minimal impact on historical and cultural assets in the area.



10.0 Acceptability Criteria

10.1 Summary of Requirements

TAN15 Section 11 summarises the acceptability critical for flooding consequences. For this development, these criteria are as follows:

- No increase in flooding elsewhere
- Occupiers aware of flood risk
- Escape/evacuation routes present
- Flood emergency plans and procedures agreed and in place
- Flood resistant and resilient design
- Acceptable consequences for type of use

For 'Less Vulnerable' development the FCA must ideally demonstrate that:

- The scheme will be flood free for the 1 in 100 annual probability flood event with an appropriate allowance for climate change; and
- That in extreme flood conditions the depth of flooding will not exceed 600mm and the velocity of flood water will not exceed 0.3m/s.

10.2 Proposed Substation Extension

To evaluate the potential impact of the proposed flood mitigation, the Updated Model provided by SLR was used to assess the change to flood risk elsewhere. Assessment of acceptability criteria has been based on the outputs of the 0.1% AEP plus 30% for climate change. These are addressed below:

➤ *No Increase in flooding elsewhere*

Defending the existing substation and proposed extension will displace floodwaters during an extreme flood event.

To assess the potential impact of the displacement of floodwaters, The Updated Model (Model 113) was modified to exclude floodwater from the footprint of the existing substation and proposed extension to represent the construction of the flood defence wall (DEV). The model was then rerun to assess the impact of the displacement of floodwaters for a range of return periods which included climate change scenarios.

The results of the analysis for the 1% and 0.1% flood event including the central estimate of climate change are enclosed in **Appendix A-10** and **A-11** respectively. These show that very minor increases in flood extent arise from excluding floodwaters from the existing substation and proposed extension.

As shown by **Appendix A-10** and **A-11**, changes in flood extent that would impact third parties are largely confined to the internal access roads within the adjacent BOC Gas Facility, approximately 400m to the south.

As the increase in flood extent would not impact any buildings within the BOC Gas Facility, it is considered that the minor increase in flooding to third parties would be acceptable when set in the context of the importance of the development discussed at Section 9.2.

The increase in flood level in the vicinity of the proposed development arising from the exclusion of floodwaters is provided in Table 10-1.



Table 10-1: Post Development Change in Flood Levels at the Site

Event Return Period	Change in Flood Level (m)
1.0% AEP + 30%	0.019
0.1% AEP + 30%	0.023

At the time the model was run, details of the short section of new access road to serve the substation were not fully resolved and therefore it was not explicitly including in the modelling. The construction of the access road will exclude circa 875m³ of floodwater during the 1% AEP + 30% and 0.1% AEP + 30% flood events. Over the area of the flood envelope in the vicinity of the substation (to the south of Harbour Way) of some 376,000m², the displaced floodwaters from the construction of the access road would increase flood levels shown in Table 10-1 by a further circa 0.002m.

➤ *Occupiers aware of flood risk*

The proposed extension to the substation will feature an ancillary office. The room is to provide welfare facilities to people working in the substation. It is a separate building so that PPE does not need to be worn inside it and people working outside the main secure control rooms housing sensitive equipment can also use the room.

The office will be used during scheduled maintenance activities which take place as a minimum twice monthly, with further additional works on top of that as part of other routine maintenance/replacements/inspections.

The owner and operatives attending the substation are aware of the risk of flooding. Flood risk information will be communicated through internal training, site induction materials risk assessments that includes the formal Emergency Flood Response Plan discussed below

Maintenance visits will be planned with reference to NRW's flood warnings and weather alerts, and access to the Site will be avoided during periods of elevated flood risk.

➤ *Escape/evacuation routes present*

As shown by **Appendix A-12**, the access road to the Site from Harbour Way to the north remains largely free from flooding.

The hazard associated with traversing flood waters is evaluated at 'Table 4 - Hazard to People Classification using Hazard Rating ($HR = d \times (v + 0.5) + DF$) for Source Table 13.1 of FD2320/TR2 - Extended version'²⁴.

With reference to Table 2 of the supplementary note and **Appendix A-12**, the Hazard Rating for the existing access road is ≤ 0.73 . The Hazard to People Classification would be 'Very Low' Caution - "Flood zone with shallow flowing water or deep standing water".

Where the access road crosses the Upper Mother Ditch, 200m north of the proposed substation extension, the results of the modelling for the 1% AEP plus climate change flood event show the peak water level as being 0.5m lower than the surrounding road level, with a peak velocity at the road crossing of 1.2m/s.

²⁴ Supplementary note on flood hazard ratings and thresholds for development planning and control purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1, Suresh Surendran and Geoff Gibbs (Environment Agency), Steven Wade and Helen Udale-Clarke (HR Wallingford) May 2008



Whilst the existing crossing structure has not been explicitly modelled, based on the peak velocity at the crossing and a conservative assumption regarding head losses through the structure it is unlikely that the existing structure would cause water levels upstream to increase by as much as 0.5m. It is therefore unlikely that floodwater during the 1% AEP plus climate change event would overtop the road. On this basis, it is reasonable to assume that the Hazard Rating at the crossing will be equivalent to the road surface either side, i.e. ≤ 0.73 .

It is understood that the existing access road will be extended to tie in with the proposed entrance to the new substation compound and that this new section of road will be constructed at the same elevation as the existing access road (Shown in **Appendix D**). It is therefore reasonable to assume that the degree of flood hazard will remain as 'Very Low'.

If operatives have to access the Site in an emergency during a flood event, based on the modelled maximum flood depth and velocities of floodwaters during the design flood event, the access road would be passable with care in a 4x4 vehicle.

In addition, the substation and proposed extension will provide a safe place of refuge should it not be safe to evacuate the Site.

➤ *Flood emergency plans and procedures agreed and in place*

The Site falls within the 'Rivers Afan and Kenfig' Flood Alert area that provides an early notification that flooding may be possible. There is currently no 'Flood Warning' available for the Site.

There is also a tidal 'Flood Alert' available for the 'Swansea Bay and the Gower coast' however, the alert area does not extend to the Site reflecting the low tidal flood risk.

The Site will be registered with NRW to receive live flood warnings during the construction phase. This will extend to the operational phase to ensure operatives completing planned inspection and maintenance tasks are alerted to any potential flood risk.

A formal Emergency Flood Response Plan will be prepared by the operator to ensure that checks are carried out regarding whether there are any Flood Alerts in place before accessing the Site.

It is recommended that the provision of an Emergency Flood Response Plan is secured by condition.

➤ *Flood resistant and resilient design*

- The flood defences will adopt a crest level of 5.3m aOD to exclude flood waters for the 0.1% AEP (1 in 1000 annual probability) flood event with an allowance of 30% for climate change. The flood defence wall will be designed and constructed to resist the loads imposed by extreme flood events to the structure and the ground. The substation is not a permanently manned facility and therefore the flood gates to allow access through the flood defence wall will be kept locked shut. They will only be opened to allow access for planned inspection and maintenance activities. The cost of the proposed flood defence wall will be borne by the developer along with future inspection and maintenance works.

This approach exceeds the flood event threshold where development must be flood-free as set out at Figure 5 of TAN15.

The alignment of the proposed flood defence wall and flood gates is shown by Drawing No. MARPT-BHK-01-ZZ-DG-C- 181009 / 18_LOR_0206 enclosed at



Appendix D. The reinforced concrete wall will vary in height between 1m and 3m supported by sheet piles varying in depth between 6m and 9m.

The flood risk during construction is addressed as part of the construction phasing plan.

- *Acceptable consequences for type of use (see detailed guidance below)*
 - *The scheme will be flood free for the 1 in 100 annual probability flood event with an appropriate allowance for climate change; and*
 - *That in extreme flood condition the depth of flooding will not exceed 600mm or the velocity of flood water 0.3m/s*

Therefore, with the proposed flood defences in place, there is no significant risk of flooding to the existing substation, or the proposed extension.



11.0 Residual Risk

There is a residual risk that the flood defences along Swansea Bay to the west of the TATA Steel Facility would be breached, however, given the importance of these defences to protecting significant industrial assets it is considered that this is unlikely.

If a breach were to occur, the inland propagation of floodwaters towards the Site would be moderated by the high ground within the TATA Steel Facility.

Flood events of a greater magnitude than those considered by this assessment have a very low probability of occurrence.

The FMC Model originally did not include an outlet structure for fluvial flooding at the Site, as highlighted in Section 6.4.4. **Appendix H** discusses that the fluvial flood risk at the Site is highly sensitive to inflows and outflows. It also notes that the sluice structure (referred to as the 'outfall structure') is currently unconfirmed, and it is likely that the anticipated design flood level has an inherent degree of inaccuracy

Managing the residual risk to operatives would be via the Emergency Flood Response Plan.



12.0 Sustainable Drainage Measures

12.1 Introduction

Sustainable drainage systems (SuDS) are required to manage both the rate and volume of runoff and importantly surface water quality.

Surface water drainage provision for new development is subject both to the planning process and, following implementation of Schedule 3 to the Flood and Water Management Act 2010, approval by the SuDS Approval Body (SAB).

12.2 SAB Approval

Section 15 of TAN15 advises that simultaneous applications are the best approach but recognises that this is not always feasible, as the level of detail required by a full SAB application (in effect, construction drawings) is rarely available at the point an application is made.

TAN15 therefore recommends that a Drainage Statement is submitted to provide the planning authority with confidence that the scheme incorporates SuDS appropriately and is subsequently likely to obtain SAB approval. The scope of such a Statement is set out in the six Statutory National Standards²⁵:

- Standard S1 - Surface water runoff destination
- Standard S2 - Surface water runoff hydraulic control
- Standard S3 – Water Quality
- Standard S4 – Amenity
- Standard S5 – Biodiversity
- Standard S6 – Design of drainage for Construction and Maintenance and Structural Integrity

12.3 Preliminary Drainage Strategy

A drainage strategy for the proposed development has been prepared by the Client in support of the application that demonstrates how the six standards are met. It is anticipated that the submission of a detailed drainage strategy for formal approval will be made the subject of a condition to the planning permission.

25 Welsh Government (2018) Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems. Available from: [statutory-national-standards-for-sustainable-drainage-systems.pdf](https://www.welsh.gov.uk/statutory-national-standards-for-sustainable-drainage-systems.pdf) [Accessed: 13 May 2025].



13.0 Summary

SLR Consulting Limited (SLR) has been appointed by BakerHicks Ltd (the 'Client') to produce a Flood Consequence Assessment (FCA) for a proposed extension of the Margam Distribution Substation (the 'Site')

The aim of the assessment was to determine an appropriate design level for a flood defence wall to protect the existing substation and proposed extension from a 0.1% AEP flood event when considering the central estimate of the impact of climate change over the lifetime of the development. The operational lifetime of the development has been taken as 50 years to 2077.

The Site is undeveloped marshland adjacent to the existing Margam Distribution Substation and is located approximately 1.7km inland from the Swansea Bay coastline.

An initial flood screening indicated that the Site is potentially at risk from multiple sources. These were considered in detail and it is concluded that whilst there is a risk of flooding from Surface Water and Small Watercourses, it is the flood risk from fluvial sources that dominate. Despite the proximity to the coast, the risk of tidal flooding is considered low due to existing tidal flood defences along the coastline to the west of the TATA Steel Facility.

The FCA has been informed by the results of a detailed hydraulic model built on the existing FMC Model (provided by NRW). The model confirmed that that the proposed development is primarily at risk from fluvial flooding from the Nant Cwm Philip and the Margam Duck Pond, 1.77km to the east. The tidal flood risk to the proposed development is not considered significant. The modelling confirms that proposed development lies within Flood Zone 3 defined by TAN15, Figure 1.

A design crest level of 5.3m aOD is proposed for the flood defences to protect the existing substation and proposed extension based on the updated FMC model outputs which includes a 300mm freeboard allowance.

The proposed development would be considered a '*Less Vulnerable Developments*' and is considered appropriate in Flood Zone 3 as the proposals seek to support key economic objectives, energy security need and the decarbonisation of TATA steel.

The proposed development meets all the TAN15 acceptability with the exception of the potential impact on the flood risk elsewhere. However, excluding floodwater from the existing substation and proposed extension will have only a very minor impact on third party land.

A drainage strategy based on an attenuated discharge to the local drainage network has been developed to demonstrate the feasibility of the proposed SuDS solution. SAB approval of the drainage scheme will be sought in parallel to the planning application for the proposed extension of Margam Substation.

It is recommended that to ensure the proposed development is safe for operatives, the requirement to develop a Emergency Flood Response Plan is secured by a planning condition. Similarly, a planning condition is recommended to require a detailed sustainable drainage strategy to be submitted for approval.





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- Motherwell (Eurocentral) +44 (0)1698 756100
- Manchester +44 (0)161 873 2500
- Derby +44 (0)1332 974398
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