

Technical Note

Project:	Swansea University, CISM Building	Job No:	60605215
Subject:	Drainage and Flood Statement	Rev:	02
Made by:	Angela Esposito	Date:	20/02/2020
Checked by:	David Mulkerrin	Date:	21/02/2020

1. Introduction

AECOM have been appointed by Swansea University to prepare a statement regarding the drainage and flood risk associated with the development of the new CISM building within Swansea University Bay Campus, Swansea.

This document has been prepared to accompany the Pre-application planning submission for the CISM development site, with the aim of reviewing the approved Flood Consequences Assessment and assessing the risk and consequences of flooding at the site following completion of mitigation measures adopted from the outline planning approval.

2. Site Description and Development Proposal

The site is located within the Swansea University Bay Campus, at an approximate National Grid Reference of SS702928.

The proposed CISM building will be located at the eastern end of the campus adjacent to the Energy Safety Research Institute (ESRI) and Institute of Structural Materials (ISM). The facility will include laboratories, testing facilities and plant rooms.

3. Background Information

A Flood Consequence Assessment (FCA) was prepared in 2009 by URS Corporation Limited for this site as part of the Environmental Statement for the Outline Planning Application for "The Bay Science and Innovation Campus, Swansea University" project.

This document assessed the pre-existing potential of flooding at the site from different sources, and established mitigation measures in response to the identified risks. Key considerations and recommendations from the 2009 FCA are summarised below.

The "*Technical Advice Note (TAN)15: Development and Flood Risk*" planning policy includes "*Development Advice Maps*", which identify three flood risk zones associated with different levels of flood risk. The FCA identified the site as lying in Zone C2 based on the Welsh Assembly Government "*Development Advice Map*", which defines Zone C2 as "*areas of the floodplain without significant flood defence infrastructure*" and it indicates that only low vulnerability developments should be considered in this Zone or developments that meet requirements defined within the technical advice note. The CISM site was previously assessed as being appropriate for the proposed new development at the site.

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The following main existing mechanisms of flooding at the site were assessed within the 2009 FCA, including mitigation measures to protect the site up to 1:200yrs event with allowance for climate change:

- Tidal flooding: The site was considered at risk of tidal flooding due to its coastal location in an area with limited significant flood defences. The FCA presented flood depths up to 1 in 1000 years tidal events. Although the site was classified as Zone C, based on further assessments undertaken within the FCA, the latter concluded that parts of the site were at low risk of tidal flooding.

The FCA indicated raising of ground levels as a mitigation measure against tidal flooding at the site. Finished surface level were suggested to be raised to “a minimum of 7.0mAOD”, with a finished floor level for buildings “above 7.4mAOD and up to 7.6mAOD” and the internal roads to “at least 7.4mAOD”. Additional protection was indicated to account for potential wave overtopping above increased levels, with the rock revetment along the Severn Estuary to be extended “up to minimum level of 8.4mAOD”. Entrance to basements was indicated to be “at least 7.4mAOD”. Registration with the local Environment Agency Wales (EAW) flood warning system and flood emergency plans were advised at the site.

- Groundwater flooding: A shallow water table was identified at the site, with levels varying with fluctuating tides. The risk of groundwater flooding was identified as likely for any subsurface elements (i.e. basements). However, the FCA indicates that flooding from groundwater was considered to be “unlikely” to produce any significant flooding on the surface of the site “assuming finished surface levels are at, or above, current elevations”.

Increment of ground levels and basements to meet British Standard 8102 guidance were indicated to minimise risk of flooding from groundwater.

- Overland Flow and Sewer Related Flooding: The 2009 FCA identifies the risk of localised flooding in low lying areas in the event of prolonged or intense rainfall event periods. This circumstance was also linked to the shallow water table level at the site. No formal drainage system was identified at the site within the 2009 FCA, with drainage assets within or nearby the site including: a culvert to the south-west of the site, a combined sewer overflow pipe within the site to the west, a drain running across the site.

The risk of flooding from overland flows and sewers were assessed as “low” and no mitigation measures were indicated.

Exceedance flow were indicated to be considered within the drainage design, as per CIRIA C635 guidance.

- Flood risk at the site was deemed to increase as an effect of climate change, resulting in more frequent floods and increased flood depths.

Surface water runoff from the site will discharge to the sea, with negligible risk to other areas. Permeable paving, french drains and perforated distribution pipes were indicated to minimise the risk of beach erosion due to uncontrolled discharge.

4. Assessment of Tidal Levels

Given the proximity of the development site to the coast and following received comments from the Statutory Pre-Application Consultation (Natural Resources Wales Doc. Ref. No. CAS-106052-G8S7 dated 15th January 2020), AECOM have undertaken an assessment of the likely extreme sea levels at the site and the estimated sea levels rise due to climate change.

Tide levels have been obtained from Natural Resources Wales (NRW) through the DEFRA’s data online portal (“Coastal Flood Boundary Dataset update 2018”), which constitutes the set of relevant

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information on sea levels available at the location. Correspondence with NRW is included in Appendix A.

The data available on the portal include extreme peak sea levels for a range of return periods, from 1:1 year up to 1:10,000 years return periods, along with additional parameters (e.g. highest astronomical tide and mean high water spring tide conditions). For each return period, the peak is provided with the relative 2.5% and 97.5% confidence levels.

The NRW Guidance specifies that “*extreme sea levels values include the effects of storm surge and astronomical tides but do not specifically account for any localised increase in sea level that may be induced by onshore wave action, orientation or topography.*” Therefore, they do not take into account increased water levels due to wave set-up and wind set-up.

Extreme sea levels derived from the DEFRA’s online portal are listed in Table 1. The figures refer to the closest NRW dataset point to the development site (Point Coordinates: 269298.7, 190387.3) and they are provided to the base year of 2017.

Table 1. NRW Extreme Sea levels¹

Return Period (years)	Extreme Water Level Estimate (mAOD)	Lower Confidence Interval (2.5%) (mAOD)	Upper Confidence Interval (97.5%) (mAOD)
100	6.25	6.15	6.38
200	6.37	6.22	6.56
250	6.41	6.25	6.63
1000	6.66	6.43	7.05

Source: Coastal Flood Boundaries data on DEFRA’s data portal

The extreme water levels in Table 1 are comparable, and generally slightly lower than the corresponding values previously defined within the 2009 FCA.

In order to account for the effects of climate change and sea level rise, an allowance has been added as per relevant Welsh Government Guidance (“*Flood Consequence Assessments: Climate change allowances*”, 2016). The Guidance indicates a 75-year lifetime for non-residential developments should be considered, indicating projections of sea level rise for different periods of time. This lifetime duration is greater than the proposed building’s anticipated design life, which equates to 60 years.

The results from these estimates are included in Table 2 and Table 3.

Table 2. Sea level rise estimates

Period	Annual Increment (mm)	Cumulative rise (mm)
2017-2020	3.5	14
2021-2025	3.5	17.5
2026-2055	8.0	240
2056-2085	11.5	345
2086-2095	14.5	145
Total	-	761.5

¹ Extreme sea levels are considered accurate to one decimal place (NRW Guidance, “Coastal flood boundary conditions for the UK: update 2018. User guide.”).

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Table 3. NRW Extreme sea levels including sea level rise

Year	Extreme Water Level Estimate (mAOD)			
	100 years -return period	200 years -return period	250 years -return period	1000 years -return period
2017	6.25	6.37	6.41	6.66
2020	6.26	6.38	6.42	6.67
2095	7.01	7.13	7.17	7.42

5. Proposed Surface Water Drainage Strategy

A surface drainage design proposal was developed for the Stage 3 of the project in accordance with the approved drainage strategy (Drawing Ref. No. 60605215-ACM-XX-DR-CE-0001). Following the implementation of Schedule 3 of the Flood and Water Management Act 2010, further assessment of the strategy will be required which may have an impact on the strategy.

The proposed approach for the surface water drainage at the site includes a piped drainage network for the surface run-off flow generated by the development. The surface water runoff from the development will be discharged to the existing surface water sewer west of the CISM building.

Due to the limited space available within the plot area, the site offers limited opportunities to provide Sustainable Urban Drainage Systems (SuDS) features as part of the proposed surface water drainage network. Infiltration techniques are not considered appropriate due to the limited available space whilst maintaining suitable offset distances from proposed and existing buildings and structures at the site.

Rainwater pipes are proposed to collect runoff from the CISM building's roof, before discharging the flow to the proposed below ground drainage network.

Linear channels will be located at entrances or access points to the building.

The design of the proposed surface water drainage network was undertaken assuming a finished floor level of 8.0mAOD (as indicated on Drawing Ref. No. SU-INF-00-CE-BH-DR-G77-023 Rev K).

6. Proposed Foul Water Drainage Strategy

The drainage design proposal developed for the Stage 3 Planning Application included a separate drainage system.

The proposed foul water drainage scheme indicates below ground building drainage to discharge to the existing foul water sewer running to the west of the CISM building, with the final discharge point at the north-western corner of the building.

Allowance for foul gullies has been made to account for any spillage from proposed plant rooms.

A demarcation chamber is included in the proposed drainage layout, to be located to the north-west of the building immediately before the final connection point to the existing sewer.

7. Site Development and Flood Risk

The proposed CISM building is located within the wider Swansea University Bay Campus university development site area.

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As part of the works undertaken to deliver the overall university campus development, ground levels in the area were generally increased over the last years. Site levels for the building adjacent the site are recorded to be 7.80mAOD (Drawing no. 50200497_500 Rev. C8, WSP, November 2013).

The drainage design developed as part of the Stage 3 Planning Application assumed the finished floor level of the building to be 8.00mAOD. This value is in line and greater than the recommended value indicated in the 2009 FCA document and higher than the estimated peak sea levels at current date and for the assumed 75-years lifetime duration for the proposed building.

Flood defence interventions were implemented on the coastline, south of the site, with increased levels of the existing rock revetment. This intervention has provided flood protection for the area and it is in accordance with the 2009 FCA mitigation measures.

8. Conclusions

This Drainage and Flood Statement has been prepared to accompany the Pre-application submission for the proposed CISM building within the Swansea University Bay Campus, Swansea.

A Flood Consequence Assessment (FCA) was prepared in 2009 by URS Corporation Limited for this site. The 2009 FCA assessed the risk of flooding at the site, with suggestions for mitigation measures to be implemented at the site.

The CISM building is part of the wider development scheme for the Swansea University Bay Campus. As part of this development, the area where the site is located has been subject to significant development over the last years. Development actions for the area included increased ground levels and raised flood defences along the coastline, south of the site.

These interventions, along with suitable levels considered within the drainage design at the site, ensure acceptable protection from flooding for the proposal to be delivered.

The site was previously designated as Zone C2 in 2009 according to the Welsh Assembly Government "*Development Advice Map*" at the time. As such, it should only be suitable for less vulnerable development. The 2009 FCA states that the site meets TAN15 requirements and it can be considered appropriate to deliver the proposed development.

A drainage design scheme was proposed within the of the Stage 3 Planning Application for the CISM building. The proposal included separate drainage systems.

Both the proposed surface and foul water drainage network included below ground drainage network, with final discharge point to the existing surface water sewers to the west of the CISM building.

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Appendix A



Esposito, Angela

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 03 February 2020 12:05
To: Esposito, Angela
Subject: ATI18868a Flood Product Enquiry, Swansea Uni Bay Campus, SA1 8EN 160120

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Ms Esposito,

Further to your initial enquiry concerning the above site; please note that unfortunately we do not have any modelling for this location, so all that would be available are the Extreme Tidal levels of which you are already in receipt of. Please note that for a Flood Consequence Assessment, you would also have to consider the effect of wave overtopping.

Apologies we could not have been of any additional assistance to you on this occasion.

Yours sincerely,

Michelle Lewis

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

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 21 January 2020 10:12
To: Esposito, Angela <Angela.Esposito@aecom.com>
Subject: RE: Flood Data Request - Swansea University Campus

Dear Angela,

Thank you for your request. Please note you can obtain some of the data you have requested via the following links;

Flood Zone map - <http://lle.gov.wales/Catalogue?lang=en&text=flood> zone and
<https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en>
Areas benefiting from Flood defences - <http://lle.gov.wales/Catalogue?lang=en&text=defences>
Historic flooding records - <http://lle.gov.wales/catalogue/item/HistoricFI/?lang=en>

Tide levels - you will need to access the Coastal Flood Boundaries data on DEFRA's data portal <https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/CoastalDesignSeaLevels&Mode=satial> Please see the attached quick guide for further information.

This is part of Coastal Design/Extreme Sea Levels, a GIS dataset and supporting information providing design / extreme sea level and typical surge information around the coastline of the UK, including England, Wales, Scotland, Northern Ireland, Isle of Man and Jersey. The information is relevant under present day (year 2018) conditions and does not account for future changes due to climate change, such as sea level rise. This is a specialist dataset which informs on work commenced around the coast ranging from coastal flood modelling, scheme design, strategic planning and flood risk assessments.

For any further data that we hold that is not available on-line, your request has been added to our queue. Please note - we aim to respond to requests within 20 working days, however we are currently extremely busy and are dealing with a very large amount of data requests. This also means we are working with a considerable backlog.

It is therefore unlikely you will receive a response to your request before the 20 working day deadline.

Due to the above, please note we cannot respond to chaser e-mails. As I'm sure you can appreciate, responding to chaser e-mails means we are not working on the requests. When your request has been logged, we will be in touch.

Please accept our sincere apologies for this and be assured we are doing all we can to rectify this. If you are unhappy with this we would direct you to our complaints policy on our website <https://naturalresources.wales/about-us/contact-us/complaints-and-compliments/?lang=en>

Kind regards,

Tîm Cyswllt Cyfoeth / Customer Hub Team

E-bost / E-mail: datadistribution@cyfoethnaturiolcymru.gov.uk

Gwefan / Website: <https://naturalresources.wales/?lang=en>

Ewch i / Browse our [Data Services Webpage](#)

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

From: Esposito, Angela <Angela.Esposito@aecom.com>

Sent: 16 January 2020 18:07

To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>

Cc: Sambrook, Richard <Richard.Sambrook@aecom.com>; Mulkerrin, David <david.mulkerrin@aecom.com>

Subject: Flood Data Request - Swansea University Campus

Good afternoon,

We are currently preparing a statement regarding the flood risk associated with the development of a new building within Swansea University Bay Campus, Swansea, and we would like to submit a request for flood risk information for the site.

The site that we require information for is located at an approximate National Grid Reference of SS702928 (closest post code: SA1 8EN). Attached is a plan showing the indicative site location.

As part of this assessment, we would need the following information:

- Flood Zone map
- Modelled flood levels (including sea/tidal flood levels) on site for all relevant return periods (where available)
- Modelled in-channel levels for surrounding watercourses (where available)
- Flood defence information (and areas benefitting)
- Historic flooding records
- Any other relevant flood risk information relating to the site and surrounding area- given proximity to the coast any information on tidal/coastal flooding and sea levels would be a priority.

Please let us know if you need any further information.

Thank you.

Kind regards,

Angela Esposito

Assistant Engineer, Development Infrastructure

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