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Bulk Container Store

Flood Risk Assessment

Diageo Baileys Global Supply

Report No. W3499-W-R002
29 September 2021
Revision 00

DIAGEO

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Contents

1 Introduction

1.1 Background

This report is produced in relation to the proposed upgrade works at Nangor House Baileys Global Supply, New Nangor Road, Dublin 12. The development will consist of the construction of the Bulk Container Storage Warehouse, located at the Diageo Baileys Global Supply factory.

The Bulk Container Store is 8.8m in height and has a plan area of 465.3m^2. The warehouse is located to the west of the main building.

1.2 Scope

ByrneLooby (BL) has been engaged by Diageo to perform a desk-based Flood Risk Assessment (FRA) to be submitted as part of the Planning Application for the works. The FRA will be completed in accordance with "The Planning Systems and Flood Risk Management – Guidelines for Planning Authorities", hereafter referred to as "the Guidelines".

1.3 Flood Risk

Understanding flood risk is a key step in managing the impacts of flooding. Flood risk is a combination of the likelihood of flooding occurring and the potential consequences arising. The methodology used for this FRA is based on the Guidelines published by the Office of Public Works (OPW). The Guidelines recommend a staged approach to flood risk assessment that covers both the likelihood of flooding and the potential consequences.

The likelihood of flooding is normally defined as a percentage probability of a given magnitude or severity occurring or being exceeded in any given year. The consequences of flooding depend on the hazards associated with the flooding, and the vulnerability of people, property and the environment potentially affected by a flood.

The assessment of flood risk requires an understanding of where the water comes from (i.e., the sources), how and where it flows (i.e., the pathways) and the people/property/environment and assets affected by it (i.e., the receptors).

The principal sources are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow, and river and coastal floodplains and their defence assets. The receptors can include people, their property, and the environment. All three elements must be examined as part of the flood risk assessment including the vulnerability and exposure of receptors to determine its potential consequence.

1.4 Report Objectives

As part of the design, the FRA has been carried out in the following stages:

- Stage 1 – Flood Risk Identification Report
- Stage 2 – Initial Flood Risk Assessment
- Stage 3 – Detailed Risk Assessment

A Stage 1 – Flood Risk Identification determines if there is a risk of flooding to the proposed developments.

A Stage 2 – Initial Flood Risk Assessment is required to accompany the planning application. It confirms the sources of flood risk, appraises the adequacy of existing information, and determines what approach is required.

A Stage 3 – Detailed Risk Assessment is required to identify what mitigation and prevention measures must be implemented to ensure the proposed development is not contributing or worsening the risk of flooding.

This report will address the above by identifying whether there may be a flood risk to the development that may warrant further investigation.

2 Site Location and Description

2.1 Site Location and Proposed Development

The proposed upgrade works are located at Nangor House Baileys Global Supply, New Nangor Road, Dublin 12. The site is a large industrial facility with an overall area of ca. 12.28ha. It is located off the New Nangor Road, as seen in Figure 2.1.

The site is bounded to the south by the New Nangor Road and the Camac River, to the west by the Oak Road, to the north by the Grand Canal, and other industrial developments to the east.

Figure 2.1: Site Location (Google Maps, 2020)

The proposed development consists of the construction of the Bulk Container Store to the west of the main building, as seen in Figure 2.2.

The latest drawing for the proposed Bulk Container Store is presented in Figure 2.3 below.

The Bulk Container Store is located on an area consisting of an existing bitmac hardstanding and sloped grassed area.

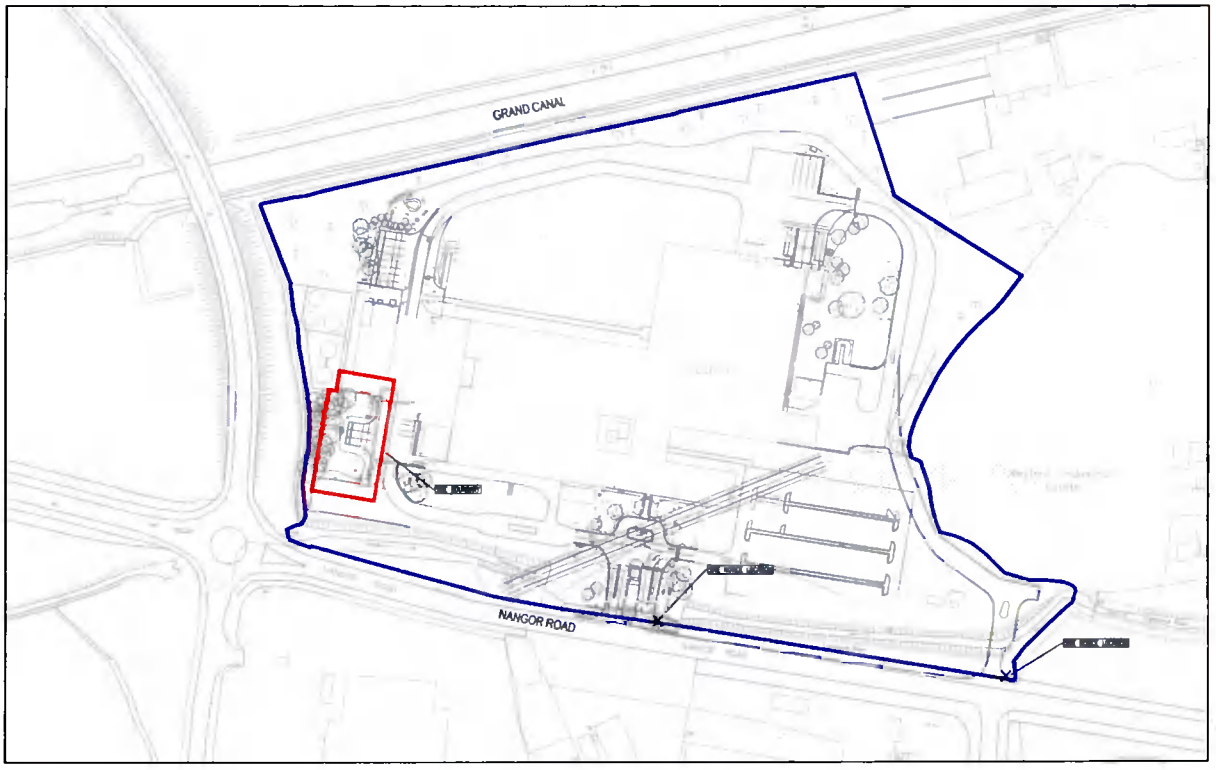

Figure 2.2: Proposed Bulk Container Store Location

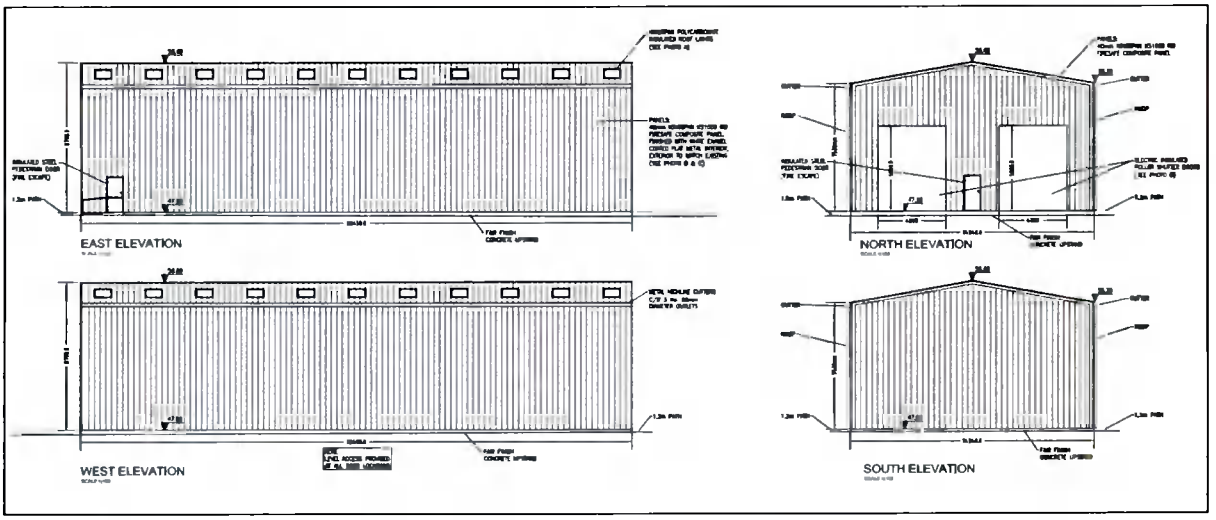

Figure 2.3: Proposed Bulk Container Store

2.2 Site Setting

The Camac River (also known as the River Cammock) runs along the south of the site, between the New Nangor Road and Nangor House, i.e., Diageo Baileys Global Supply Factory.

The Grand Canal borders the northern section of the site.

The Camac River and the Grand Canal can be seen bordering the site in Figure 2.4.

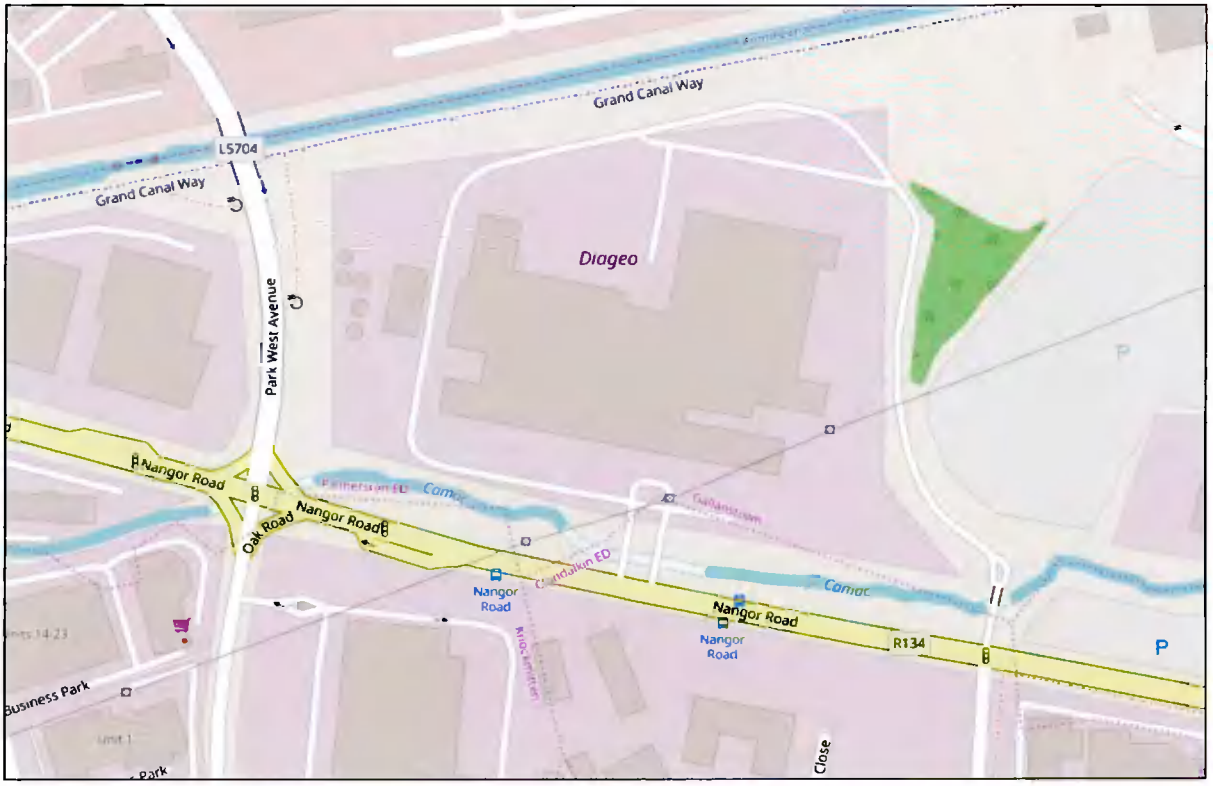

Figure 2.4: The River Camac and the Grand Canal Locations (EPA Maps, 2020)

2.3 Zoning

The proposed development is in an area marked "to provide for enterprise and employment related uses" in the South Dublin County Council (SDCC) Development Plan 2016 to 2022, as seen in Figure 2.5.

Since May 2019, the site is subject to zoning objective "Regen" to "facilitate enterprise and/or residential led regeneration" under South Dublin County Council Development Plan 2016-2022, as a consequence of Variation No. 3 of the County Development Plan.

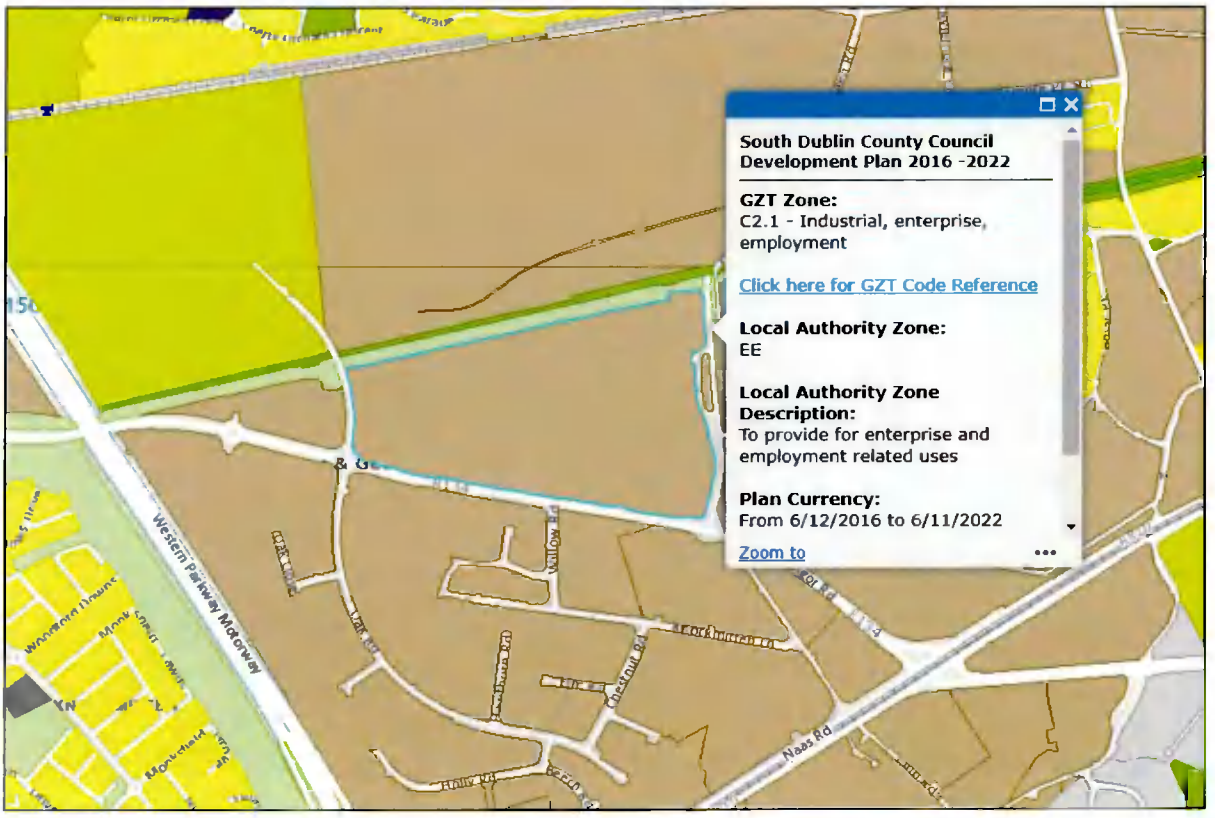

Figure 2.5: South Dublin County Council Development Plan 2016 – 2022

2.4 Vulnerability

Industrial infrastructure, such as the Diageo Baileys Global Supply, is classified as a less vulnerable development to flooding. Less vulnerable development will be allowed to proceed without recourse to the Justification Test in an area of moderate probability of flooding. A less vulnerable development in an area of high probability of flooding is considered inappropriate, unless the requirements of a Justification Test can be met.

3 Data Collection

3.1 Flood History

3.1.1 Nangor House

There has been one record of a flood event occurring at Diageo Baileys Global Supply, according to the OPW website, floodinfo.ie. The flood occurred on the 24th of October 2011. It is noted that this was considered an extreme rainfall event and that many areas of Dublin were severely affected by this pluvial event resulting in drainage systems being inundated and fluvial flooding along the main Dublin rivers.

The source of the flood water was the Camac River, which was overtopped. The factory site is in a slight depression and water accumulated at a general level of 300mm across the site but up to a depth of 600mm in some areas.

The out of bank flooding from the Camac River resulted in the closure of the factory for one week. The OPW report is contained for information in Appendix A.

3.1.1 Neighbouring Properties

Neighbouring properties were also affected by flooding on the 24th of October 2011. A summarized list of the flooding is shown below:

- An Post, Oak Road: The security hut was flooded to a general level of 200mm. The carpark was also flooded. The main building was not affected.
- Toyota, Killeen Road: The Camac overtopped at the culvert adjacent to the Toyota main site entrance. The site was equally affected by run-off water from the Nangor Road. The Toyota workshop to the south of the Camac was flooded to approximately 450mm above floor level. A build-up of debris immediately downstream of the Diageo/Toyota boundary culvert was cleared from the river a few days after the flooding. The build-up of debris would have contributed to the backwater effect experienced upstream of this culvert in the Diageo site.

3.2 Geology

The geology in the area of the site was identified using Geological Survey Ireland (GSI) Spatial Resources. The bedrock formation specified in the area of the site is the Lucan Formation. The Lucan Formation is typically made up of dark limestone and shale.

The GSI Spatial Resource was used to estimate the Groundwater Subsoil Permeability. The map classifies how easy water can infiltrate subsoils downwards at any point in the land surface. Permeability across Ireland is classified as either "High", "Moderate" or "Low". The GSI Spatial Resources indicates that the groundwater subsoil permeability is classified as "Low" in the region of the site.

A ground investigation was completed by Ground Investigation Ireland (GII) as part of the project. 11 No. trial pits were carried out to a maximum depth of 3.9m below ground level.

As part of a separate project, boreholes (BHs) were dug using a shell and auger type rig along the southern border of the site. The Overview Map for GSI Report No. 4074: Cycle Path included 13 No. boreholes along the New Nangor Road. BHs No. 119351, 119352, 119353, 119354, 119355 are of interest to this report. The BH depths ranged from 3.9m to 4.1m.

The soil was described as Topsoil, overlying Made Ground, overlying a slightly gravelly Clay, overlying a slightly silty sandy Clay. A number of the trial pits were terminated at shallow depths on boulders/assumed rockhead.

3.3 Fluvial & Pluvial Flood Maps

The Commissioners of Public Works in Ireland developed the Flood Maps for the Republic of Ireland on www.floodinfo.ie as part of the Catchment Flood Risk Assessment and Management (CFRAM) Programme together with Dublin City Council, other Local Authorities and Ordnance Survey Ireland.

The Flood Maps have been developed for the purposes of establishing a framework for the assessment and management of flood risks, aiming at the reduction of adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods.

The current Fluvial Flood Extent map for the area have been downloaded from the OPW Flood Maps website. The fluvial map relevant to the site (Drawing No.: E09CAM_EXFCD_F1_18) is included in Appendix B.

The map indicates that there is a risk of fluvial flooding during extreme conditions. It is noted that part of the site is protected by flood defences. The Grand Canal does not contribute to the fluvial flooding.

The current Pluvial Flood Extent map for Dublin has also been downloaded from the OPW Flood Maps website. The map downloaded is for a medium probability event, i.e. a 100-year return period. It indicates the estimated depth of flooding at a given location. The pluvial map (Drawing No.: E09DCC_DPPCD010_F0_03) is included in Appendix B and the area of interest to this report is circled in red.

3.4 Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a range. They are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. There are three types or levels of flood zones defined for the purposes of the Guidelines which are described below:

- Flood zone A – where the probability of flooding is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding) and where a wide range of receptors would be vulnerable.

- Flood zone B – where the probability of flooding is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding).
- Flood zone C – where the probability of flooding is low (less than 0.1% or 1 in 1000 for both river and coastal flooding).

3.5 Site Topography

The site is located within a slight depression. Embankments border the north and west of the site and part of a southern border.

A topographical survey was produced by Murphy International Ltd. for the purpose of this project and the drawings are included in Appendix C. The hardstanding areas generally range from 47.50m OD and 48.00m OD.

3.6 Site History

A review of the Ordnance Survey of Ireland historical maps show that a dam and a pond were located at the site in 1837, as seen in Figure 3.1.

Figure 3.1: Historical 6-Inch Map 1837 to 1842 (OSi Online)

The historical maps show that the pond and the dam were located at the site in the period 1837 to 1842. The dam was located for a mill which was located southwest of the site. The Grand Canal has developed to its present-day alignment by this period.

4 Stage 1 – Flood Risk Identification

Initial examinations of the available existing data from the data sources presented in Section 3 have led to an identified flood risk to parts of the site.

Historical flooding information identified that flooding has occurred previously at the site. Fluvial and pluvial flood extent maps showed that the site is in a location that has a risk of flooding.

Accordingly, a Stage 2 – Flood Risk Assessment is required.

5 Stage 2 – Initial Flood Risk Assessment

5.1 Pluvial Flood Risk

An indication of the pluvial flood risk to the site is shown on the pluvial map (Drawing No.: E09DCC_DPPCD010_F0_03), included in Appendix B. The map indicates that there is a pluvial risk on the site.

Furthermore, rainfall data and reports from the 24th October 2011 have been examined. The Environmental Protection Agency (EPA) and Met Éireann have produced data and reports for the October 24th pluvial rainfall event. DCC Environment and Engineering Department published a report titled "Progress Report on extreme Event Pluvial flooding 24th October 2011". According to the report, the cause of the flooding was extreme pluvial rainfall which exceeded the capacity of the drainage system and in turn gave rise to fluvial flooding. It was particularly evident along the Camac River.

According to a utility survey report produced by Murphy's International Ltd. (Report No. 33486), there is a drainage network on site that collects the storm water, therefore mitigating the risk of pluvial flooding. However, the drainage discharges through flap valves on outlets to the Camac River. During high water levels in the river there is a risk of restricted discharge from the site, resulting in a back-water effect in the drainage systems.

5.2 Fluvial Flood Risk

The fluvial flood risk is outlined on the map (Drawing No.: E09CAM_EXFCD_F1_18) included in Appendix B. An extract from which is shown below in Figure 5.1. This map indicates that the site is at risk from the 0.1% Fluvial Annual Exceedance Probability (AEP) event.

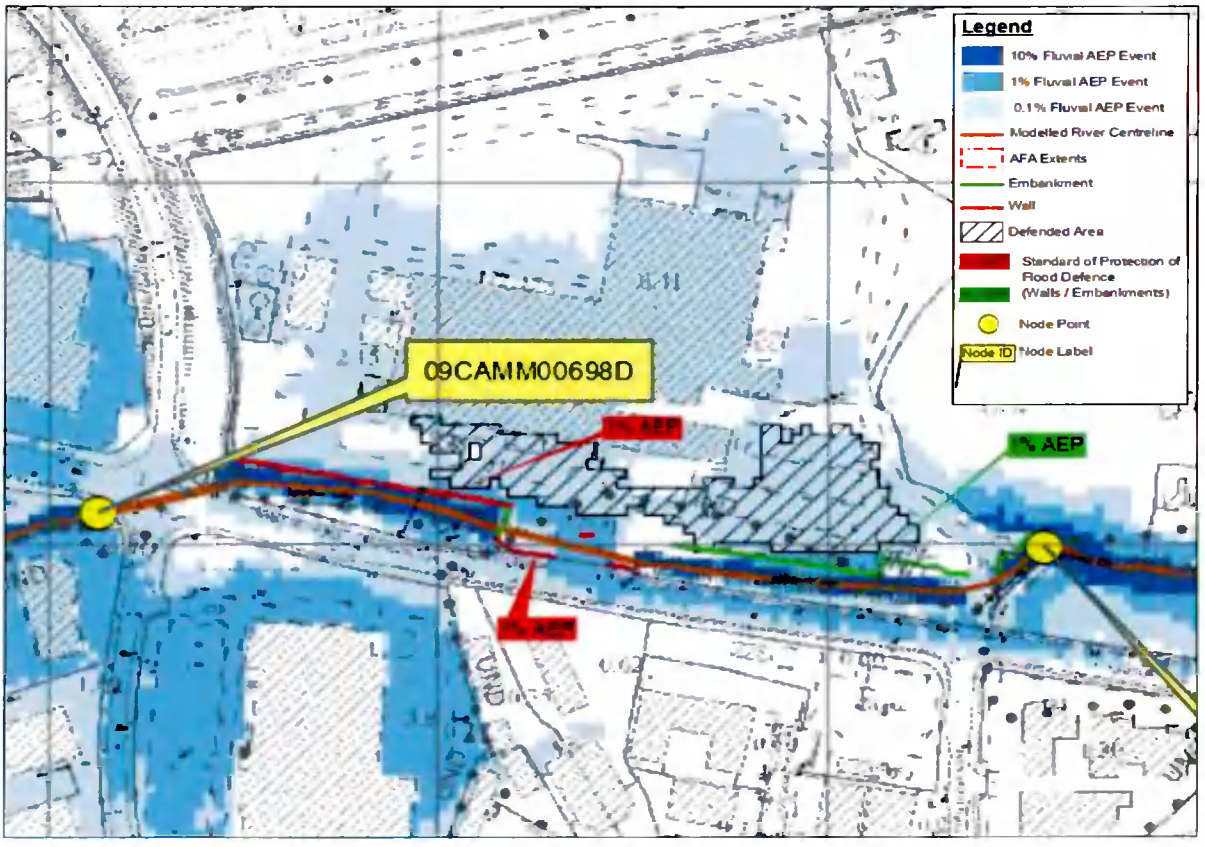

Figure 5.1: Fluvial Flood Map Extract

This is confirmed by the information contained within the "Strategic Flood Risk Assessment (SFRA) for South Dublin County Council Development Plan 2016-2022". A copy of the Flood Mapping produced for this SFRA is included in Appendix B, with an extract shown in Figure 5.2.

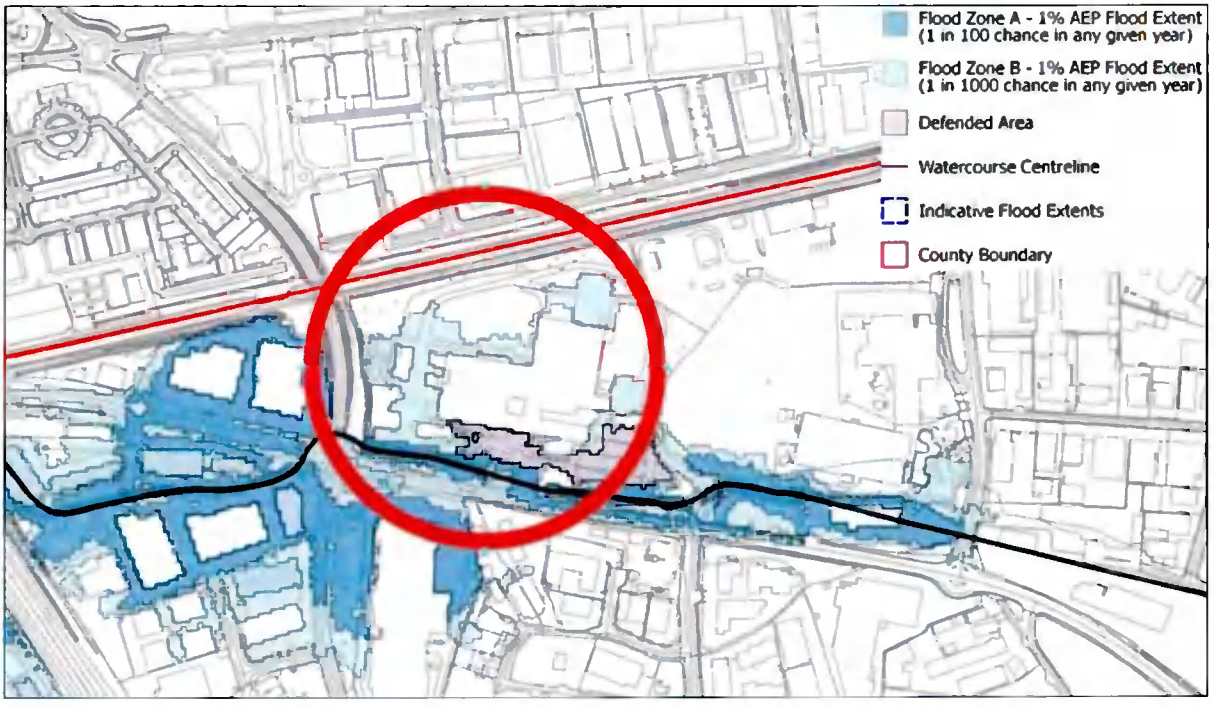

Figure 5.2: Extract of Flood Plain Extents (SFRA for SDCC Development Plan 2016 to 2022)

The proposed development is therefore situated within Flood Zone B, i.e., where the probability of flooding is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding). The site is classified as a less vulnerable development, as described in Section 2.4 above. Therefore, the Guidelines require a Justification Test.

The fluvial flooding is caused by overtopping of the Camac River. The Grand Canal is considered a low risk to contribute to the flooding. However, a mechanical or human error at the lock upstream of the site could potentially affect the site.

5.3 Tidal Flood Risk

The OPW Flood Maps was used to determine the tidal flood risk to the site. The results indicated that there is no risk of coastal/tidal flooding in the vicinity of the site.

Furthermore, the "Progress Report on extreme Event Pluvial flooding 24th October 2011" states that while "...there was a two weekly high tide with a level of 2.13m Malin recorded at Alexandra Basin at virtually the same time as the peak river flow...No tidal flooding was reported..." According to the report, the previous flooding event of the 24th October 2011 was not affected by tidal conditions.

5.4 Groundwater Flood Risk

A generalised OSi 6-inch map indicates that the area is not prone to marshy ground. A GSI map for groundwater karst features showed no sign of Karst in the vicinity of the site.

Groundwater was not encountered in any of the exploratory holes carried out. However, perched groundwater may be encountered within the Made Ground.

5.5 Summary of Flood Risk

Based on the above information it can be concluded that the site is located within Flood Zone B, i.e., the 0.1% AEP event fluvial flood extent area.

Accordingly, a Stage 3 – Detailed Risk Assessment has been completed.

6 Stage 3 – Detailed Risk Assessment

The purpose of the Stage 3 FRA is to identify what mitigation measures must be implemented to ensure the development is not at further risk of flooding and identify any residual flood risks and how those residual risks should be managed.

6.1 Residual Flood Risks

The main residual flood risks for the overall site are as follows:

- Blockages in the river channel or culverts resulting in an increase in flood level. A build-up of debris in the river channel contributed to the flooding on the 24th October 2011.
- Failure of existing defences.
- Failure of the storm water discharging from site due to high water levels in the Camac River.
- Increase in flood water levels due to development and/or mitigation measures upstream and downstream of the site.
- A flood event greater than the 0.1% AEP event occurs.

6.2 Future Flood Risk and Climate Change

Due to climate change the frequency, pattern and severity of flooding are expected to change, becoming more uncertain and possibly more damaging. The impacts of climate change will increase the risks posed by coastal flooding; however, this will not be an issue for the site due to its location. An increase in heavy rainfall events and storm activity will affect fluvial and pluvial flooding.

Flood Maps has the capability to model and estimate the effect of future fluvial flooding due to climate change. Figure 6.1 indicates a mid-range future scenario with a 1-in-a-100 chance of occurring or being exceeded in any given year.

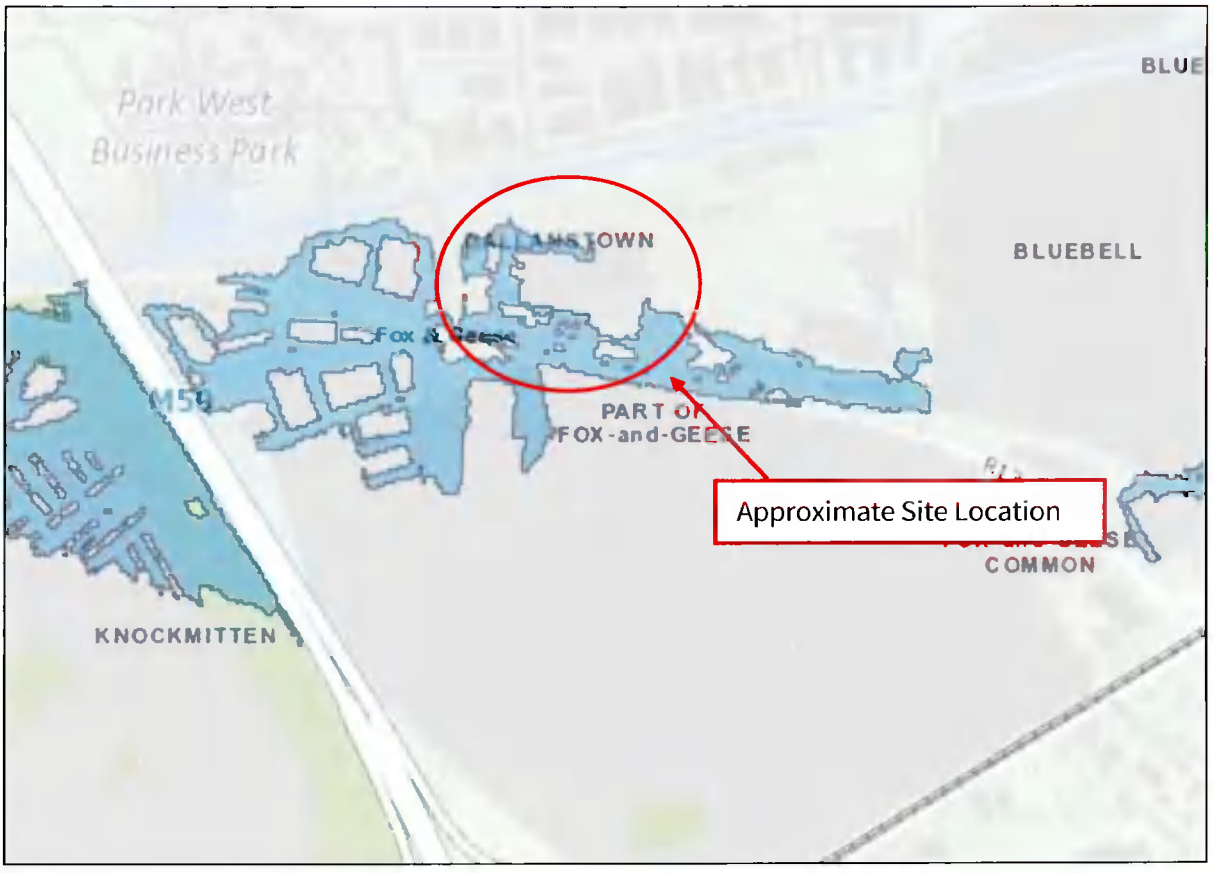

Figure 6.1: Estimated Future Flood Extents (Flood Maps)

6.3 Mitigation Measures

The Bulk Container Store is located partially on a grassed area. This will increase the overall hardstanding area of the site. However, due to the size of the contribution, the additional stormwater added to the drainage network would be considered negligible.

Considering the residual flood risks and the future flood risk due to climate change, we recommend the below mitigation measures to ensure that the proposed development will not increase flood risk on site.

6.3.1 Attenuation of Additional Run-Off

Additional stormwater (pluvial) run-off from the increase in impermeable area shall be attenuated locally to the new building. The form of attenuation will be designed using SuDS principles. The attenuation will store the residual runoff and release it slowly back to the Camac River to match the sites current runoff as not to exacerbate the current situation.

The form of attenuation is sized for a 1:100-year critical storm event with an allowance of 10% for climate change. The required volume is 30.7m^3. The attenuation calculations and proposed layout drawing are attached in Appendix D.

A control device/orifice shall be fitted to the attenuation system to limit the discharge from the new building to the ensure run-off rate for the site does not exceed current levels.

7 Justification Test

The Justification Test is an assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere.

Due to the proposed development location in Flood Zone B and classed as a less vulnerable development, a Justification Test is required. The following criteria must be satisfied:

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.

   Response: The proposed Bulk Container Store is included under upgrade works to the existing factory on site. Therefore, the land has been previously designated for industrial use. However, the land was rezoned in May 2019 by South Dublin County Council to "Objective REGEN" to facilitate enterprise and/or residential-led regeneration. Given the rezoning, the development should not impinge on future attempts to regenerate the area as the provision of these storage buildings within the existing development will not infringe upon the preparation of a masterplan for the Regen zoned lands, nor shall it infringe upon future delivery and implementation of regeneration in the area in the medium to longer term.

2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:

   i. The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk.

   Response: As discussed in Section 6.3 the proposed development will have a negligible impact on the existing surface water drainage. BL have included mitigation proposals to ensure that flows to the existing drainage network are not increased above current levels by introducing attenuation which has been designed using SuDS principles.

   The drainage for the proposed development has been designed in order to attenuate storm water run-off for the proposed minor increase in area of impermeable area, thereby preventing an increase in the risk of flooding as a result of increased run-off from the site.

   The proposed development includes a comparatively small storage building within the curtilage of a large existing industrial facility. Whilst the building is located within Flood Zone B, much of the existing site is already within this Zone, and as such this minor structure is highly unlikely to increase flood risk at the site or elsewhere.

   ii. The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible.

   Response: There will be no additional risk to property as there will be no increase in flood levels due to the proposed mitigation measures for any increase in runoff

flows. As discussed in Section 6.3, using a recognised form of SuDS attenuation will maintain current discharge levels thereby not increasing current risks.

iii. The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access.

Response: The site is an existing development. The addition of the proposed Bulk Container Store will have negligible impact on the residual risks discussed in Section 6.1. The mitigation of the residual risks to the entire site is outside the remits of the scope for this report, however, BL have included mitigation measures to ensure the proposed Bulk Container Store does not increase the residual risks to the site.

iv. The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

Response: The area was rezoned in May 2019 from Objective EE to Objective REGEN to facilitate enterprise and/or residential-led regeneration. Given the rezoning, the development should not impinge on future attempts to regenerate the area as the provision of these storage buildings within the existing development will not infringe upon the preparation of a masterplan for the Regen zoned lands, nor shall it infringe upon future delivery and implementation of regeneration in the area in the medium to longer term.

8 Conclusion and Summary

A Stage 1 – Flood Risk Identification, Stage 2 – Initial Flood Risk Assessment and a Stage 3 – Detailed Risk Assessment has been undertaken for the proposed Bulk Container Store at Nangor House, New Nangor Road, Dublin 12, as part of site upgrade works.

Information was gathered on flood history by reviewing old OS Maps, internet searches, the OPW flood database, GSI geological and karst data and the SDCC Development Plan. Previous flood studies were also reviewed and current fluvial flood extent maps.

From the information gathered it was shown that the proposed Bulk Container Store is in an area of moderate risk (Flood Zone B) and therefore a Justification Test was required.

It was determined that the proposed development will have a negligible effect on the flood extents on site and would not increase flood risk elsewhere. However, mitigation measures were proposed in order to protect the structure from flood events and to ensure no increase in flows to the existing drainage network.

Appendix A – Flooding at Diageo, Nangor Road.

Flooding at Diageo, Nangor Road
24th October 2011

The information contained in this report has been extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants working on the Eastern River Basin District (RBD) Catchment Flood Risk Assessment and Management (CFRAM) Project.

1 Location and date of flood event:

Location: DIAGEO Baileys Global Supply, Nangor Road, Dublin 12
Irish Grid Co-ordinates – 308,875 232,100

This flooding event started on 24th October 2011. The peak flood occurred on 24th October 2011.

2 Source and cause:

The source of the flood water was the Camac River, which was overtopped. The factory site is in a slight depression and water accumulated at a general level of 300mm across the site but at a depth of 600mm at some points.

3 Flood data:

The following flood information was provided:

Flood Parameter	Max Value	Typical Value	Comments
Flood Level (metres OD Malin)	48	47.9	
Flood Depth (metres)	0.6	0.3	
Flood Flow (m^3/s)			
Flood Velocity (m/s)			

It is not know if flooding has previously occurred at this location.

4 Impacts of flooding event:

Impacts to people: There was no loss of life or serious injury as a result of this flooding event.
Impacts to property:
Residential – 1 residential property was flooded.
Commercial – 1 commercial property was affected – DIAGEO Baileys Global Supply

5 **Additional information:**

Out of bank flooding from the Camac River, which is adjacent to the DIAGEO factory, resulted in the closure of the plant for 1 week.

6 **Attached documents:**

Photographs and a map of the affected area attached

Diageo, New Nangor Rd, Dublin 12

01.jpg

02.jpg

03.jpg

04.jpg

Appendix B – OPW Flood Maps

Appendix C – Topography Survey Drawings

Appendix D – Stormwater Attenuation Calculations

BYRNELOOBY	Project	Barleys Plant, Nangor Road	Job No.	W3499		
		Bulk Container Store	Made By	SB	Date	28/09/2021
	Calc. Title	Stormwater Storage	Chkd by	AMC	Date	28/09/2021
		Calculation	Sheet No.	1	Rev	0

Reference	Calculations	Output

Nangor Road Upgrade Works - Attenuation Calculations

Proposed Development Area = 1,250 m^2

= 730 m^2 of Greenfield/Grassed Area

= 520 m^2 of Hard-standing/Impermeable Area

Qbar for Greenfield Area

$Qbar = 0.00108 \times (AREA)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$ (50 ha site)

where AREA = 0.5 km^2

SAAR = 727 mm (See note below)

SOIL = S5 = 0.53

Q_{bar} = 327.48 l/s = 1178.9 m^3/hr

Interpolating for an area of 0.073ha gives Qbar(site): 0.4781 l/s

Qbar =

0.48 l/s
1.7212 m^3/hr
6.5495 l/s/ha

Qbar for Hard-standing Area

$Qbar = 0.00108 \times (AREA)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$ (50 ha site)

where AREA = 0.5 km^2

SAAR = 727 mm (See note below)

SOIL = S5 = 0.90 (0.9 used to account for impermeable nature of site)

Q_{bar} = 1033.3 l/s = 3719.7 m^3/hr

Interpolating for an area of 0.052ha gives Qbar(site): 1.0746 l/s

Qbar =

1.07 l/s
3.8685 m^3/hr
20.665 l/s/ha

Qbar for Greenfield Area = 1.7212 m^3/hr
Qbar for Hard-standing Area = 3.8685 m^3/hr

Qbar Combined = 5.5897 m^3/hr

Attenuation Calculations for 100-year Storm Event

Additional Impermeable Site Area: 0 m^2 (Bottle Storage)
Additional Impermeable Site Area: 730 m^2 (Bulk Container)

Total: 730

Extreme Rainfall Event					Runoff		Attenuation
Duration	Duration	Depth	(+10%)	Rate	Total	Allowable	Volume
minutes	hours	mm	mm	mm/hr	m^3	m^3	m^3
5.00	0.08	16.80	18.48	221.76	13.5	0.5	13.0
10.00	0.17	23.40	25.74	154.44	18.8	0.9	17.9
15.00	0.25	27.60	30.36	121.44	22.2	1.4	20.8
30.00	0.50	34.10	37.51	75.02	27.4	2.8	24.6
60.00	1.00	42.10	46.31	46.31	33.8	5.6	28.2
120.00	2.00	52.10	57.31	28.66	41.8	11.2	30.7
240.00	4.00	64.40	70.84	17.71	51.7	22.4	29.4
360.00	6.00	72.90	80.19	13.37	58.5	33.5	25.0
720.00	12.00	90.10	99.11	8.26	72.4	67.1	5.3
1440.00	24.00	111.50	122.65	5.11	89.5	134.2	-44.6
2880.00	48.00	123.00	135.30	2.82	98.8	268.3	-169.5
4320.00	72.00	132.80	146.08	2.03	106.6	402.5	-295.8

Required Attenuation Volume for extreme 100 year storm event: 30.66 m^3

Note: Rainfall depths and SAAR obtained from Met Eireann and relate to Irish Grid co-ordinates Easting: 309000 Northing: 232000