
Town Park at Ninch, Laytown, Co. Meath

Flood Risk Assessment – Planning Stage

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1.0 Introduction

1.1 General Description

Meath County Council intends to make an application for approval to An Bord Pleanála to carry out development in the townland of Ninch, Laytown, Co. Meath. The proposed development of a Town Park comprises of the following:

- The creation of formal and informal play spaces;
- The provision of new pathways and improvement of existing pathways including a new pedestrian road crossing and a boardwalk over the dunes;
- The creation of an open space for flexible-use (events, gathering, markets, leisure, informal sport games);
- All associated and ancillary site works associated with the proposed development including landscaping, signage and street furniture.

1.2 Report Scope

BDP have prepared this Flood Risk Assessment Report (FRA) on behalf of the Meath County Council for the proposed Laytown Park Project, Ninch, Laytown, Co. Meath.

This report should be read in conjunction with the following Planning Application drawings:

- LTP-BDP-ZZ-00-DR-L-000002– Site Layout Plan
- LTP-BDP-ZZ-00-DR-L-000003– Landscape Plan

This report have been prepared following review of available existing service information from Local Authority records and national bodies including The Office of Public Works (OPW), Meath County Council (MCC), Irish Water (IW) and the wider Design Team.

1.3 Site Description

The site is situated in the jurisdiction of Meath County Council (MCC). The site location is indicated with a red star in Figure 1.0. The site is located in the coastal area of Laytown bounded by the River Nanny Estuary and Laytown Strand. The site slopes from Station Road to the coastline. Existing site levels vary between 3.00mAOD at the Station Road to 2.26mAOD along the coastline. The site is partially surrounded by an embankment with levels between 3.45mAOD to 3.80mAOD. A Topographical Survey for the site is included in Appendix E. As shown on Figure 1.0, the site's immediate surrounding area is commercial and residential with Laytown Railway Station to the west. The total site is approximately 2.824 ha (28,235m²).



Figure 1.0 - Site Location Map (Source: Open Street Map)

2.0 Flood Risk Assessment

This flood risk assessment was prepared and informed by the DEHLG Guidelines for Planning Authorities (DEHLG & OPW, 2009) on 'The Planning System and Flood Risk Management' (and Technical Appendices) and the findings of the Strategic Flood Risk Assessment (SFRA) for the Meath County Development Plan 2021 - 2027.

This flood risk assessment is to determine whether this particular development is in an appropriate location in terms of risk to people, property and the environment. It should be assessed over a full range of probabilities, including extreme events and how risks can be reduced.

Flood Zones are used to indicate the likelihood of a flood occurring as defined by 'The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009'. The Flood Zones are based on an undefended scenario and do not take into account the presence of flood protection structures such as flood walls or embankments and are categorised as follows:

- Flood Zone A: Indicates a high probability of flooding;
- Flood Zone B: Indicates a moderate probability;
- Flood Zone C: Indicates a low probability of flooding from fluvial or tidal sources.

Highly vulnerable developments at risk of Zone A and Zone B flooding require a Justification Test in accordance with Table 3.2 Matrix of Vulnerability versus flood zone from The Planning System and Flood Risk Management Guidelines for Planning Authorities reproduced below.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 2.0 – Justification Test Matrix from the Planning System and Flood Risk Management Guidelines

This flood risk assessment applies a sequential approach, including:

- Flood Risk Identification
- Initial Flood Risk Assessment
- Detailed Flood Risk Assessment

The possible sources of flooding may be assessed using the Source Pathway – Receptor Model at the Initial Flood Risk Assessment of the FRA - as outlined in Table 2.1 below.

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	Overtop Breach	People Property	Likely	Low	High
Fluvial	Overtop Breach	People Property	Likely	Low	High
Pluvial / Surface Water	Overflow	People Property	Possible	Low	Medium
Groundwater	Rising groundwater levels	People Property	Unlikely	Low	Low

Table 2.1 – Source – Pathway Receptor Model

2.1 Site Context

The development is situated approximately 40m from the Nanny River Estuary / Laytown Strand. The mouth of Nanny River is subject to recurring flooding with some tidal flooding along coastline. The proposed development is located within Flood Zone A as per the Strategic Flood Risk Assessment (SFRA) mapping provided by Meath County Council for the Development Plan 2021 - 2027. An extract is included below in Figure 2.0. Flood Zone A is an area with the highest risk of flooding from rivers (i.e. more than 1% probability or more than 1 in 100) and the coast (i.e. more than 0.5% probability or more than 1 in 200).

The vulnerability of development to flooding depends on the nature of the development, its usage and proposed construction methods. The site is zoned as Community Infrastructure (G1) as per Meath County Councils Development Plan 2021 - 2027. The proposed land use for this site is amenity open space, outdoor recreation and open event space. Due to the proposed land use it is possible to manage the safety of people in flood events and the implications for the recovery of the function of the site facilities. As community infrastructure the site is classified as water-compatible and a less vulnerable development. Therefore, the development is appropriate in Flood Zone A as per the Justification Test Matrix from the Planning System and Flood Risk Management Guidelines in Table 2.0.

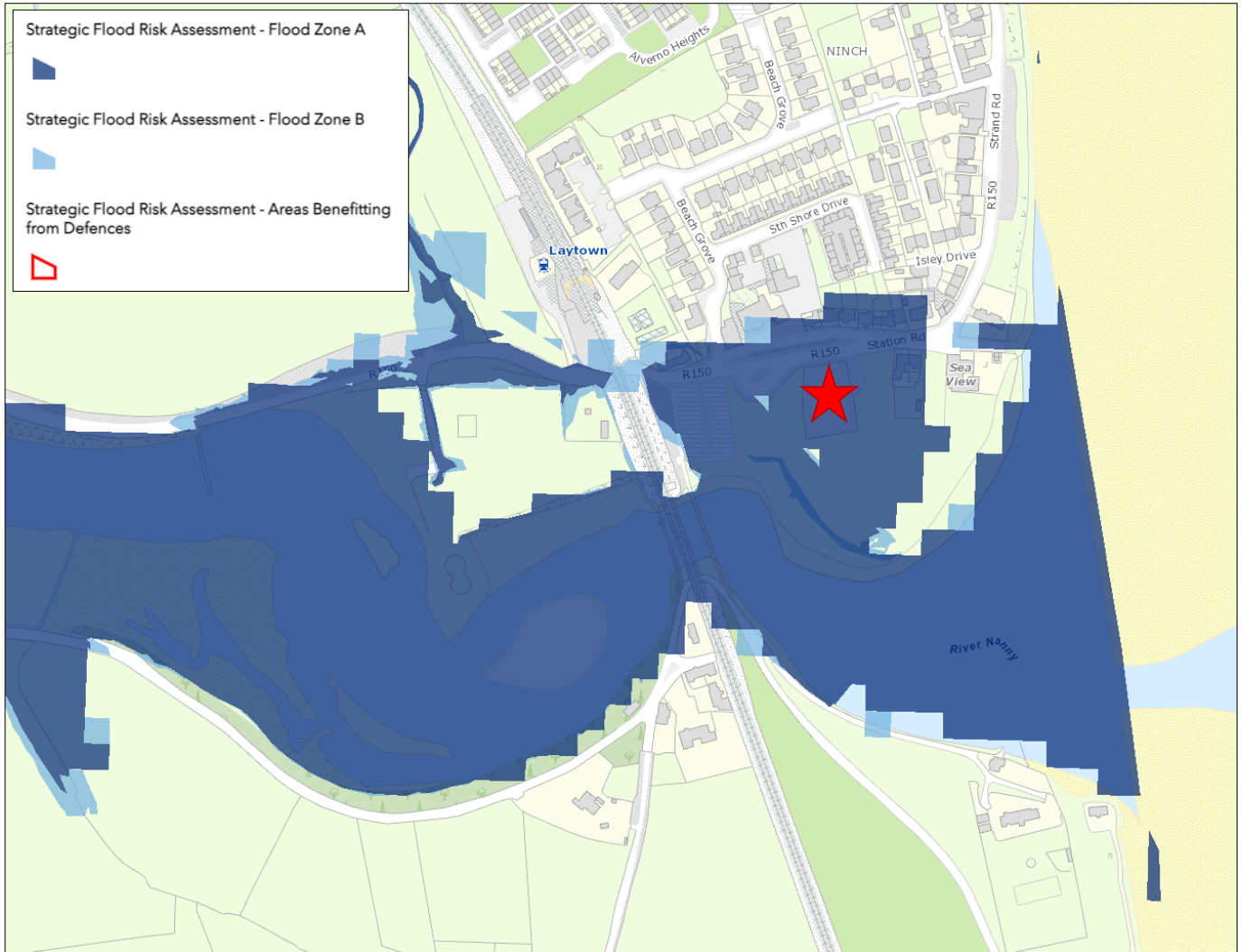


Figure 2.0 – Extract of Flood Zone Web Mapping from the Strategic Flood Risk Assessment (SFRA) for the Meath County Development Plan 2021 – 2027

2.2 Tidal Flooding

Flood Risk Identification

The existing site is located at the mouth of the Nanny River Estuary. The tidal flood mapping produced by the OPW for the Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAMS) indicates that the subject site is inside the current tidal flood extents scenario for all probable tidal AEP events (10%, 0.5% and 0.1%) as per Figure 2.1. The FEM FRAMS tidal map showing the tidal flood extent for the site and surrounding area is included in Appendix B.

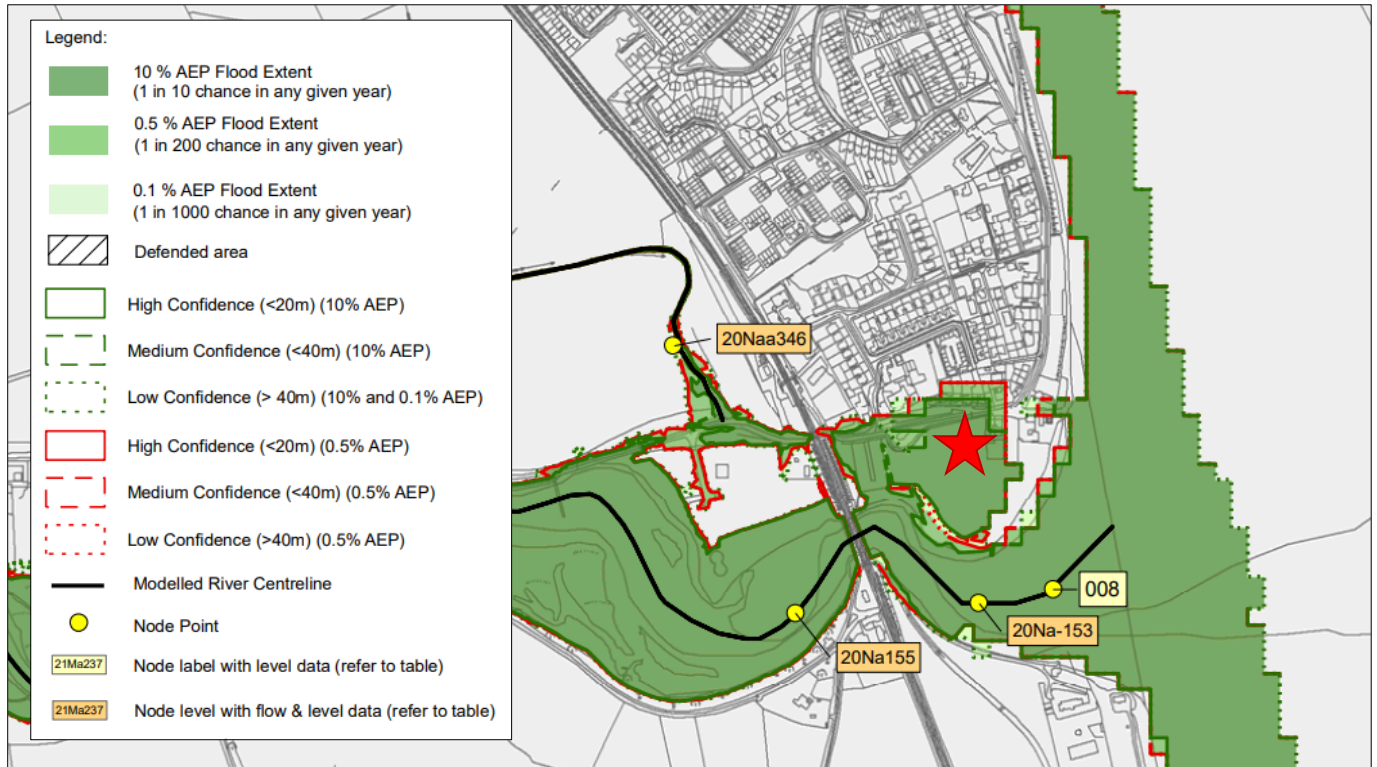


Figure 2.1 – Extract of FEM FRAMS Tidal Flood Map NAN/HPW/EXT/CURS/T/004 from Floodinfo.ie

Initial Flood Assessment

The tidal flood mapping produced by the OPW for the Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAMS) indicates that the subject site is inside the tidal flood extents for all tidal AEP events (10%, 0.5% and 0.1%) as per Figure 2.1. The nearest predicted flood level from the FEM FRAMS tidal map is approximately 100m from the site and is provided below in Table 2.2. A copy of the FEM FRAMS Mapping with the full map extents and levels table is included in Appendix B. Flooding is shown on site for the 10%, 0.5% & 0.1% AEP Events. The flood maps were checked against historic flooding in the area and there is recurring river and tidal flooding at the mouth of the Nanny River Estuary. This flooding extends beyond the site along Station Road and to some surrounding streets and properties. The existing ground levels across the site vary between 2.26mAOD and 3.00mAOD which is below the water level at the nearest node label for the 0.1% AEP predicted tidal flood levels including climate change.

Node Label	Tidal FEM FRAMS Level (mAOD)		
	10% AEP	0.5% AEP	0.1% AEP
20Na-153	3.08	3.50	3.73

Table 2.2 – Extract of the Tidal Flood Levels from the Nanny Model Flood Extent Map for the Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAMS) Project

Using the Source Pathway – Receptor Model as outlined in Table 2.1 above, the flood source is tidal and the pathway to the community infrastructure is overtop breach as existing site levels are below the flood levels for all predicted

flood events. Although, existing ground levels for the community infrastructure is below all predicted AEP flood events, the site is appropriate as it is categorised as a water-compatible and less vulnerable development according to the Table 3.1 - Classification of vulnerability of different types of development from the Planning System and Flood Risk Management Guidelines. The risk from the effects of flooding on site to people who will use the community infrastructure can be managed.

Detailed Flood Assessment

The existing information available does not warrant further investigation.

2.3 Fluvial / River Flooding

Flood Risk Identification

The existing site is located at the mouth of the Nanny River Estuary. The tidal flood mapping produce by the OPW for the Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAMS) indicates that part of the site is inside the current fluvial / river flood extents for all probable fluvial AEP events (10%, 1.0% and 0.1%) as per Figure 2.2. The FEM FRAMS Fluvial map shows the river flood extending on to the south west part of the site where the existing carpark is located and to be retained. The FEM FRAMS fluvial / river map showing the flood extent for site and the surrounding area is included in Appendix C.

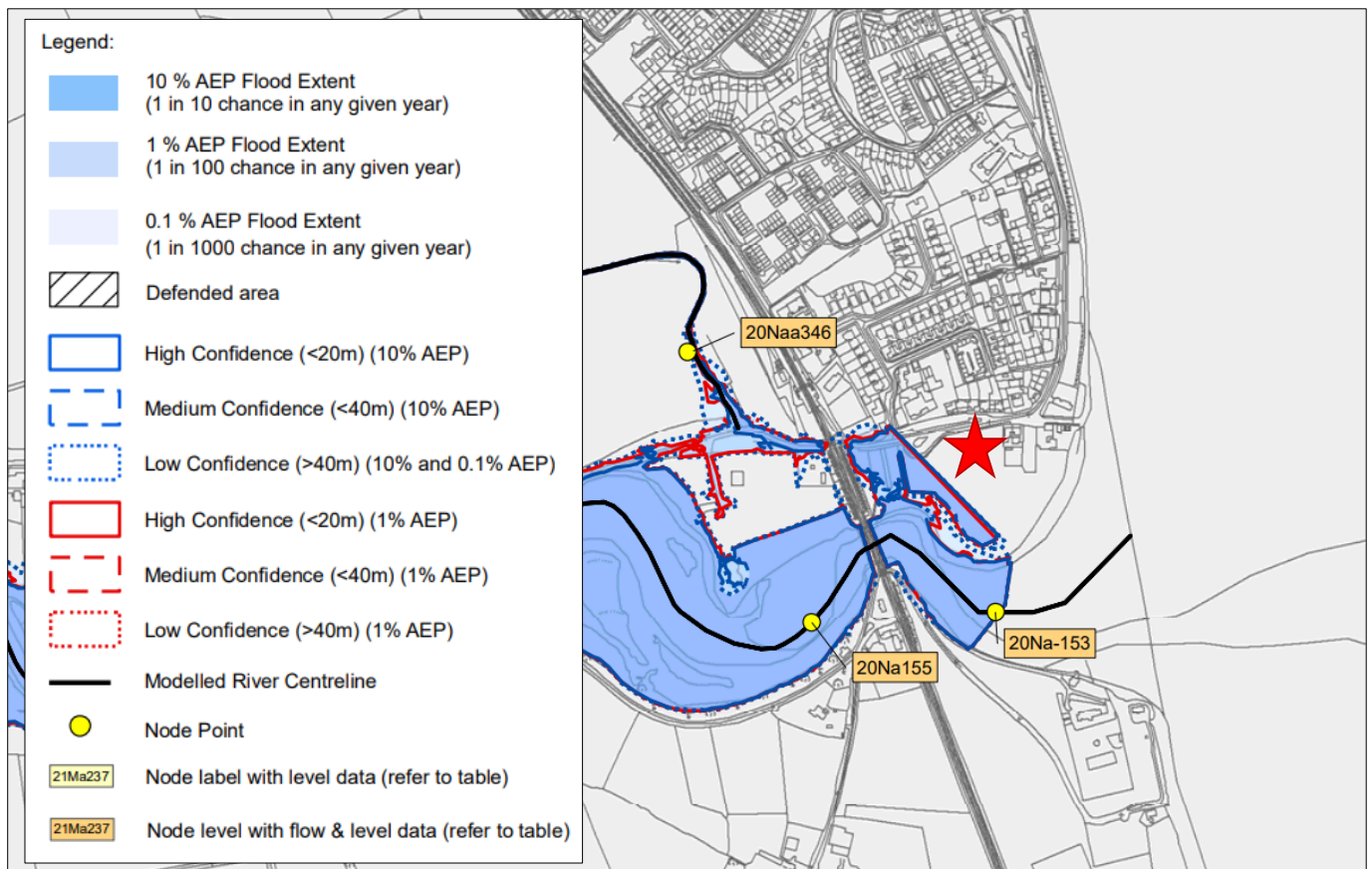


Figure 2.2 – Extract of FEM FRAMS Tidal Flood Map NAN/HPW/EXT/CURS/004 from Floodinfo.ie

Initial Flood Assessment

The fluvial / river flood mapping produced by the OPW for the Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAMS) indicates river flooding extends into the south west area of the site for all fluvial AEP events (10%, 1.0% and 0.1%) as per Figure 2.2. The nearest predicted flood level from the FEM FRAMS river map is approximately 100m from the site and is provided below in Table 2.3. A copy of the FEM FRAMS Mapping with the full map extents and levels table is included in Appendix C. Flooding is shown on site for the 10%, 1.0% & 0.1% AEP Events. The mouth of the Nanny River Estuary is tidal and there is recurring river and tidal flooding from historic records and mapping. This flooding extends west of the site along Station Road to surrounding streets and

lands to the west of Laytown Railway Station. The existing ground levels to existing carpark on the west of the site is approximately 3.00mAOD which is below the water level at the nearest node label for the 1.0% & 0.1% AEP the predicted fluvial flood levels including climate change.

Node Label	Fluvial FEM FRAMS Level (mAOD)		
	10% AEP	1.0% AEP	0.1% AEP
20Na-153	2.87	3.06	3.46

Table 2.3 – Extract of the Fluvial / River Flood Levels from the Nanny Model Flood Extent Map for the Fingal East Meath Flood Risk Assessment and Management Study (FEM FRAMS) Project

Using the Source Pathway – Receptor Model as outlined in Table 2.1 above, the flood source is river / tidal and the pathway to the community infrastructure is overtop breach as existing site levels are below the flood levels for all predicted flood events. Although, existing ground levels for the community infrastructure is below all predicted AEP flood events, the site is appropriate as it is categorised as a water-compatible and less vulnerable development according to the Table 3.1 - Classification of vulnerability of different types of development from the Planning System and Flood Risk Management Guidelines. The risk from the effects of flooding on site to people who will use the carpark can be managed.

Detailed Flood Assessment

The information available does not warrant further investigation.

2.4 Pluvial / Surface Flooding

Flood Risk Identification

The OPW’s floodinfo.ie website provides the Past Flood Event Local Area Summary Report, which is available in Appendix D, lists reports of historical flooding within 2.5km of the subject site. The location of historic flooding in the areas nearby and on the site are shown in Figure 2.3. There is recurring historic flooding on site due to high tide conditions (Flood ID = 882) with the most recent single event occurring in Feb 2002 (Flood ID = 5321). Surface water drainage floods every year after heavy rain at Alverno Heights, Laytown, which is approximately 300m north of the site due to inadequate drainage (Flood Id = 963).

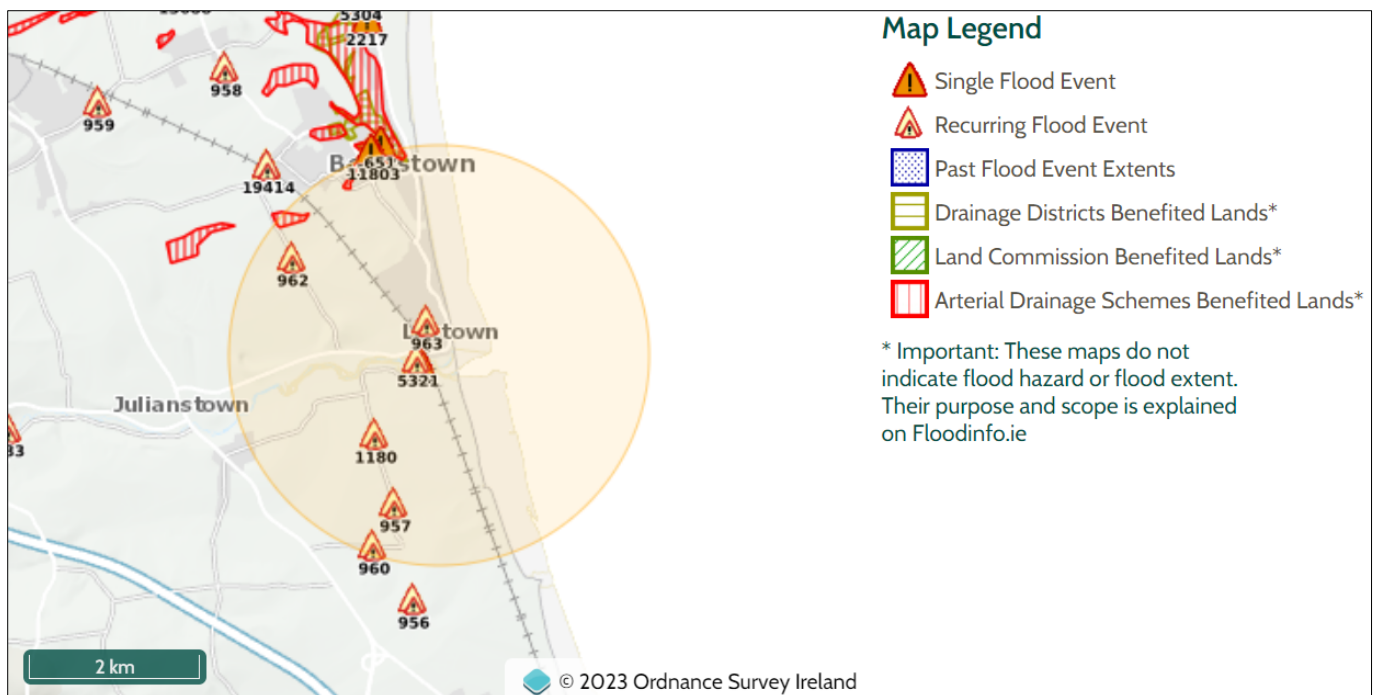


Figure 2.3 – Extract all flood events within 2.5 kilometres of the site from floodinfo.ie

Initial Flood Assessment

There is pluvial / surface flooding indicated to the surrounding roads of the site as per Figure 2.3. The mapping indicates recurring flooding on site which is consistent with the predicted flood mapping from the tidal and river flooding events. The surface flooding at Alverno Heights, Laytown is a significant distance and is considered to be not a risk to the site.

Following an assessment of the information available, the probability of pluvial flooding on the site from the overland flow is likely. The existing flood information indicates that there is no pathway for pluvial flooding to the site from the surrounding areas. In accordance with Table 2.1 - Source - Pathway Receptor Model from the DEHLG Guidelines. In accordance with the Source Pathway – Receptor Model (Table 2.1), it is reasonable to conclude that the risk and the consequence from pluvial flooding to the site and surrounding area is negligible and can be managed as the site is categorised as a water-compatible and less vulnerable development.

Detailed Flood Assessment

The existing information available does not warrant further investigation.

2.5 Groundwater Flooding

Flood Risk Identification

The site is located in an open amenity area on the outskirts of an urbanized area. The urban fabric discontinues at the site boundary where it becomes coastal wetland. There are no historic reports of groundwater flooding as per the mapping obtained from Geological Survey of Ireland (GSI). There are recorded springs at Julianstown, Gaskinstown and Garballaghon from the GSI database. There is a recorded dug wells approximately 800m south west of the site for domestic use. These springs and wells are not indicated as source protection zones for the mapping in the area. The site is located on a flat sandur plain formed by meltwater from glaciers. The underlying subsoil stratum of the sandur is marine sands and gravel (Figure 2.4). These unconsolidated materials overly limestone and shale bedrock (Figure 2.5). The primary Groundwater Body (GWB) in the region is the Bettystown GWB. The GWB is composed of high permeable karstified limestone. The bedrock aquifer in the region is an important karstified conduit aquifer as shown in Figure 2.5.

The pathway to the underlying aquifer is affected by the strata thickness and subsoil overlaying the bedrock. The marine sand and gravel on site provides a high subsoil permeability rating as shown in Figure 2.6. Regional groundwater flow from springs and rivers discharges to the Nanny River creating baseflows, annual groundwater fluctuations and a rapid response to groundwater recharge. The groundwater recharge from GSI mapping shown in Figure 2.7 indicates that groundwater recharge in the immediate area of the site is high between 201 - 250mm / year. Please note that no site investigations have proven the made ground, subsoils and the hydrogeological regime on site.

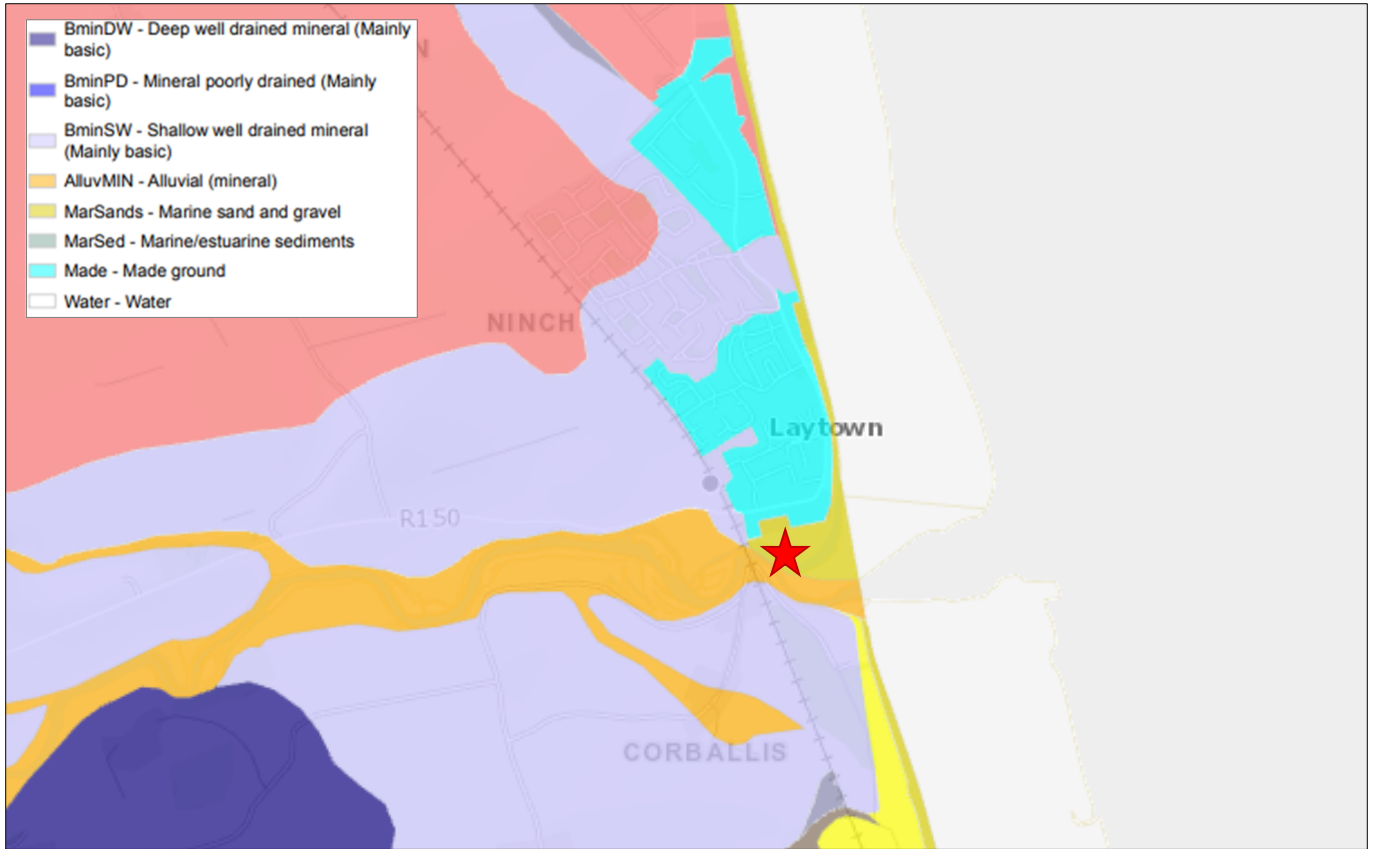


Figure 2.4 – Extract of Teagasc Soils from GSI website

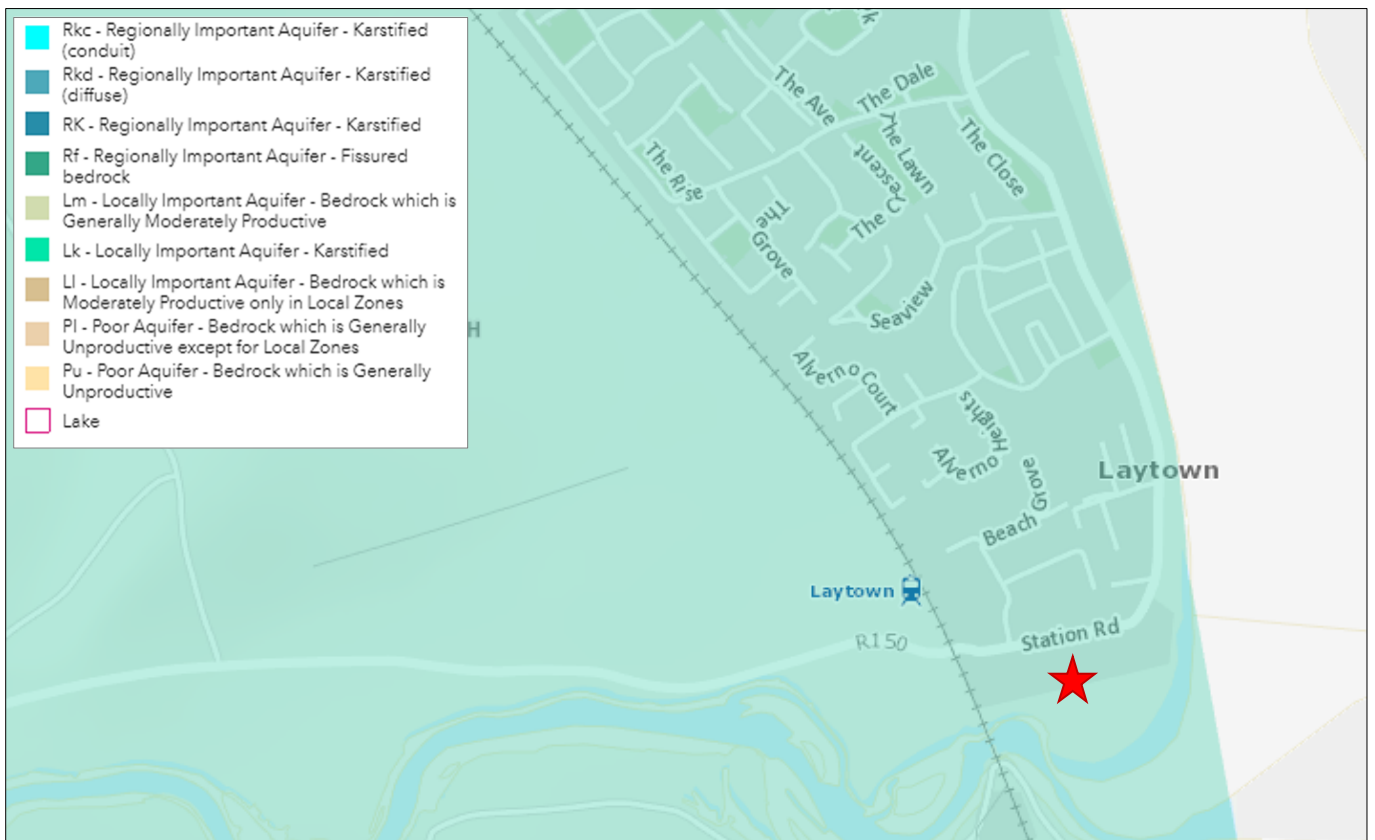


Figure 2.5 – Extract of Bedrock Aquifer GSI website

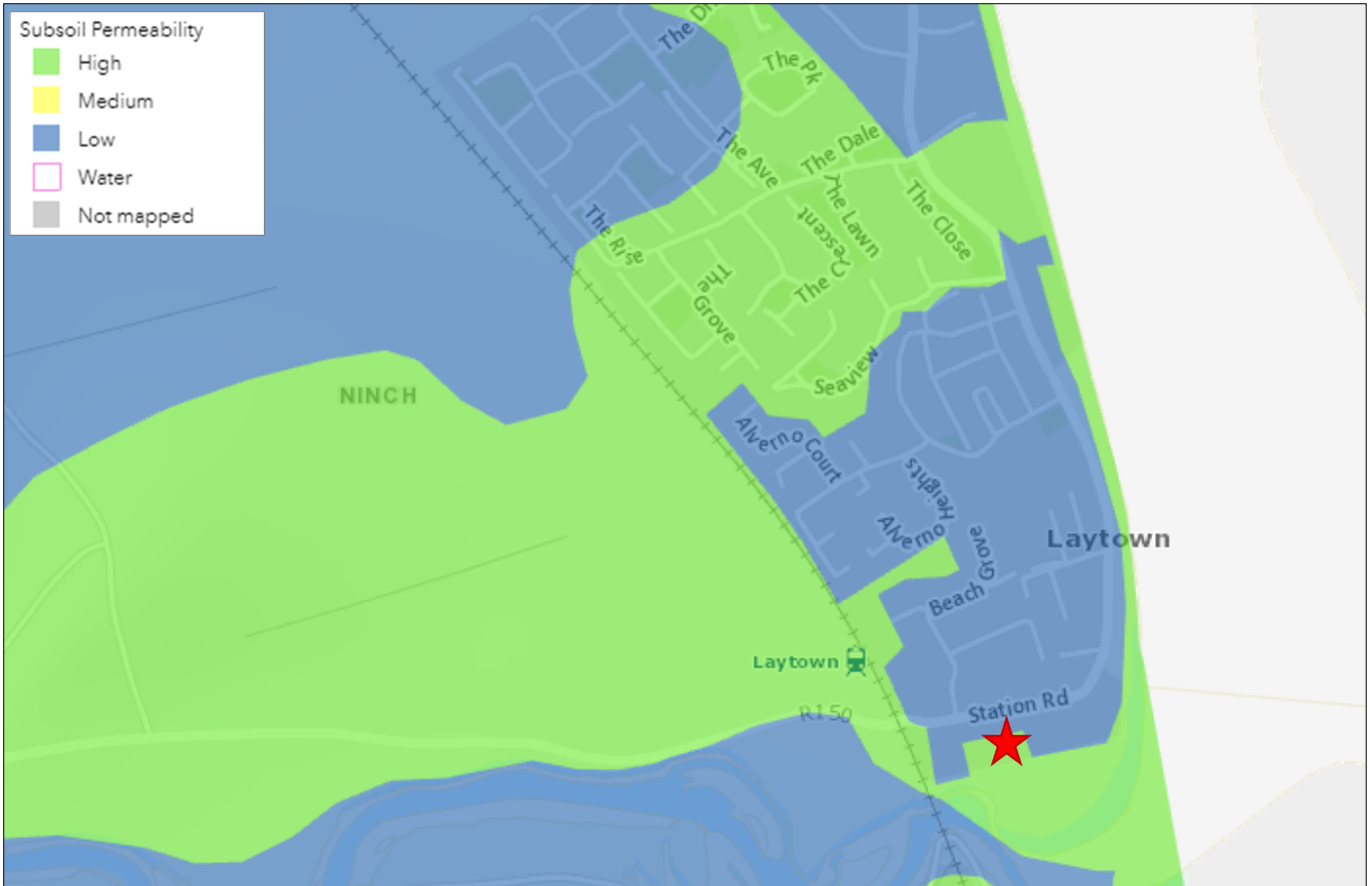


Figure 2.6 – Subsoil Permeability from GSI website

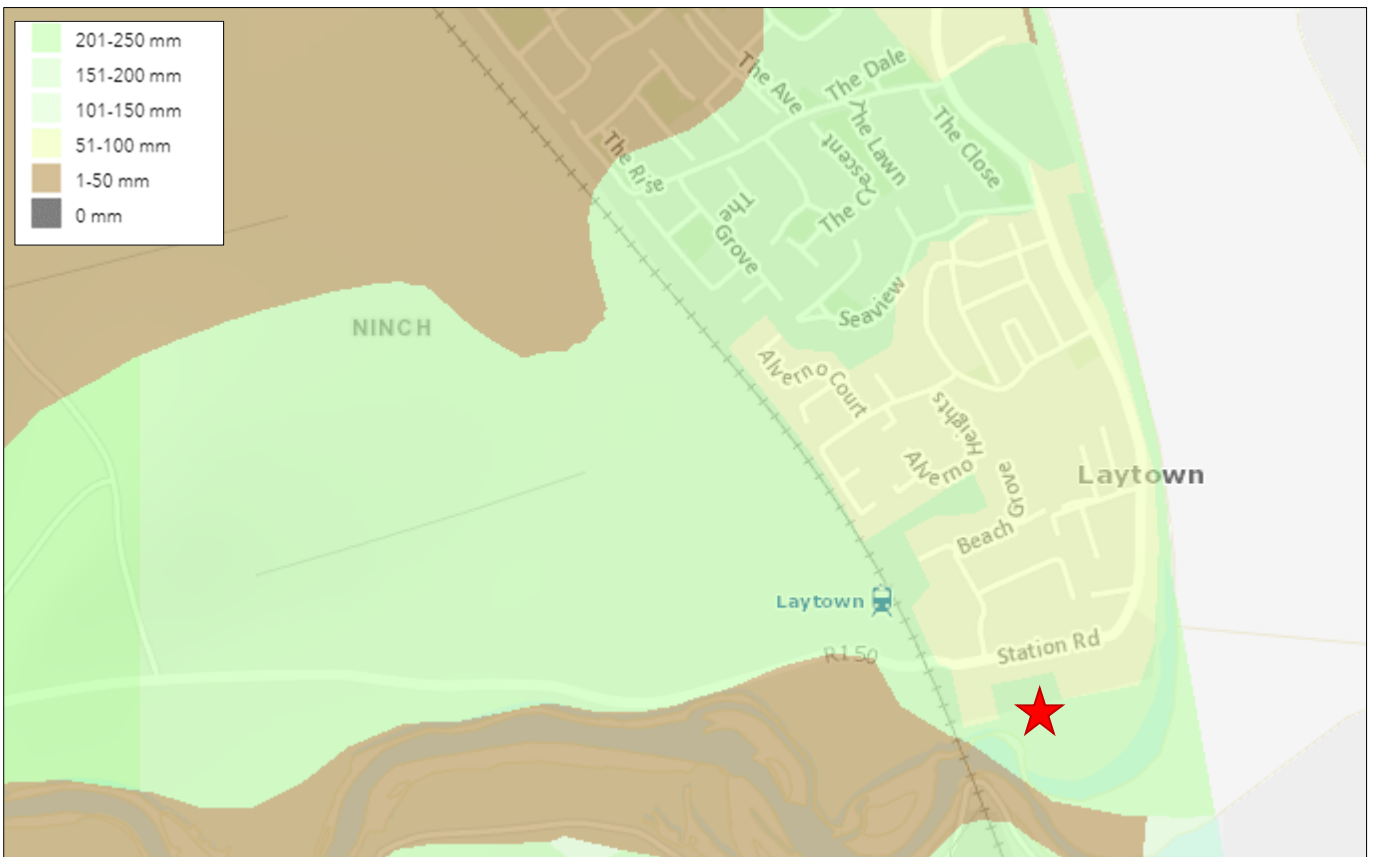


Figure 2.7 – Groundwater Recharge from GSI website

Initial Flood Assessment

The site is located in an area with a high groundwater recharge. The subsoil permeability and recharge for the site area has been identified as high due to the marine sand and gravel soil overlying the bedrock. The subsoil is thinnest and most permeable at the Nanny River Estuary and large amounts of rainwater will enter the aquifer quickly through the riverbed. The limestone bedrock has moderate to good permeability through joints and fissures. The majority of groundwater flow occurs in the upper 30m in the Bettystown GWB area. Due to the generally high permeability surface water run-off will infiltrate rapidly to the soil and the aquifer below. When the water table is above the riverbed, water will discharge directly from the aquifer and subsoil to the coast.

The existing site is generally finished with permeable soft landscaping and impermeable tarmac footpaths and playground finishes. The provision of new pathways and improvement of existing pathways is proposed with the development. The site will remain mostly permeable with continued opportunity for percolation to the subsoil below.

In accordance with the Source Pathway – Receptor Model (Table 2.1), there will be no increase in existing groundwater levels which could cause increased flooding on site as proposed finishes are to generally remain as soft landscaping. It is reasonable to conclude that the hydrological regime will remain unchanged. Groundwater from the adjacent riverbed estuary is unlikely to be a source of overland flow routes as a high water table can discharge directly to the coast. Therefore, it is concluded that there will be a negligible risk of groundwater flooding the proposed development.

Detailed Flood Assessment

The existing information available does not warrant further investigation.

2.6 Infrastructure Failure Flooding

Flood Risk Identification

Flooding can occur as a result of infrastructure designed to store or carry water. There is an existing river and aqueduct which discharges to the Irish Sea. The site is bounded by the River Nanny Estuary which is tidally influenced. As discussed above in Section 2.2 and 2.3, there are flooding risks from the tidal and river flooding via overtop breach due to sites distance from these sources and ground levels. A combination of a high river flow and a high tide will prevent water flowing out to sea which may be a risk for the failure of existing infrastructure. The site is adjacent a Railway Aqueduct, coastal cliff / sand dune defenses and public sewer.

Railway Aqueduct Failure:

The Laytown Railway Aqueduct crosses the Nanny River Estuary and approximately 50m from the development. There are historical records of flooding noted at the Laytown Railway Aqueduct as discussed in Section 2.4. There has been reported re-occurring flooding at the aqueducts location. Most recently in February 2002 tidal surge caused overtopping of the railway aqueduct. No other flooding has been reported since.

Coastal Erosion:

The coastal cliff and sand dunes at Laytown Strand are protected from erosion with gabions and meshes. The loss of natural coastal defenses for these cliffs and sand dunes due to erosion or wave damage can increase the risk of flooding to the site. Coastal erosion is evident along the extents of Laytown Strand which has been identified as an area of high risk from coastal erosion in several reports commissioned by Meath County Council. No significant erosion has been identified adjacent the site. The soft dry sand and a small dune system is present and intact from the River Nanny Estuary to Laytown Strand to the slipway at Station Road. However, the dunes at Station Road Carpark and at the Railway Slip Road, at the extents of the site, are under pressure from erosion with exposure of rock in the intertidal area.

Drainage Failure:

The development will have no positive drainage system to public sewers along Station Road. It is the understanding that the existing carpark at the west boundary of the site has private carpark drainage and buildings to the east discharge to the public sewers on Station Road. There are no sewer flooding issues along Station Road as discussed in Section 2.4 above. There may be at risk from flooding in the future with an increase in upstream developments, climate change and blockage of the drainage system.

Initial Flood Assessment

Railway Aqueduct Failure:

Potential flooding can possibly arise due to failure or breach of an aqueduct, overtopping and or operational issues or blockage of the railway aqueduct arches. The site is approximately 50m from Laytown Railway Aqueduct. There is historical flooding events and potential reoccurring flooding risks at this location. It is reasonable to conclude from the existing information flooding as a result of an aqueduct blockage and failure is possible. In an unlikely event of blockage and or failure, overflows may be directed away from the site due to topography and the surrounding area via the estuaries natural contour. Therefore, the flooding risk from blockage and failure is deemed to be low.

Coastal Erosion:

The site is subject to flooding due to tidal / river overtopping as discussed above in sections 2.2 and 2.3. The Nanny River Estuary, coastal cliff and dune systems provide some site protection against current extreme sea levels. Coastal erosion has been identified in areas close to the site boundary. It is reasonable to conclude that there is a residual risk of flooding from the future impacts of sea level rise with the potential for coastal erosion as a result of climate change.

Drainage Failure:

There are no reported sewer flooding issues adjacent the site as discussed in Section 2.4 and it is reasonable to conclude that the failure of the drainage system along station road and the existing carpark at the west side boundary is unlikely. In an unlikely event of failure, overflows will be directed away from the site due to topography of the site and surrounding area. There is no private drainage or site outfalls identified within the development as per the topographical survey included in Appendix E. It is reasonable to conclude that there is no risk of flooding on or near the site from the blockage of the existing drainage located in the public road to the front of the site. There is no proposed drainage for the development and the site will remain soft landscaping with permeable surfaces. Therefore, there is no risk from proposed drainage systems with the proposed development.

As the site is categorised as a water-compatible and less vulnerable development the site is deemed appropriate according to the Table 3.1 - Classification of vulnerability of different types of development from the Planning System and Flood Risk Management Guidelines. It is reasonable to conclude that the risk from flooding as a result of infrastructure failure on site can be managed as the site is categorised as a water-compatible and less vulnerable development.

Detailed Flood Assessment

The existing information available does not warrant further investigation

3.0 Flood Risk Summary

- The site is zoned as community infrastructure (G1) which is considered a water-compatible and less vulnerable development;
- The development is located within Flood Zone A, however, it is deemed appropriate as the development is categorised as a 'Water-compatible development / Less Vulnerable' under the Planning System and Flood Risk Management Guidelines. Therefore, no justification test is required under the guidelines;

- Due to the water-compatible nature and community infrastructure usage of the development it is expected that flooding on site can be managed with no risk to people and property;
- The development has been sequentially assessed from the following sources for residual risk:
 - Tidal;
 - Fluvial;
 - Pluvial;
 - Ground Water;
 - Infrastructure Flood Failure;
- Fluvial, Tidal and Pluvial flood risks have been identified on or near the site following a review of all publically available flood mapping, development plans and LAPs for the area of the community infrastructure;
- The existing sources of information available does not warrant further investigation;
- It is reasonable to conclude given the low vulnerability categorisation of the development that the residual flood risk is acceptable such that there is no inappropriate risk of flooding arising and no inappropriate flood risk to the development, its users and adjoining properties from the following identified sources;
- Therefore, the site is appropriate for development when assessed against the requirements of 'The Planning System and Flood Risk Management' as issued by the Department of the Environment, Heritage and Local Government in November 2009.

Appendix A

Flood Zone Map (SFRA 2021 - 2027)

Appendix B

Tidal Flooding Map

Appendix C

Fluvial Flooding Map

Appendix D

Past Flood Event Local Area Summary Report

Appendix E

Topographical Survey