

FLOOD RISK ASSESSMENT
FOR
LARGE SCALE RESIDENTIAL DEVELOPMENT
AT
LISDARAN
CAVAN
CO. CAVAN



Prepared for
Lisdaran Developments Ltd

Prepared by
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Reference Number
25.528 TE

Date of Issue
30th September 2025



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Project Title: Flood Risk Assessment

Client: Lisdaran Developments Ltd

Office Reference: 25.528 TE

Status: Fina

Date: 30th September 2025

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1.0 INTRODUCTION

Traynor Environmental Ltd have been appointed to carry out a site-specific flood risk assessment for the proposed development at Lisdaran, Cavan, Co. Cavan. This report is intended to satisfy the requirements of Cavan County Council relating to the proposed development.

1.1 Flood Risk Management Guidelines (2009)

As per the Flood Risk Management Guidelines (2009), where flood risk may be an issue for any proposed development, a flood risk assessment (FRA) should be carried out that is appropriate to the scale and nature of the development and the risks arising. The flood risk assessment outlined herein is intended to be sufficiently detailed to quantify the risks and effects of any flooding, necessary mitigation measures, together with recommendations on how to best manage any residual risks.

As per the document 'The Planning System and Flood Risk Management (2009)' the flood risk assessment will consist of the following sections:

- Site description
- Site layout
- S-P-R model; sequential approach; justification test
- Determination of flood level
- Mitigation measures
- Conclusions

Traynor Environmental carried out site inspections on 15th May 2025. The inspection consisted of a walkover and visual inspection of the site and in the vicinity of the site.

1.2 Methodology

The methodology used for the flood risk assessment is based on '*The Planning System and Flood Risk Management Guidelines for Planning Authorities*' (2009)' and also incorporating the *Strategic Flood Risk Assessment*. The FRM Guidelines require the planning system at national, regional, and local levels to:

- Avoid development in areas at risk of flooding, particularly floodplains, unless there are proven wider sustainability grounds that justify appropriate development.
- Adopt a sequential approach if applicable to flood risk management when assessing the location for new development based on avoid, substitute, justify, mitigate, and proceed; and
- Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

1.3 Definition of Flood Risk

Flood risk is a combination of the likelihood of a flood event occurring and the potential consequences arising from that flood event and is then normally expressed in terms of the following relationship:

Flood risk = Likelihood of flooding x Consequences of flooding.

To fully assess flood, risk an understanding of where the water comes from (i.e. the source), how and where it flows (i.e. the pathways) and the people and assets affected by it (i.e. the receptors) is required. Figure 2.1 below shows a source-pathway-receptor model.

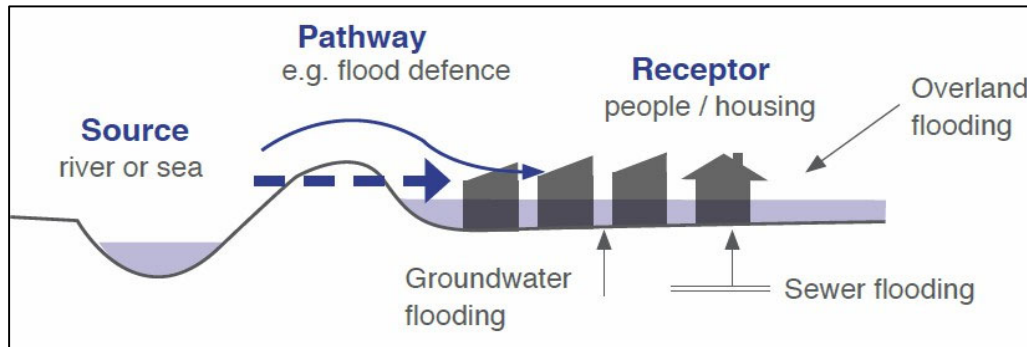


Figure 1 Source-Pathway-Receptor Model

The principal sources of flooding are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors can include people, their property and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

1.4 Stages of the Flood Risk Assessment

The detail and complexity of the study required should be appropriate to the scale and potential impact of the development. For the purposes of this study, the following have been considered:

- Available information on historical flooding in the area.
- Site level information.
- Details of structures, which may influence hydraulics of the watercourse and consideration of the effect of blockage of structures.
- Estimates of design levels when works have been completed.

1.5 Structure of the Flood Risk Assessment

The Planning System and Flood Risk Management-Guidelines for Planning Authorities (Department of the Environment & Local Government November 2009) recommend that a staged approach is adopted when undertaking a Flood Risk Assessment (FRA). The recommended stages are briefly described below: -

• Stage 1 – Flood Risk Identification

To identify whether there may be any flooding or surface water management issues that will require further investigation. This stage mainly comprises a comprehensive desk study of available information to establish whether a flood risk issue exists or whether one may exist in the future.

• Stage 2 - Initial Flood Risk Assessment

If a flood risk issue is deemed to exist arising from the Stage 1 Flood Risk Identification process, the assessment proceeds to Stage 2, which confirms the sources of flooding, appraises the adequacy of existing information, and determines the extent of additional surveys and the degree of modelling that will be required. Stage 2 must be sufficiently detailed to allow the application of the sequential approach within the flood risk zone.

• Stage 3 - Detailed Flood Risk Assessment

A detailed FRA is carried out where necessary to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk.

1.6 Likelihood of Flooding

The Guidelines define the likelihood of flooding as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as a return period or annual exceedance probability (AEP). A 1% AEP flood indicates a flood event that will be equalled or exceeded on average once every hundred years and has a return period of 1 in 100 years. Annual Exceedance Probability is the inverse of return period as shown in Table 2.1 below.

Correlation between return period and AEP

Return Period (years)	Annual Exceedance Probability (%)
1	100
10	10
50	2
100	1
200	0.5
1000	0.1

1.7 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and are split into three categories in The Guidelines:

1.7.1 Flood Zone A

Flood Zone A where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

Most types of development would be considered inappropriate in this zone. Development in this zone should be avoided and/or only considered in exceptional circumstances, such as in city and town centres, or in the case of essential infrastructure that cannot be located elsewhere, and where the Justification Test has been applied. Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation, would be considered appropriate in this zone.

1.7.2 Flood Zone B

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 or 0.5% or 1 in 200 for coastal flooding);

Highly vulnerable development, such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses and primary strategic transport and utilities infrastructure, would generally be considered inappropriate in this zone, unless the requirements of the Justification Test can be met.

Less vulnerable development, such as retail, commercial and industrial uses, sites used for short-let for caravans and camping and secondary strategic transport and utilities infrastructure, and water-compatible development might be considered appropriate in this zone. In general, however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone C and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to and from the development can or will adequately be managed.

1.6.3 Flood Zone C

Flood Zone C where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all plan areas which are not in zones A or B.

Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but would need to meet the normal range of other proper planning and sustainable development considerations.

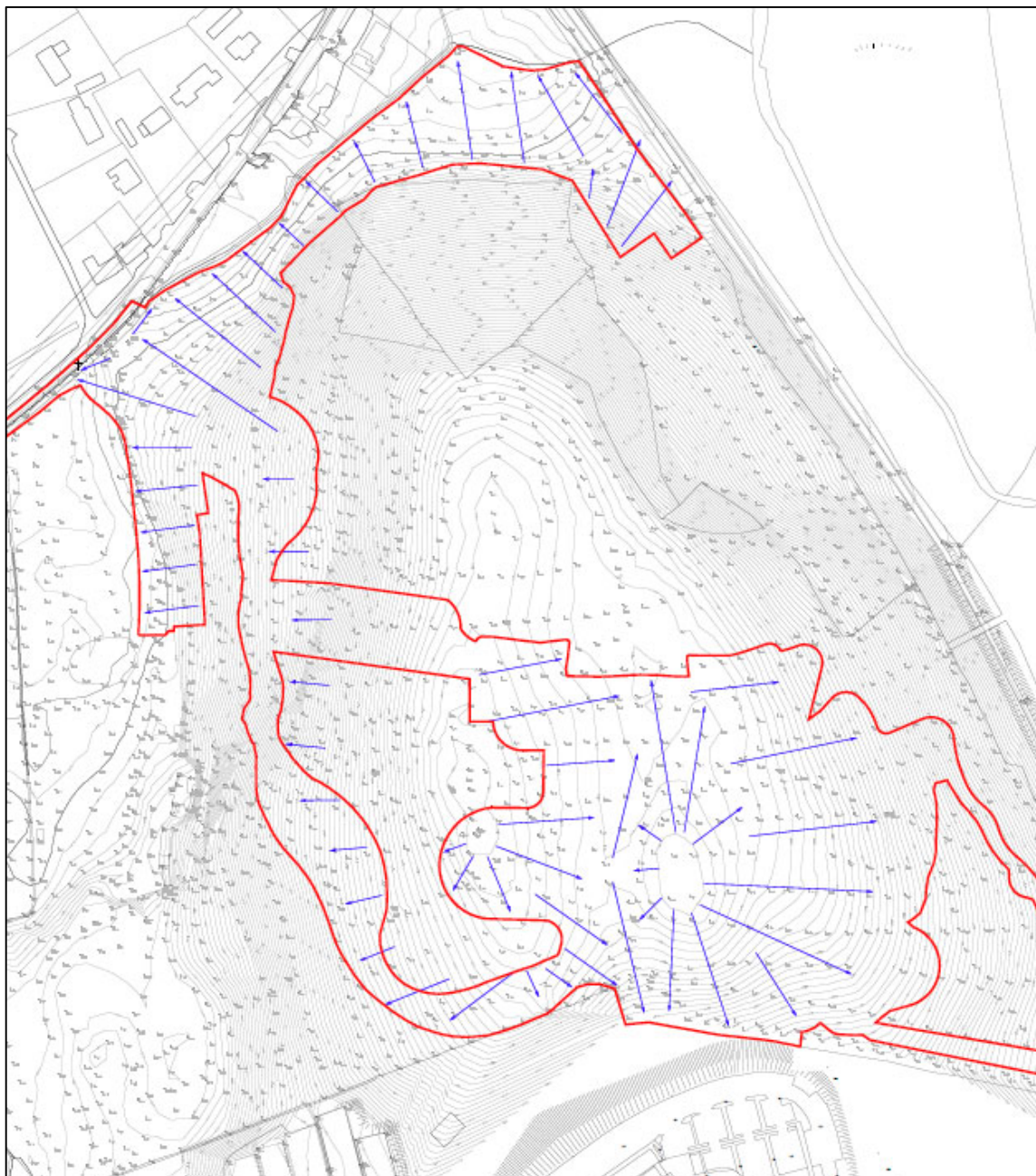
It is important to note that when determining flood zones the presence of flood protection structures should be ignored. This is because areas protected by flood defences still carry a residual risk from overtopping or breach of defences and the fact that there is no guarantee that the defences will be maintained in perpetuity.

2.0 SITE DESCRIPTION & LOCATION

2.1 Site Description

The site is located at Lisdaran, Cavan, Co. Cavan accessed off L-1513-0, Loreto Road. The site area comprises a partly brownfield/partly greenfield parcel of lands measuring over 8ha. The subject lands are located within the settlement boundary of Cavan Town and zoned mainly as 'Proposed Residential', 'Proposed low Density Residential Development' and 'Public and Community', a very small proportion is zoned as "Strategic Residential Reserve".

Figure 1 - Site Location & levels

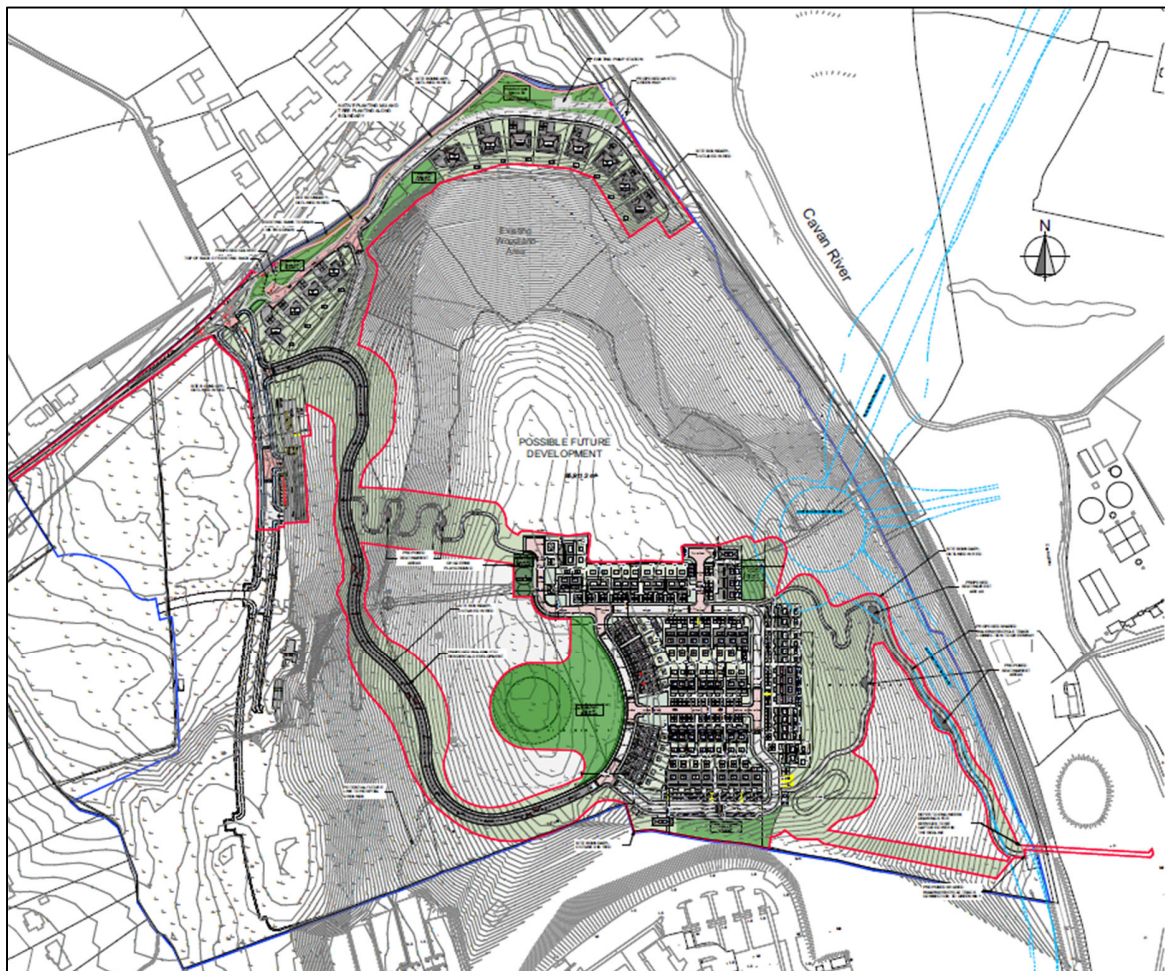


2.2 Development Proposal

The development will consist of the provision of a total of 109 no. residential units along with provision of a creche. Particulars of the development comprise as follows:

- Site excavation works to facilitate the proposed development to include excavation and general site preparation works.
- The provision of a total of 65no. residential dwellings which will consist of 23no. 2 bed units, 26no. 3 bed units and 16no. 4 bed units. The dwelling types range from detached units to terrace units and are 2storey.
- The provision of a total of 44no. duplex apartment units consisting of 8no. 1 bed units, 18no. 2bed units and 18no. 3 bed units. The duplex units range in height from 2storey to 3storey.
- Provision of a two storey creche with associated parking, bicycle and bin storage.
- Provision of associated car parking at surface level via a combination of in-curtilage parking for dwellings and via on-street parking for the creche and duplex apartment units.
- Provision of electric vehicle charge points with associated site infrastructure ducting to provide charge points for residents throughout the site.
- Provision of associated bicycle, bin and bulky items storage facilities for duplex apartment units.
- Upgrading the existing access point from Loreto Road with associated works to include for provision of a right turning lane, provide for internal access roads, footpaths and associated site works.
- Provision of internal access roads and footpaths and associated works to include for regrading of site levels as required along with connections onto the Greenway.
- Provision of residential communal open space and public open space areas to include formal play areas along with all hard and soft landscape works with public lighting, planting and boundary treatments to include boundary walls, railings & fencing.
- Internal site works and attenuation systems which will include for provision of hydrocarbon and silt interceptors prior to discharge.
- All ancillary site development/construction works to facilitate foul, water and service networks for connection to the existing foul via a rising main and provision of a foul pumping station, water connections and ESB network connections along with provision of an ESB substation network connections.

A Natura Impact Statement (NIS) has been prepared and accompanies this application.

Figure 2.0 - Site Layout Plan

2.3 Site Levels and Topography Survey

A topographical site survey was carried out and was incorporated into the site layout plan. All elevations quoted being relative to Malin Head Datum. The proposed finished floor level of the development ranges from 52.5m – 56.3mOD at the North of the site and 87.20m – 89.50mOD at the South of the site. No area of the proposed site is prone to pluvial flooding according to the OPW National Flood Hazard Map, My Plan OPW Flood Map and/or CFRAM Fluvial Flood Risk Map. Elevations of note on the site are outlined in Table no. 1 below.

Table 1.0 - Site Elevations

Location	Proposed Elevation (mOD)
Proposed finished floor level South of site	87.20 – 90.70
Proposed finished floor level North of Site	52.80 – 56.80
Elevation at the development entrance	51.57
Elevation at the Northern boundary	51.09 – 52.63
Elevation at the Eastern boundary	70.00 – 78.00
Elevation at the Southern boundary	80.20 – 84.40
Elevation at the Western boundary	52.16 – 53.91
Level of access road into the site	51.50– 54.42
1 in 1000-year flooding event (North)	52.05
1 in 1000-year flooding + 0.30m Freeboard (North)	52.35
1 in 100-year flooding Event (North)	51.24
1 in 100-year flooding + 0.30 Freeboard (North)	51.54
1 in 1000-year flooding event (South)	55.76
1 in 1000-year flooding + 0.30m Freeboard (South)	56.06
1 in 100-year flooding Event (South)	55.07
1 in 100-year flooding + 0.30 Freeboard (South)	55.37

Michael Fitzpatrick Architects presented a site layout map which shows the proposed new development to be located on the site see Figure 2.0 above. The site is accessed via the northern boundary of the site (L1513 Lisdraran/Carrickane)). The lowest part of the site is towards the eastern boundary. A copy of the topographical survey drawing is included in appendix A.

3.0 GEOLOGY & HYDROGEOLOGY

The hydrogeology of the site was assessed by means of a desk study of relevant literature. This included available geological and hydrogeological information and maps from the Geological Survey of Ireland (GSI) and the EPA. Groundwater can be defined as water that is stored in, or moves through, pores and cracks in subsoils.

The potential of rock to store and transport water is governed by permeability of which there are two types, intergranular and fissure permeability. The GSI, EPA and the Department of Environment, Heritage, and Local Government (DOEHLG) have developed a Programme of Groundwater Protection Schemes (GPWS), with the aim of maintaining the quality and quantity of groundwater in Ireland, and in some cases improving groundwater quality, by applying a risk assessment approach to groundwater protection and sustainable development.

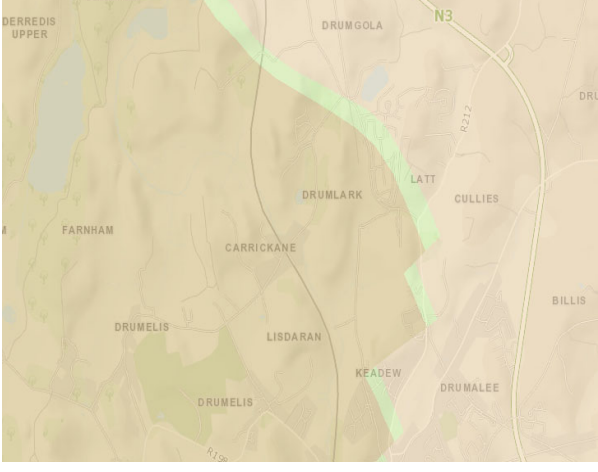
From the GSI maps for the area it can be seen that the bedrock aquifer underlying the site is located within an area of Low/Moderate groundwater vulnerability.

3.1 Soils

The site is shown in GSI mapping is derived by Shales and sandstones till (Namurian).

3.2 Hydrology

Figure 3 - Groundwater Vulnerability and Aquifer Classification Map

Groundwater Vulnerability Map (E – Extreme)	Aquifer Classification Map (LI – Locally Important Aquifer)
	
E – Low/Moderate Vulnerability	LI – Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones

(Source GSI mapping)

During the survey carried out by Traynor Environmental Ltd hydraulic features were noted on the proposed site. The Cavan River was noted to the east of the site.

4.0 FLOODING HISTORY

As part of the study data collection phase, a number of available sources of information generally as set out in the *Planning and Flood Risk Management – Guidance for Planning Authorities* were investigated in order to build an understanding of the potential risk of flooding to the site. The following review highlights the key findings of the anecdotal evidence collection exercise.

4.1 Published Information

4.1.1 OPW National Preliminary Flood Risk Assessment

The OPW is the lead agency for flood risk management in Ireland and is the national competent authority for the EU Floods Directive. OPW works in close partnership with all Local Authorities in delivering the objectives of the CFRAM Programme.

4.1.2 OPW National Flood Hazard Mapping

The OPW's online National Flood Hazard Mapping Database provides information on reported floods, in the form of reports, photographs and newspaper articles. The database provides information on historic flooding events. No flooding events are recorded within the site area.

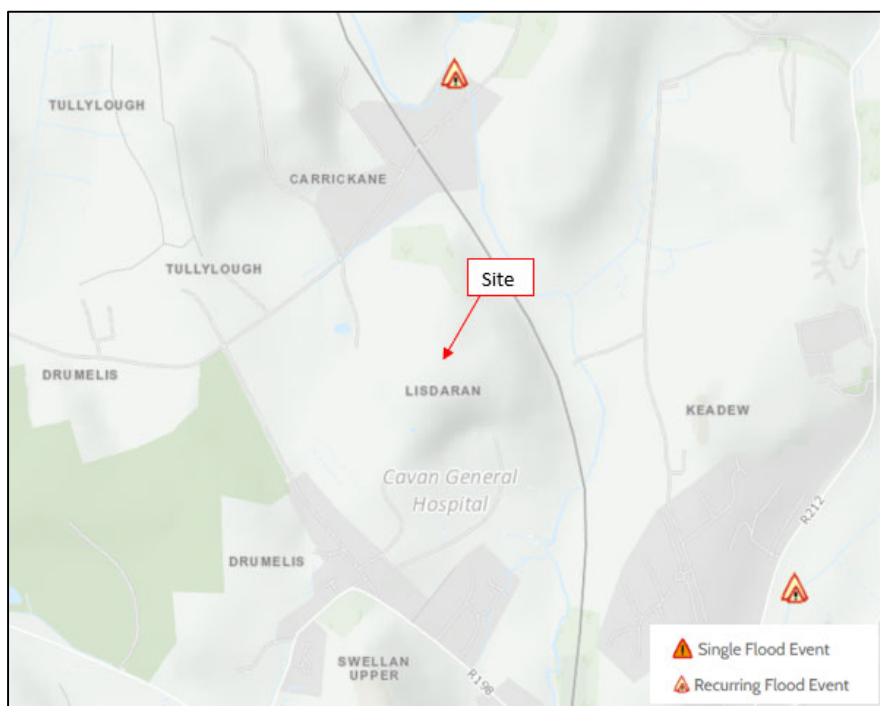
4.2 Historical OSI Maps

The historical 6" OSI maps, dated c.1830-1840, and slightly more detailed 25" OSI maps, dated later c.1900-1910, show no structures on the proposed site. The land would have been typically used for agricultural grazing. There are no indicators of flooding on historical maps.

4.3 OPW National Flood Hazard Mapping

The historic flood event data map for Lisdaran, Cavan, Co. Cavan area obtained from the OPW flood mapping website is shown in figure 5. The map provides no evidence of any actual historical flood events occurring at or within the vicinity of the site.

Figure 5 - OPW National Flood Hazard Map



In Summary the OPW Flood Mapping indicates that:

- OPW flood maps indicate that at Carrickane the Cavan River overflows its banks every year after heavy rain. This area is located >300m north of the proposed site.
- A previous small scale flooding event that occurred near the site entrance and northern boundary of the site was proven to be caused by a blocked pipe/culvert. When this issue was resolved the ponding of water no longer occurred.
- No flooding events occurred within the site of the proposed development.

4.4 OPW Flood Mapping

Figure 6 below appears to show that the application site is not at risk of fluvial, pluvial and or coastal flooding. The mapping data suggests that the land >140m to the south, east and northwest are susceptible from fluvial flooding.

Figure 6 - My Plan OPW Flood Map



4.5 CFRAM Fluvial Flood Risk Map

The purposed site was included in CFRAM flood risk mapping commissioned by the OPW and carried out by RPS in 2016 (Figure 7). The fluvial flood mapping Programme uses hydraulic modelling to predict surface water levels under various flood flow scenarios at designated node points along the river channel.

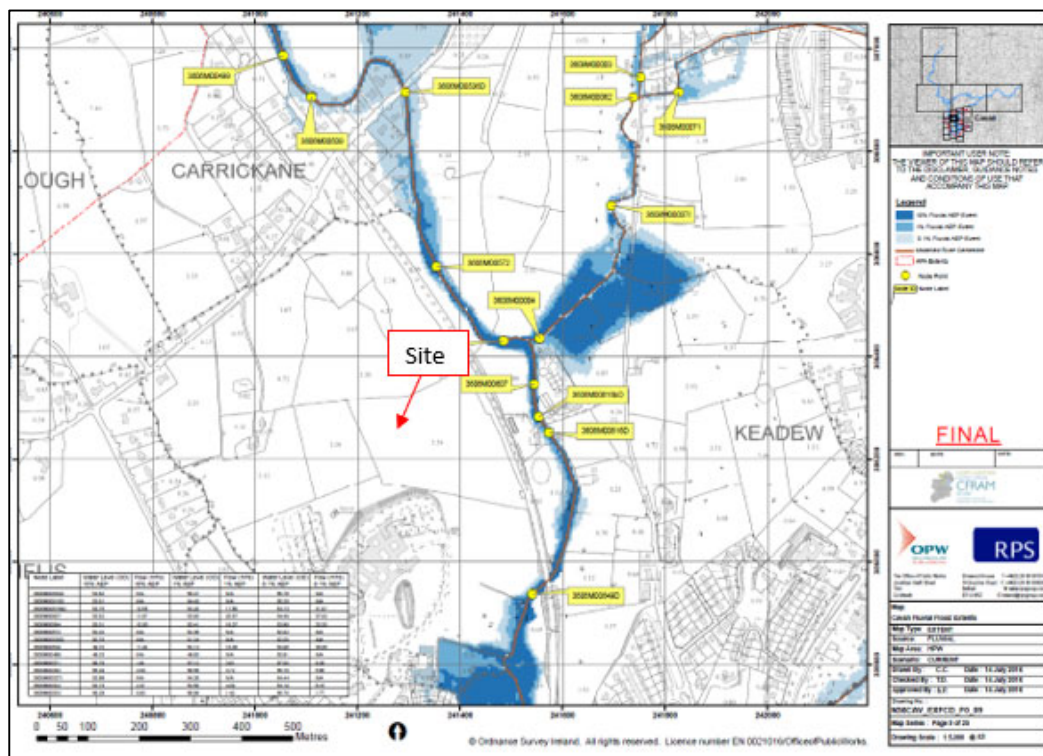
Figure 7 - CFRAM Fluvial Flood Risk Map

Figure 7 identifies that:

- The proposed development is approximate >200m east of the closest flood modelled node.
- No area of the development is at risk of 1 in 100-year flooding + 0.30 Freeboard and 1 in 1000-year flooding + 0.30 Freeboard.
- Model output at the most representable node to the site is presented in Table 2, Node 3606M00649D is located southeast of the site at the Cavan River and 3606M00536D is located northeast of the site at Northern boundary. These are the most representable nodes due to the topography of the area and location.

Table 2.0 – Flood fluvial flows and level prediction at CFRAM nodes

Node	Watercourse	Location	Q ₁₀ 10% AEP		Q ₁₀₀ 1% AEP		Q ₁₀₀₀ 0.1% AEP	
			Level, mOD	Flow m ³ s ⁻¹	Level, mOD	Flow m ³ s ⁻¹	Level, mOD	Flow m ³ s ⁻¹
3606M00649D (South)	Cavan River	approx. 370m Southeast of the site	54.62	N/A	55.07	N/A	55.76	N/A
3606M00536D (North)	Cavan River	approx. 180m Northeast of the site	50.78	N/A	51.24	N/A	52.05	N/A

A flood extents maps was prepared using the topographical survey compared to the CFRAM Mapping. The Q₁₀₀ and Q₁₀₀₀ fluvial flood levels + 0.30 Freeboard at the site are equal at worse case to 55.37 mOD and 56.06 mOD (South) and 51.54mOD and 52.35mOD (North), respectively.

We also highlight the CFRAM study are deemed acceptable by CCC and National Policy as being appropriate and reliable to identify flood risk. In this regard we refer to Government policy on climate change under the document 'Flood Risk Management: Climate Change Sectoral Adaptation Plan' as prepared under the National Adaptation Framework (OPW).

As the Planning Authority will note the purpose of this Climate Change Sectoral Adaptation Plan for Flood Risk Management is to:

- outline the potential impacts of climate change on flooding and flood risk management in Ireland
- identify the objectives for an effective and sustainable approach to adaptation as part of flood risk management for the future, and
- to promote a coordinated approach to adaptation:
 - within the flood risk management sector and sustainable flood risk management measures in other sectors, and,
 - across the policies and actions of other Sectors including Local Authorities, and,
 - recommend any further actions required to meet the objectives for adaptation.

Importantly as stated on page 53 of this Government policy document it states the CFRAM programmes give confidence that they are plausible for assessing climate change: ***'The MRFS and HEFS provide potential futures that permit flood hazard and risk assessments to be undertaken to identify possible impacts of climate change on flooding, which, in turn, enables an assessment of the vulnerability of different communities and areas around the country to such possible changes. This will inform how flood risk in these communities should be managed now and into the future.'***

'The comparability of the two future scenarios adopted for the CFRAM Programme against current international projections gives confidence that they are acceptable as plausible futures for use in assessing potential requirements for adaptation.'

On applying this national policy on climate change/flood risk to the lands it is clear national policy by the OPW and the CFRAM studies are acceptable for determining flood risk in relation to climate change. Further, we note the Climate Change Sectoral Adaptation Plan (CCSAP) specifically refers to how the section 28 guidelines are appropriate in terms of policy and flood risk. For ease of reference, we highlight section 3.3 of the CCSAP states: (page 33)

'The Guidelines for the Planning System and Flood Risk Management (DECLG, & OPW, 2009), provide a clear, transparent framework for forward planning and development management with due consideration of flood risk.'

The guidance on zoning for appropriate land use is based on existing risk, but with a recommendation that a precautionary approach be taken to potential future risk including the potential impacts of climate change, stating that "A Precautionary approach should be applied, where necessary, to reflect uncertainties in flooding datasets ... and the ability to predict the future climate ... ", and that "Development should be designed with careful consideration to possible future changes in flood risk, including the effects of climate change ... so that future occupants are not subject to unacceptable risks.'

The potential impacts of climate change are provided for within the Guidelines, and the robust implementation of the Guidelines should reduce the potential impacts of climate change on properties developed in the future, although the application of the precautionary approach may have implications for the development potential in some areas.' (emphasis added)

In this context we submit the policy tests as set out in the section 28 'Guidelines for the Planning System and Flood Risk Management' are wholly appropriate to determine a proposal against flood risk and climate change scenarios. With no flood risk identified for these lands (as per the OPW CFRAM maps) it can be concluded on a robust evidence basis there is no flood risk affecting the project site.

5.0 Assessment of Flooding Mechanisms

5.1 Preamble

The Irish government, as part of its development control procedures, advises against inappropriate development in areas at risk of flooding and the avoidance of new developments increasing flood risk elsewhere in accordance with their Planning Policy Document. The following assessment determines the flood hazards to the life and property at the site in order to subsequently assess the site and proposed development relative to the Flood Risk Framework contained within the Planning Policy Document.

5.2 Initial Assessment

The following is a record of the screening assessment of the development site for potential flooding mechanisms requiring subsequent detailed assessment, based on the information obtained from the background information review and consultations.

Table 3.0 - Possible Flooding Mechanisms

Source/Pathway	Significant	Comment/Reason
Fluvial Flooding		
Flood Plain	No	The proposed development is not located on a floodplain
Structure Blockage	Possible	Possible downstream structural blockages downstream.
Flood Defence Failure	N/A	There is no flood defences located in the vicinity of the site.
Coastal Flooding		
Tidal/Coastal	N/A	Site is not at affected by tidal/coastal flooding.
Other		
Urban drainage	No	Urban drainage will not be affected.
Fluvial Flooding	N/A	None of the site is affected by Fluvial Flooding.
Groundwater	N/A	Ground water flooding not deemed to be an issue.
Pluvial Flooding	No	None of the site is affected by Pluvial Flooding.
Infrastructure failure	No	Infrastructure failure not expected to be an issue on the site.
Rainfall Ponding	No	Rain fall ponding is not expected to be an issue on the site.
Reservoirs /Canals/ Artificial Sources	N/A	There are no impoundments or reservoirs in close proximity, or which drain to the site.

5.3 Flood Mechanisms

Flooding is a natural process and can happen at any time in a wide variety of locations. Flooding can come from rivers and the sea, directly from rainfall on the ground surface and from rising groundwater, surcharging sewers, and drainage systems.

5.3.1 Fluvial Flooding

Fluvial Flooding occurs when rivers and streams break their banks, and water flows out onto the adjacent low-lying areas (the natural floodplains). This can arise where the runoff from heavy rain exceeds the natural capacity of the river channel and can be exacerbated where a channel is blocked or constrained or, in estuarine areas, where high tide levels impede the flow of the river out into the sea.

Different rivers will respond differently to rainfall events, depending on a range of factors such as the size and slope of the catchment, the permeability of the soil and underlying rock, the degree of urbanization of the catchment and the degree to which flood waters can be stored and slowly released into lakes and along the river's floodplains. A storm of a given rainfall depth and duration may cause flooding in one river, but not in another, and some catchments may be more prone than others to prolonged rainfall or a series of rain events. River flooding can occur rapidly in short, steep rivers or after some time, and some distance from where the rain fell, in larger or more gently flowing rivers. Changes in rainfall patterns, such as might be caused by climate change, will have different impacts on flood magnitudes and frequency in different catchments

The National Flood Hazard Map also showed no indication of previous fluvial flood events at the site. The CFRAM Fluvial Flood Risk Map and My Plan OPW Flood Map indicates that fluvial flooding can occur to the >400m to the south and east of the site.

5.3.2 Pluvial flooding:

This type of flooding is defined as flooding from rainfall-generated overland flow before the runoff enters any watercourse or sewer. This mainly occurs when intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems, can run quickly off land and result in local flooding. It can also result when the drainage system is overwhelmed by heavy rainfall, becomes blocked or is of inadequate capacity. Flood risk from pluvial flooding exists in all areas. Provision of adequate storm water drainage systems will minimise the risk of pluvial flooding sources.

There is no area inside the site boundary being at risk of pluvial flooding according to the My Plan OPW Flood Map, National Flood Hazard Map and Geological Survey of Ireland Groundwater Flood Mapping. There is no evidence of seasonal flooding within the site boundary. Figures 2 includes the topographical map for the site. The topographical map show that any accumulation of surface water is likely to drain naturally towards the eastern boundary.

5.3.3 Groundwater flooding:

Groundwater flooding occurs when water levels in the ground rise above surface elevation following prolonged and heavy rainfall. It is most likely to occur in low-lying areas underlain by permeable rocks. Groundwater flooding may take weeks or months to dissipate because groundwater flow is much slower than surface flow and water levels thus take much longer to fall. There is no history of groundwater flooding at the site. Groundwater flow direction appears to be from east to west, and the hydraulic gradient is relatively shallow.

5.3.4 Tidal Flooding

The site location is such that It is not affected by tidal water bodies and as such tidal flooding is negligible.

6.0 JUSTIFICATION TEST

In the context of the 'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009' three flood zones are designated in consideration of flood risk to a particular development site.

Flood Zone A – where the probability of flooding from rivers and watercourses is the highest (greater than 1% or 1 in 100 years for river and watercourse flooding and 0.5% or 1 on 200 for coastal or tidal flooding).

Flood Zone B – where the probability of flooding from rivers and watercourses is moderate (between 0.1% or 1 in 1000 year for river and watercourse flooding and 0.5% or 1 on 200 for coastal or tidal flooding).

Flood Zone C– where the probability of flooding from rivers and watercourses is low or negligible (less than 0.1% of 1 in 1000 year for both river and watercourse and coastal flooding). Flood Zone C covers all areas that are not in Zones A or B.

The 'Planning System and Flood Risk Management Guidelines' list the planning implications for each flood zone, as summarised below.

6.1 Zone A – High Probability of Flooding

Most types of development would not be considered in this zone. Development in this zone should only be considered in exceptional circumstances, such as in city and town centres, or in the case of essential infrastructure that cannot be located elsewhere, and where the 'Planning System and Flood Risk Management Guidelines' justification test has been applied.

6.2 Zone B – Moderate Probability of Flooding.

Highly vulnerable development such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses, strategic transport, and essential utilities infrastructure would generally be considered inappropriate in this zone, unless the requirements of the justification test can be met. Less vulnerable development such as retail, commercial and industrial uses and recreational facilities might be considered appropriate in this zone. In general, however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone C and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to the development can be adequately managed and that development in this zone will not adversely affect adjacent lands and properties.

6.3 Zone C – Low to Negligible Probability of Flooding

Development in this zone is appropriate from a flood risk perspective. Developments in this zone are generally not considered at risk of fluvial flooding and would not adversely affect adjacent lands and properties from a flood risk perspective.

6.4 Flood Risk Zones

The PSAFRM Guidelines classify potential development in terms of its vulnerability to flooding. The types of development falling within each vulnerability class are described in Table 3.1 of the PSAFRM Guidelines, which is reproduced in Table 4.

Table 4 - Development Vulnerability Class

Vulnerability Class	Land use and types of development which include
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding. Hospitals. Emergency access and egress points. Schools. Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes, and social services homes. Caravans and mobile home parks. Dwelling houses designed, constructed, or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial, and non-residential institutions. Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans. Land and buildings used for agriculture and forestry. Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure. Docks, marinas and wharves. Navigation facilities. Ship building, repairing, and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

The Guidelines define the zones in which each class of development is appropriate – this is summarised in Table 5. The PSAFRM Guidelines recognise that flood risks should not be the only deciding factor in zoning for development; the PSAFRM Guidelines recognise that circumstances will exist where development of a site in a floodplain is desirable in order to achieve compact and sustainable development of the core of urban settlements. In order to allow consideration of such development, the PSAFRM Guidelines provide a Justification Test, which establishes the criteria under which desirable development of a site in a floodplain may be warranted.

Table 5 - "Appropriateness" Matrix

	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

The Planning System and Flood Risk Management guidelines (DoEHLG, 2009) provide vulnerability categories based on the development type. The proposed works fall into the following vulnerability categories as follows:

- Highly vulnerable = Dwelling houses designed, constructed, or adapted for the elderly or, other people with impaired mobility
- The proposed residential units are located in Flood Zone C and not at risk of flooding; therefore, a Justification test is not required

7.0 DESIGN FLOOD LEVELS

The Flood Risk Guidelines (2008) require a freeboard of 300 mm above extreme flood level, plus a freeboard. A flood extents maps was prepared using the topographical survey compared to the CFRAM Mapping. The Q_{100} and Q_{1000} fluvial flood levels + 0.30 Freeboard at the site are equal at worse case to 55.37 mOD and 56.06 mOD (South) and 51.54mOD and 52.35mOD (North), respectively. The Proposed finished floor level for the development at the North of the site ranges from 52.80 – 56.80mOD the levels at the South of the site range from 87.20 – 90.70mOD.

The roads leading up to the development site are not at risk of flooding and allows for emergency vehicles to access the site if required during a flood event. No floods have been recorded in the development site immediate location, and the following applies to the development site;

- The development is for a residential development on Zoned Lands.
- Development works are outside an area at risk of flooding from a Tidal, Fluvial or Pluvial scenario.
- All finished floor levels of the proposed development are above the flood risk level including the required freeboard
- Footpaths and Pavement area within the development site are above the river level; this will no ensure flood risk from a pluvial or fluvial flood event.
- The proposal does not obstruct an important flow path.
- Does not entail the storage of hazardous material.
- Does not impede access to a watercourse, floodplain of flood protection and management facilities.

Based on above the proposed site would be allocated as Flood Zone C.

The information provided in this section identifies that there are no potentially elevated levels of pluvial, fluvial, coastal and groundwater flood risk to the proposed residential units or site area.

7.1 Potential for the project to contribute to off-site flooding.

By restricting the flow to greenfield runoff rates and the addition of SUDS features within the proposed drainage system the likelihood of the proposed development adversely affecting the existing ditch or contributing to downstream flooding is obviated.

7.2 Residual Risk

Residual risks are defined as risks that remain after all risk avoidance, substitutions and mitigation measures have been taken. Consideration has also been given regarding flood risk caused by events or greater than the required design standard, as summarized below.

Description of Risk	Hazard	Residual Impact
Underestimation of fluvial flood level Update of OPW/CFRAM Maps	Inundation of the site for a design event	There are no fluvial or tidal flood risks affecting the site as the site levels adequately rise above the river level and ensure no overland flow or flood risk arises.
Access and egress routes to and from the site during a 1%/0.1% AEP flood event	Completely dry access/egress not possible during flood event	All areas of the development lie outside flood plain areas and access/egress route to and from the site will always be available.
Stormwater System	Failure of system	In the event of exceedance or blockage of the system the ground levels ensure than any overland flow is directed towards the green areas and river.

8.0 CLIMATE CHANGE

The Planning System and Flood Risk Management – Guidelines for Planning Authorities' DOEHLG 2009 Technical Appendix A, Section 1.6 recommends that where mathematical models are not available climate change flood extents can be assessed by using the flood Zone B outline as a surrogate for Flood Zone A with allowance for the Possible impacts of climate change.

Therefore, having reviewed the OPW CFRAM maps we highlight the site, nor its environs are identified as an area subject to flood risk. Accordingly, there is no risk of flooding in a Climate Change scenario.

8.1 Assessing flood risk in the context of climate change

We again highlight the lowest finished floor level at the proposed development is 52.80m OD, which is above the 0.1% AEP future change flood Level in the wider environs as per the CFRAM.

That proposed development site is therefore considered to be adequately protected in consideration of future scenario extreme fluvial flood event in the area.

The storm water design has also been designed to cater for climate change, with design capacity to cater for a 1 in 100 year storm event with an additional allowance of 20% in rainfall due to climate change.

9.0 CONCLUSION

Based on the examination of the development site, and of its location and all development works relating to the application as proposed we have taken account and applied "The Planning System and Flood Risk Management Guidelines for Planning Authorities" in this proposed Flood Risk Assessment of the development site.

Based on current available data for the study location there is no indication of flooding from coastal, pluvial, fluvial and groundwater sources.

The proposed site is located within **Flood Zone C** as per Table 2.2 and is defined as a **Highly Vulnerable Development** as per OPW The Planning System and Flood Risk Management, Figure 2.2 and is **Appropriate**.

The proposed development is not at risk of flooding, will not obstruct or impede important flow paths or exacerbate flooding.

Signed:

A handwritten signature in blue ink, appearing to read 'Nevin Traynor', is written over a horizontal line.

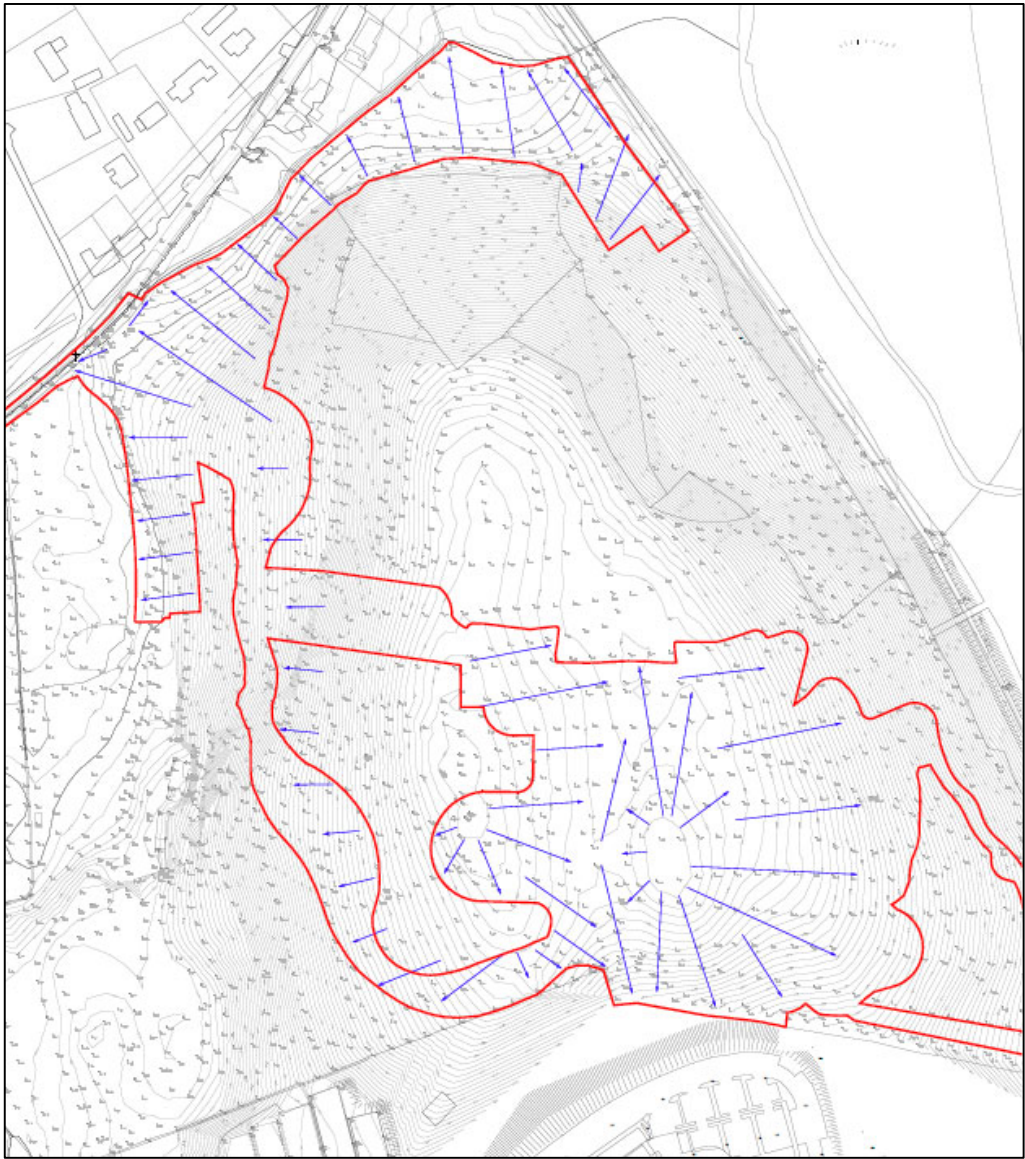
Nevin Traynor

BSc. Env, H. Dip I.T, Cert SHWW.

For Traynor Environmental Ltd

**SITE SPECIFIC FLOOD RISK ASSESSMENT
COMPLETED BY
TRAYNOR ENVIRONMENTAL LTD**

APPENDIX A – TOPOGRAPHICAL SURVEY



SITE SPECIFIC FLOOD RISK ASSESSMENT

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APPENDIX B – OPW FLOOD MAP



SITE SPECIFIC FLOOD RISK ASSESSMENT

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APPENDIX C– CFRAM FLUVIAL FLOOD RISK MAP

