FOYLE CONSULTING ENGINEERS

Client: Donegal County Council

Flood Risk Assessment Report

Proposed Housing Development, Carn Road, Gleneely, Co. Donegal

By: Bernard McLaughlin
BEng (Hons). MIEI

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Harbour Office, Port Road, Lisahally, Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com

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Harbour Office, Port Road, Lisahally, Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com

1.0 INTRODUCTION

Donegal County Council Housing, Corporate & Culture Services team are seeking planning approval for proposed site of 10 residential dwellings. The site identified for the proposed development is located on the southern outskirts of Gleneely village, Co. Donegal.

The development will have 1 phase and units will be constructed running parallel to the site road (R238) frontage, in an aim to meeting the core objectives for housing as outlined in the Donegal County Development Plan 2018-2024 Table 2A.6: The Core Strategy Table.

A site-specific flood risk assessment has been requested as part of the planning application process. This flood risk assessment will assess the site in terms of the likelihood of flooding and resultant consequences, while assessing the potential, post development risks in regard to the design of mitigation and compensation measures.

The Flood Risk Assessment (FRA) will be completed in accordance with the Flood Risk Management Guidelines, DEHLG, 2009 (or as updated) including 'Surface Water Drainage Calculations.

2.0 THE SITE

The site identified for the proposed development is located on the southern outskirts of Gleneely village, Co. Donegal. The site has a watercourse known as Gleneely River running parallel to the southern boundary, flowing from East to West converging with Culdaff River before entering the Culdaff Estuary with the North Atlantic Ocean.
The site has an area of approximately 0.88 Hectares and details of the site location and boundaries are provided on Figures 1 and 2.

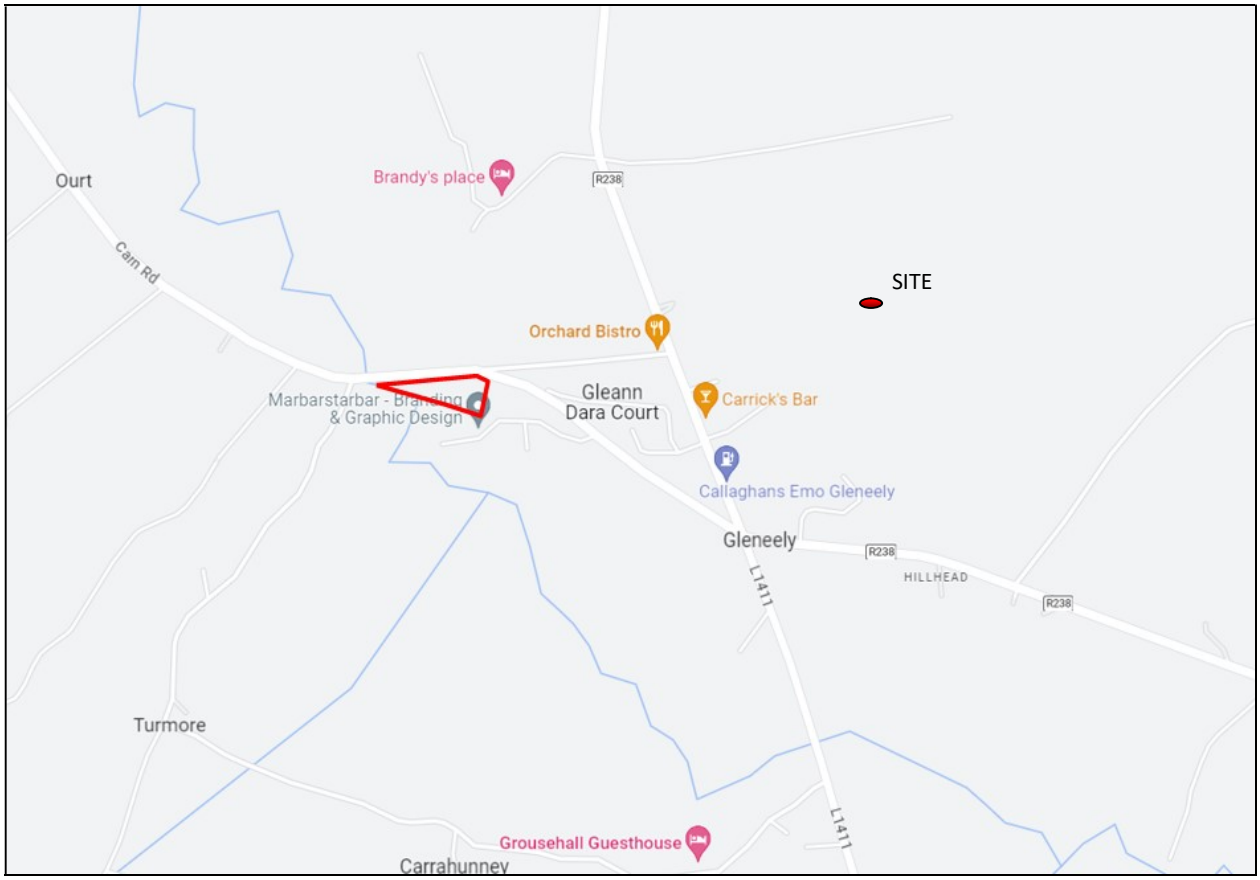


Figure 1: Site Location Map (Google Maps)

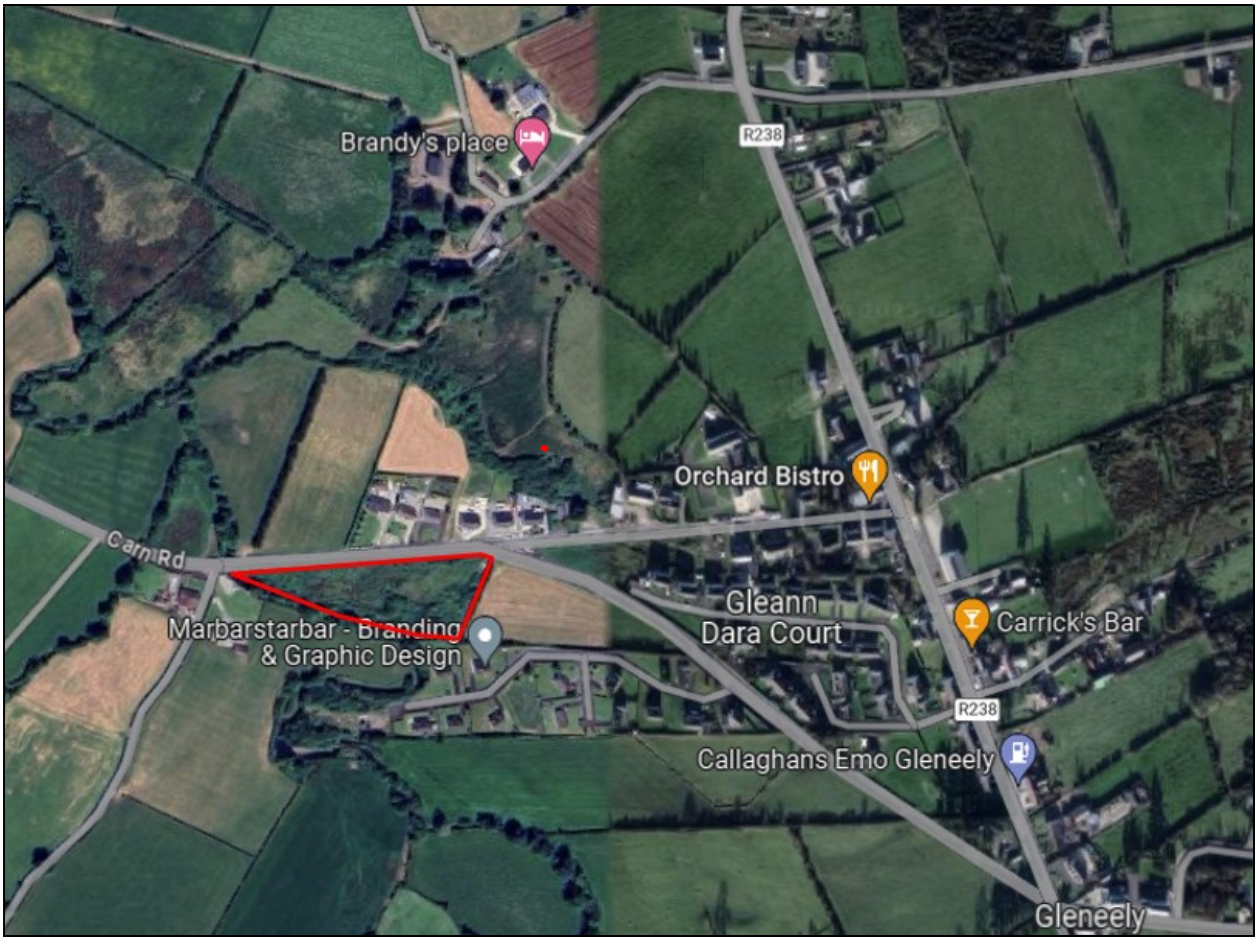


Figure 2: Site Boundary Map

2.1 Site Description

The site is accessed from the Carn Road (R238), through the existing Agriculture Access. The site is bounded to the North by the Carn Road (R238) and to the South by the Gleneely River. The west of the side is a formed point at the existing Bridge for the Gleneely River to flow under the Carn Road (R238). The east of the site is bounded by agricultural land.

The site is currently an undeveloped Greenfield site. with unmaintained overgrown hedge lines, shrubbery, hawthorns and rushes. The site is currently not being utilised for any purpose. Site Photos from a walk over survey can be found in Appendix A.

2.2 Watercourse

The site has a watercourse known as Gleneely River running parallel to the southern boundary, flowing from East to West converging with Culdaff River before entering the Culdaff Estuary with the North Atlantic Ocean.

3.0 FLOOD IMPACT ASSESSMENT

3.1 Methodology

To facilitate the completion of the FRA, the following methodology was adopted:

- Firstly, background data in relation to the site and its locale, including topographical information, was collated, to gain a general appreciation of the topography of the site and its key features.
- Next a site visit/walk over survey was carried out.
- A desktop study was undertaken with respect to the flooding history of the site. This information is presented in the following sections of this report.
- Detailed design of storm drainage system including attenuation measures required was carried out for the proposed development.
- Flood risk will be evaluated, and conclusions drawn.
- Finally, the production of FRA in accordance with the requirements of the project objectives as defined by Donegal County Council will be completed.

3.2 Site Topographical Information

A topographical survey of the proposed development sites and surrounding lands was provided by Donegal County Council. This survey was to establish the general topography of the site, to enable assessment of potential flood zones and the current drainage layout to be developed. The Key site features include:

- The topographical survey indicates the site is dense with vegetation and briars.
- The site predominantly falls Northeast to Southwest, with the highest level recorded of 38.80m.
- The lowest level recorded is 31.00m and is located along the Top pf the Bank along southern boundary of the proposed site.

A further Topographical Survey was requested to cover Gleneely Riverbed and lands south of the river. This was requested to allow for the assessment of the flood plains and risk to the proposed site. Both Topographical Surveys can be found in Appendix I.

3.3 Relevant planning policy

The relevant planning policy with respect to floodplain development is the County Donegal Development Plan 2018-2024, Chapter 5; where the core objectives are:

- F-O-1: To assess all development proposals in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities, November 2009, DoEHLG or any amendment to it.
- F-O-2: To adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction, and mitigation of flood risk.
- F-O-3: To ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management and to comply with Article 6 of the Habitats Directive and have regard to the relevant conservation objectives, qualifying interests, and threats to the integrity of Natura 2000 sites.

3.4 Previous Flooding of the Site

Investigation into the historic flooding of the site does not indicate that the proposed site or the lands immediately neighboring the proposed site are prone to flooding as illustrated on the relevant OPW National Flood Hazard Map reproduced in Figure 3. (Refer to Appendix B for full OPW Flood Hazard Map and report). The flood maps do confirm extensive flooding to the lands further South, upstream of the proposed site south of the Fox Wood Housing development.

Examination of the OSI 25 Inch and 6 Inch maps do not identify areas ‘Liable to Flood’ on the proposed site or any of the neighboring sites. (Refer to Appendix D)

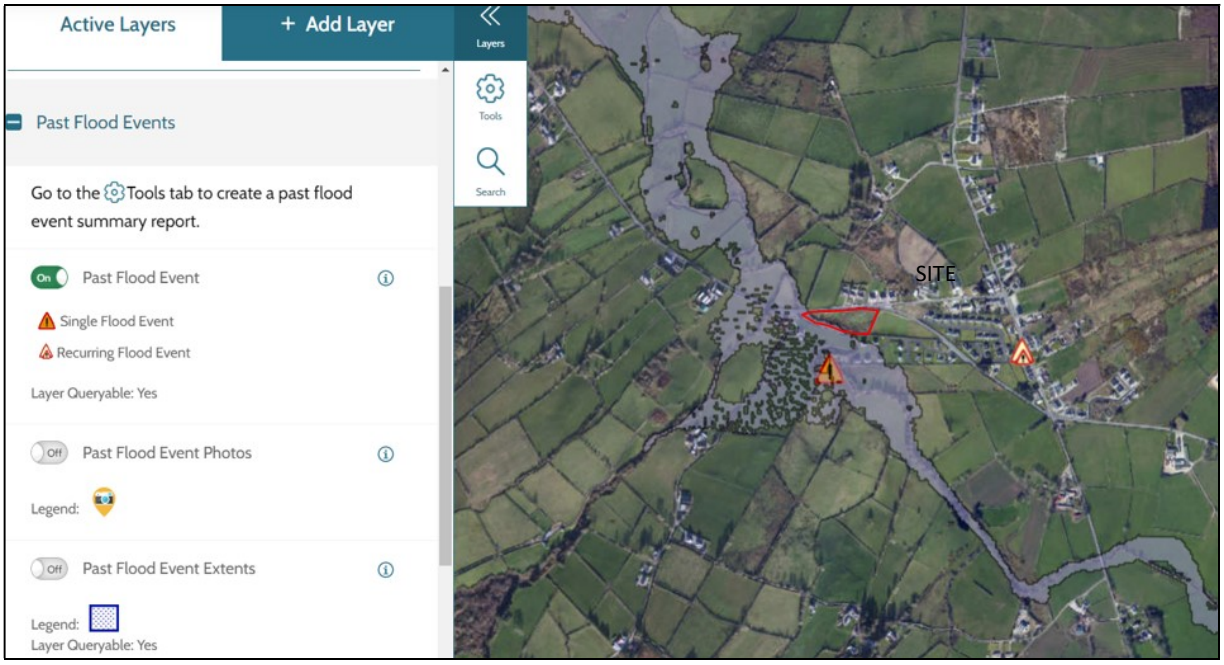


Figure 3: OPW Flood Maps- Past Flooding Event

3.5 National CFRAM Programme

The National CFRAM Programme has three principal milestones:

- Preliminary Flood Risk Assessment (Completed 2011)
- Preparation of Flood Maps (2013-2014)
- Preparation of Flood Risk Management Plans (2015)

Flood zones are geographical areas within which the likelihood of flooding is in a particular range, and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning.

A flood Zone A is defined as high probability of flooding, i.e.) more than 1% probability or 1 in 100 from rivers and more than 0.5% probability or 1 in 200 from coastal flooding. A flood Zone B is defined as moderate probability of flooding, i.e.) between 0.1% probability or 1 in 1,000 years and 1% or 1 in 100 years for river flooding and between 0.1% or 1 in 1,000 years and 0.5% or 1 in 200 for coastal flooding.

The site is not covered by any CFRAM flood maps, however the National Indicative Fluvial Mapping – Present day would indicate that part of the proposed site may fall within both flood Zone A or B. See Figure 4, 5 and 6 below:

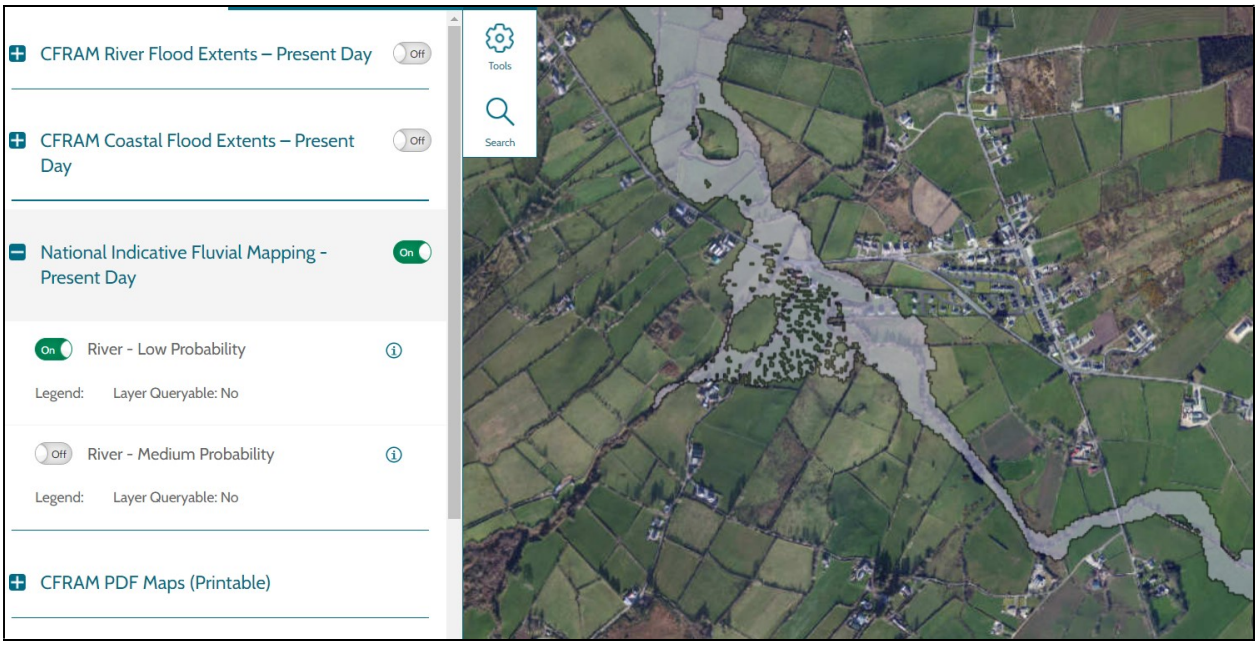


Figure 4: National Indicative Fluvial Mapping – Present day (Low Probability)

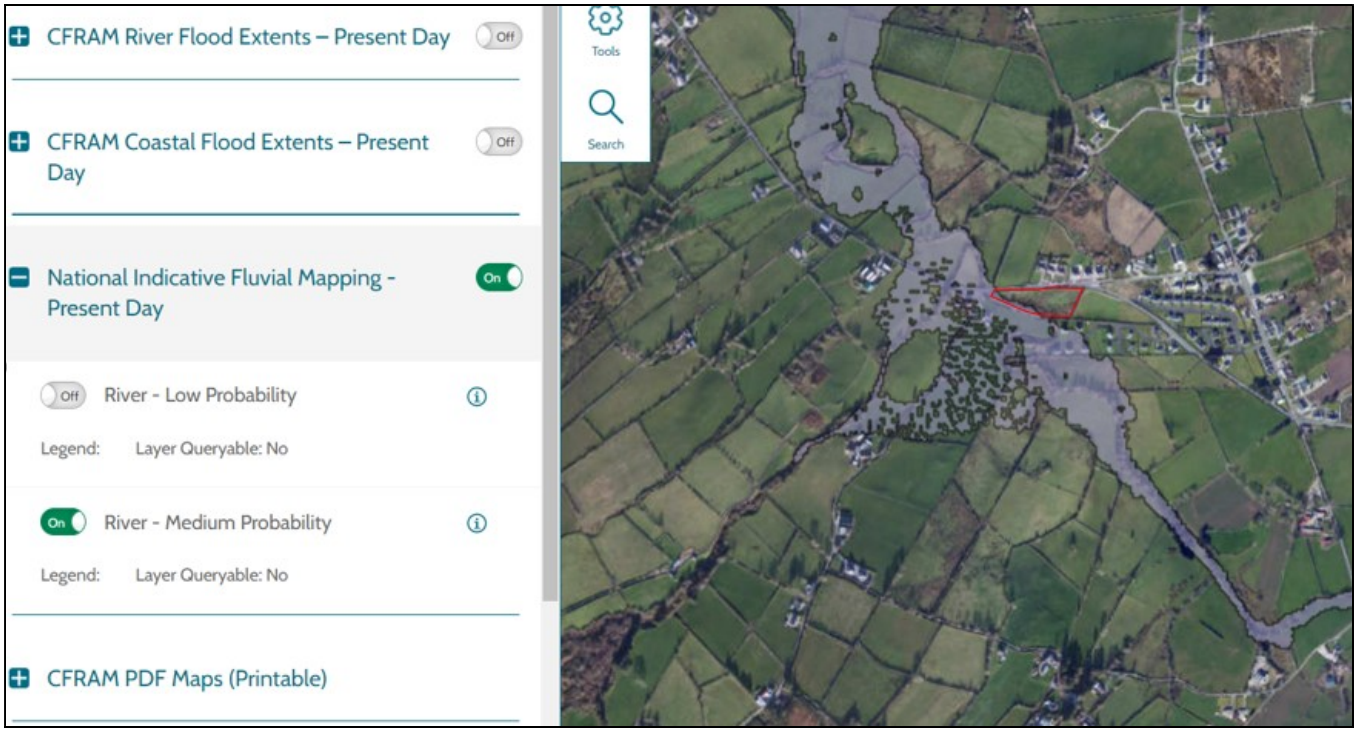


Figure 5: National Indicative Fluvial Mapping – Present day (Medium Probability)

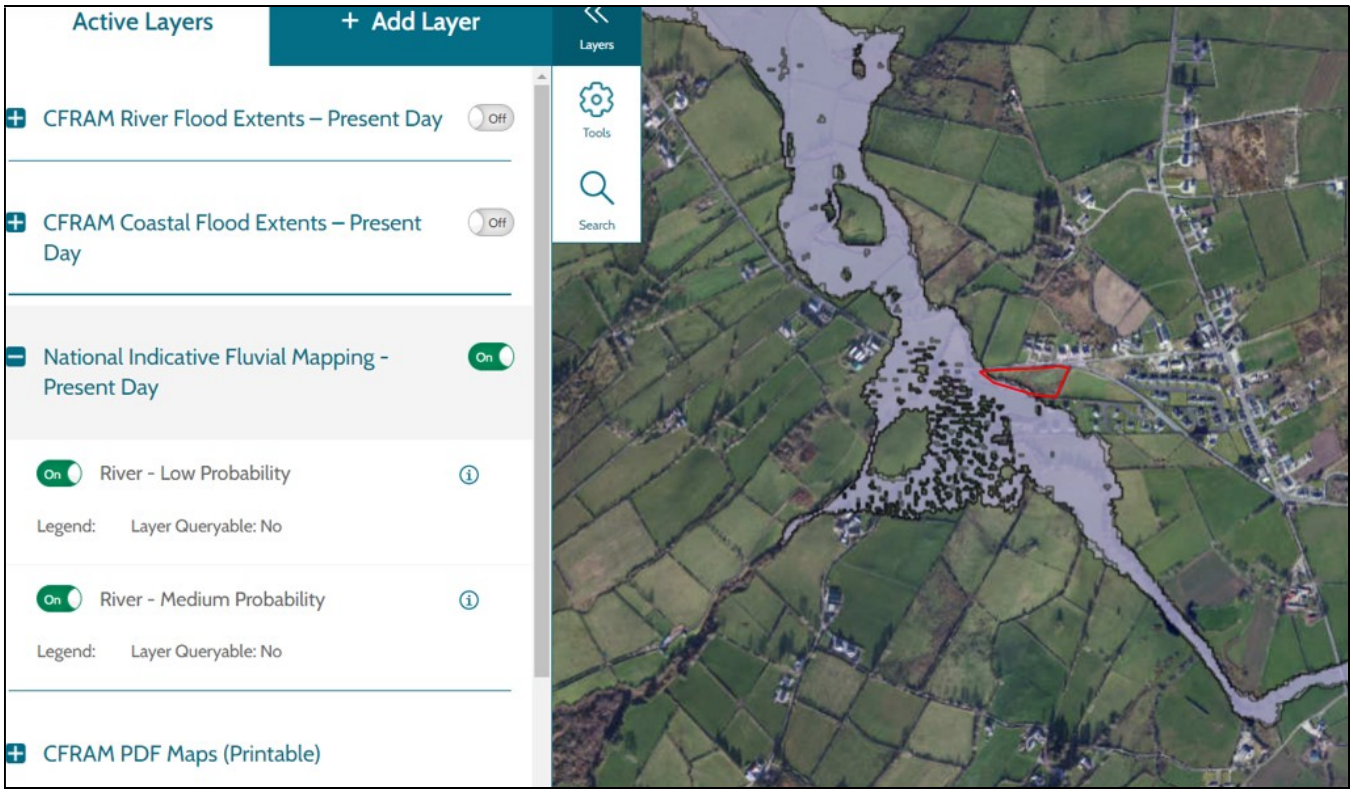


Figure 6: National Indicative Fluvial Mapping – Present day (Low + Medium Probability)

3.6 Potential Archaeological Site

Examination of the OSI 25 Inch and 6 Inch maps do not identify anything of Archaeological interest on the proposed site. Refer to Appendix D for OSI maps.

3.7 Existing Site Drainage

The existing site is Greenfield in nature and typically open with isolated whin bushes, brambles and a low-level grass covering. The southern boundary on the site is extensively overgrown with whin bushes and brambles etc. thus making the walkover survey extremely difficult and impossible in places. The open grass areas have substantial coverage of the Common rush, also known as Soft Rush, (Juncus effusus), which indicates land drainage is poor or non-existent. The rainfall that currently falls on the site either flows towards the Gleneely River, or lower lying areas and ponds or percolates into the site's sub-soil.

3.8 Proposed Development

The proposed development of the site consists of 10 housing units with associated site works to include an access road, car parking, footpaths, and landscaping. A full copy of the proposed development is contained within Appendix H.

As part of the proposed development, separate storm and foul networks will be constructed. The new storm sewer for the proposed development will discharge into the Gleneely River to the southern boundary of the site. The proposed storm drainage system will incorporate a Hydro-brake and attenuation storage to limit the proposed site to the greenfield run-off rate to ensure there will be no increase in storm water discharge as a result of the proposed development.

The Foul sewer for the proposed development will be designed to connect to an on-site treatment facility to Donegal CC and Irish Water Standards.

An indicative storm drainage layout for the proposed development is contained within Appendix G of this report.

3.9 Flood Impact Evaluation

The OPW Flood Maps and reports do not record any flooding or re-occurring flooding at the proposed site. A review of the OPW Flood maps indicate the site is not covered by any generated CFRAM Flood Maps. However, the National Indicative Fluvial Mapping indicates fluvial flooding (1:100yr and 1:1000yr) to the proposed site.

3.9.1 Desktop Study – Q100 Calculation

To provide more clarity on the Q100 flood levels within the site, a desk top study was carried out to determine the extents on the flooding on the site. To calculate the Q100 Q_{BAR} the catchment area for river Gleneely running past the site was generated. This was carried out using Catchments.ie website as shown below in Figure 7. The catchment for the proposed site was calculated as 27.08 km². The soil hydrology classification was also determined from the Catchmnets.ie website. The soil is deemed to be poorly drained as shown in figure 8 below.

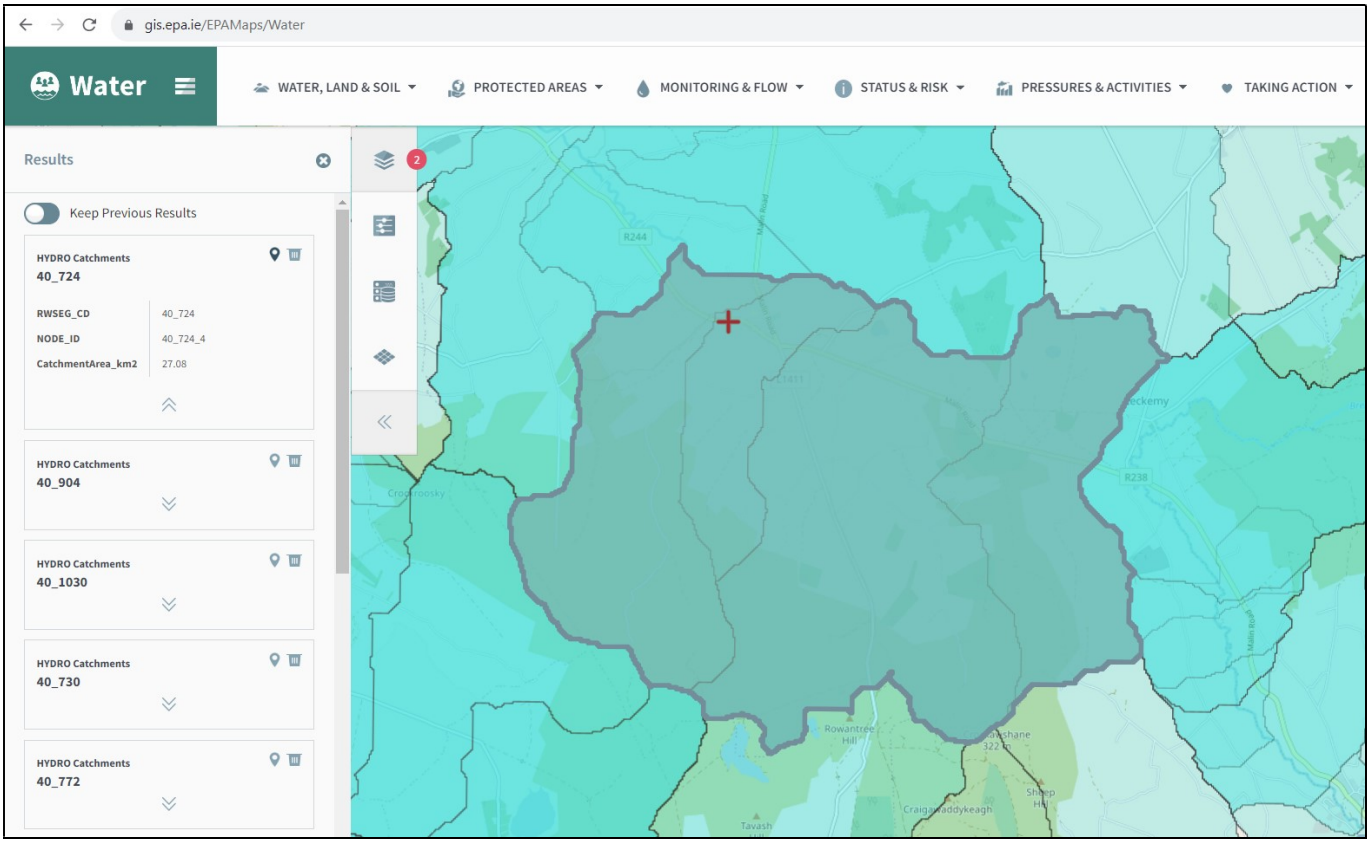


Figure 7: Catchment Area for Carn Road Site, Gleneely (https://gis.epa.ie/EPAMaps/Water)

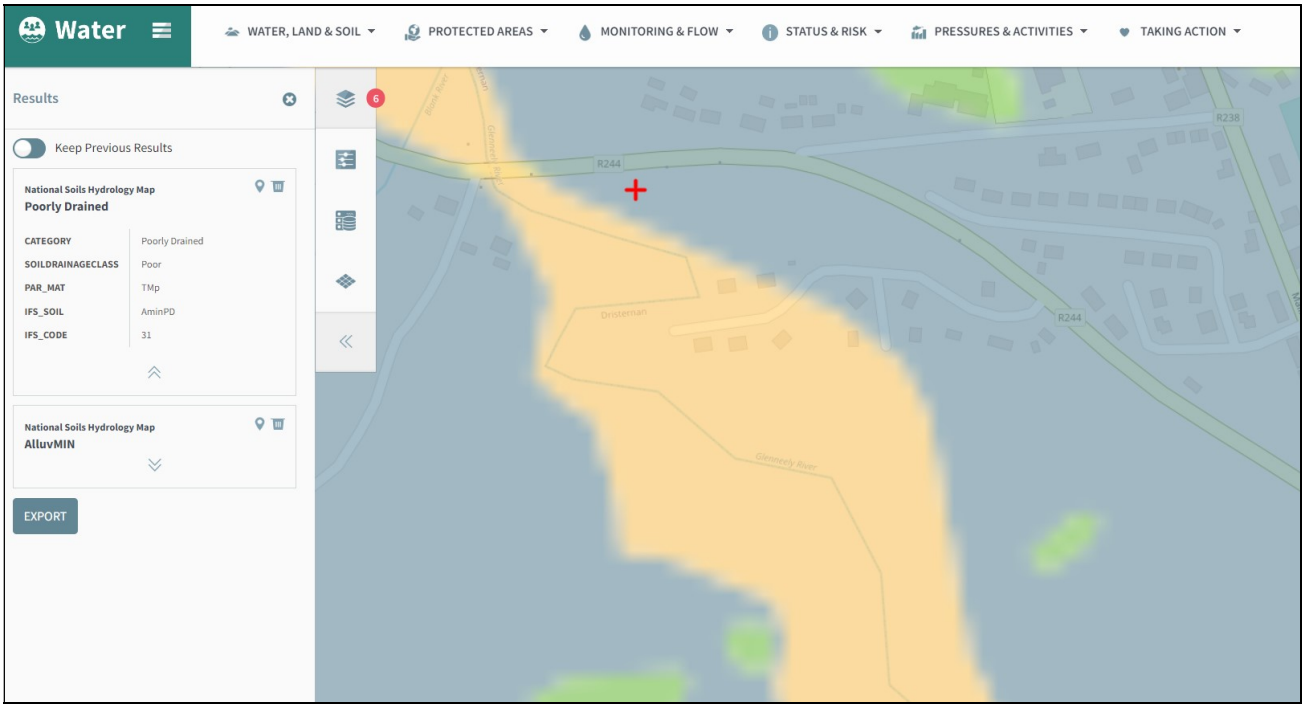


Figure 8: Soil Hydrology for Carn Road Site, Gleneely (https://gis.epa.ie/EPAMaps/Water)

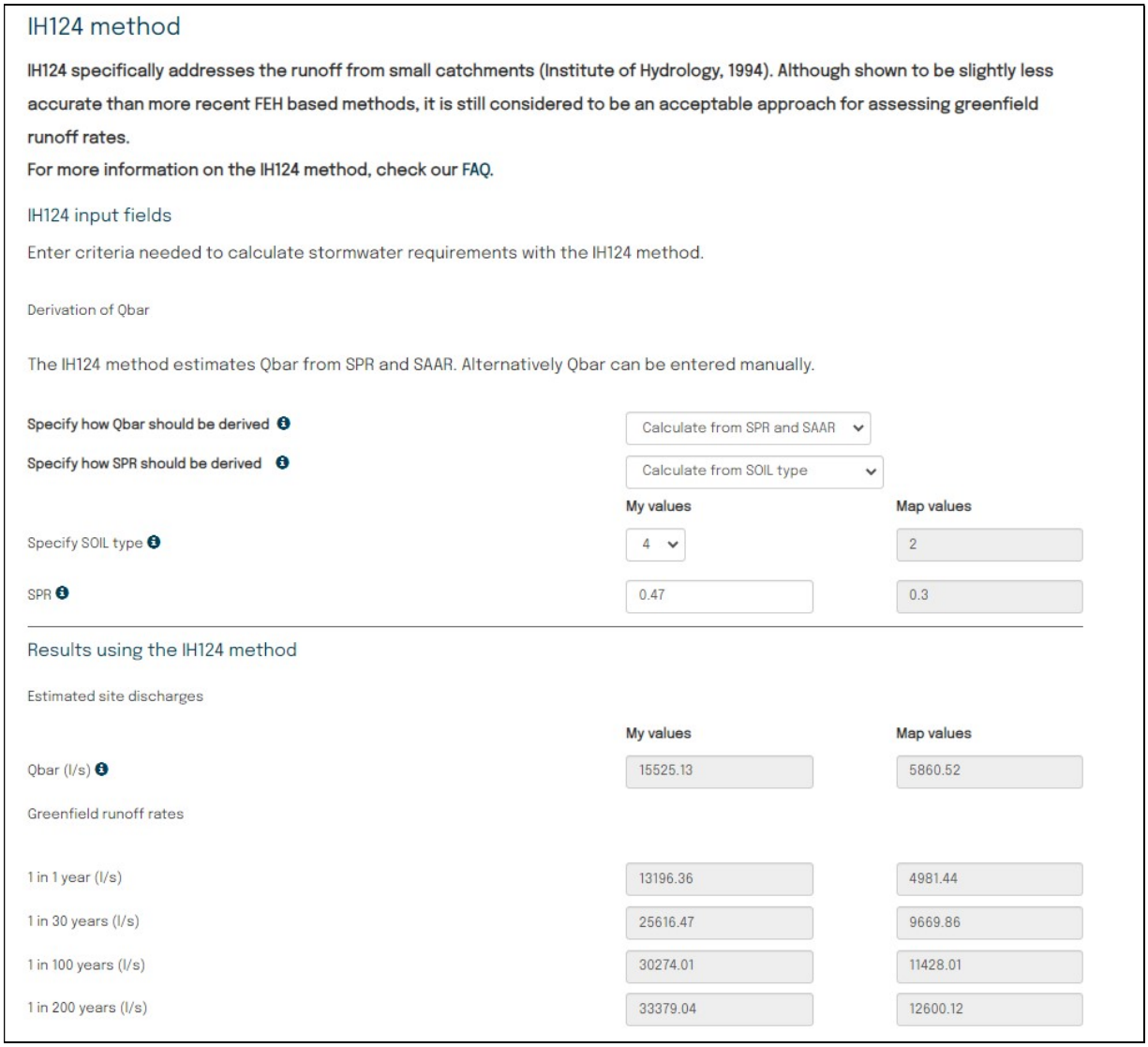
Once the catchment area and Soil Hydrology classification was determined, the information was used as part of the calculation for the Q100 Q_{BAR}. The Q100 was calculated using the HR Wallingford method within the uksuds.com Greenfield runoff tool. The runoff estimation approach was the IH124 method. The IH124 equation estimates Qbar with the following equation:

Qbar rural = 0.00108 x (0.01 x AREA)0.89 x SAAR1.17 x SPR2.17, m3/s

Where:

- Qbar rural is the mean annual flood flow from a rural catchment (approximately 2.3-year return period).
- AREA is the area of the catchment in ha.
- SAAR is the standard average annual rainfall for the period 1941 to 1970 in mm (SAAR 41-70). SAAR 61-90, which was analysed for FEH for rainfall from 1961 - 1990, is virtually the same and can also be used.
- SPR is Standard Percentage Runoff coefficient for the SOIL category.

The Q100 was calculated using the HR Wallingford method within the uksuds.com Greenfield runoff tool, which generated the existing Q_{BAR} l/sec, and predictive 1 in 30 years, 1 in 100 years and 1 in 200 years. Figure 9 shows calculated Q_{BAR} l/sec for each scenario where the full calculation sheet can be seen within Appendix C.



IH124 method

IH124 specifically addresses the runoff from small catchments (Institute of Hydrology, 1994). Although shown to be slightly less accurate than more recent FEH based methods, it is still considered to be an acceptable approach for assessing greenfield runoff rates.

For more information on the IH124 method, check our FAQ.

IH124 input fields

Enter criteria needed to calculate stormwater requirements with the IH124 method.

Derivation of Qbar

The IH124 method estimates Qbar from SPR and SAAR. Alternatively Qbar can be entered manually.

Specify how Qbar should be derived	Calculate from SPR and SAAR	
Specify how SPR should be derived	Calculate from SOIL type	
	My values	Map values
Specify SOIL type	4	2
SPR	0.47	0.3

Results using the IH124 method

Estimated site discharges

	My values	Map values
Qbar (l/s)	15525.13	5860.52
Greenfield runoff rates		
1 in 1 year (l/s)	13196.36	4981.44
1 in 30 years (l/s)	25616.47	9669.86
1 in 100 years (l/s)	30274.01	11428.01
1 in 200 years (l/s)	33379.04	12600.12

Figure 9: Greenfield Runoff rate Estimation for Carn Road Site, Gleneely (https://www.uksuds.com/tools/members/greenfield-runoff-rate-estimation-members)

3.9.2 Desktop Study – Q100 Flood Zone Determination

Following the determination of the Q100 Greenfield Runoff rate of 30,274.01 l/s, it was converted to m³/s to be able to aid in the generation of a flood plain. A Discharge rate of 30.274m³ for the Q100 allowed for plotting of the Q100 using the Manning Equation. A number of cross sections where surveyed on the site ranging from Cross section A-A to F-F. Information from each cross section was input to the Manning Equation Calculator and though trial and error of increasing the Wetted Perimeter and Area until a Discharge Q value matched or slightly greater than the Q100 Discharge rate of 30.274m³ was achieved. This allowed for a flood plain to be plotted on each cross section and interpolated onto plan form. The manning equation calculator used is shown in Figure 10.

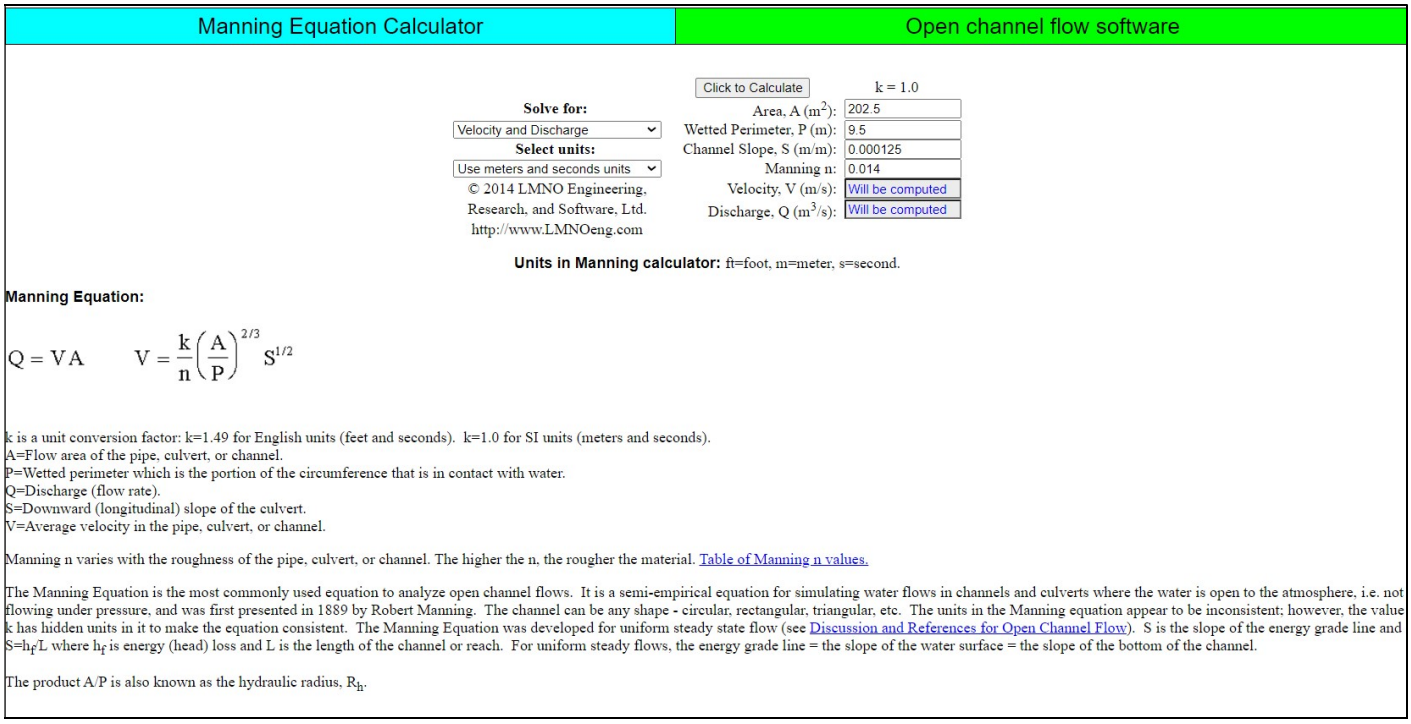


Figure 10: Manning Equation Calculator (https://www.lmnoeng.com/manning.php)

3.9.3 Desktop Study – Q100 Findings

Plotting the Q100 it was determined the highest level reached within the floodplain was 33.42m. To further safeguard against the risk of flooding and effects of the climate changes, Foyle Consulting Engineers recommends that a minimum freeboard of 600mm should be provided to the access road, and therefore a finished level of 34.02m. Furthermore, the FFL of the Dwellings should be set at a minimum of 150mm above surrounding Ground Level. The provision of this freeboard is a precaution will ensure the new houses or the access road does not flood during the 1 in 100 yr. fluvial event.

The extent of the Flood Zone will not be affected in any way by the proposed development as there will be no increase in storm water discharge, no loss of flood plain volume and the calculated flood water levels will not be altered as a result of the development. This will result in no net increase in the discharge to the neighbouring water courses and therefore will not increase flood risk to the proposed site or neighboring sites.

3.10 Existing Site-Specific Flood Risks

This section of the report considers site specific flood risk factors which could potentially result in flooding incidents within the development. The site-specific flood risks are likely to result from the following three causes:

3.10.1 Flooding of watercourses

Blockages obstructing the Gleneely River around the proposed site could constrict flow and cause localised flooding. It is essential that all local water courses are properly maintained by the landowners responsible. As long as the water courses are properly maintained then the National Indicative Fluvial maps clearly show that the site will have minimal risk from fluvial flooding up to and including the 1:1000 yr. rainfall event along its southern boundary.

The proposed development access road will run along the southern boundary and will be a buffer between the residential areas and the watercourse will reduce the probability of the flood risk to homes and careful consideration of Finished Floor Levels for the dwellings will result in a low flood risk from this source.

3.10.2 Overland flow from high ground surrounding the site.

Lands surrounding the proposed site generally fall from north to south. The proposed development will have longitudinal road gradient between 1:20 and 1:100 with crossfall gradients of 1:40 for footpaths and roads. The overland flow from high ground surrounding the site will not present a risk due the following reasons:

- Lands to the North and West are developed, and all rainwater will be contained within their own individual networks.
- The undeveloped lands to the east of the proposed site have similar levels to the proposed site and the rainfall that currently falls on this undeveloped site currently flows towards the lower lying levels that exist along its southern boundary. Any fall towards our site will be intercepted by an existing sheough on the dividing boundary.

In summary the lands surrounding of the proposed site are predominantly developed with access roads and associated storm sewers which will intercept the overland flow. There are no recorded flooding problems in the surrounding established developments, so the most likely source of flooding would be resulting from a failure of the storm water drainage system. Provided this system is maintained then the risk of flooding to the proposed development from this source is considered to be low.

3.10.3 Surcharged Storm water system

The third and final risk is pluvial flooding resulting from water escaping from the surcharged storm water network. The development proposes the discharge of water into the Gleneely River. When the local watercourses are in flood then this water has the potential to back up within the storm water drainage system and cause flooding. However, an

appropriately designed storm water drainage system should negate this risk. Careful consideration of the level of the outlet pipe combined with a well-designed storm water drainage system incorporating additional capacity / attenuation provision as appropriate, with ongoing maintenance should result in a low flood risk from this source.

The review of the site-specific flood risks determined a few sources and pathways for flooding to this site and each of these are considered to be low risk at present.

3.11 Justification Test

Where there are insufficient sites available to locate development outside flood risk areas, it may be necessary to meet the objectives of proper planning and sustainable development, for development to be sited within flood risk areas.

The Justification Test is an examination of such proposals against proper planning and sustainable development criteria and, if these are satisfied, against flood risk criteria to ensure that risks are reduced to an acceptable level and that flood risk is not increased elsewhere.

Determination if a Justification Test is required, the proposed developed is assessed using the following tables taken from the County Donegal Development Plan 2018-2024 (as varied).

Table 5.4.1: Classification of Vulnerability for different types of development taken from Table 3.1 of The Planning System and Flood Risk Management - Guidelines for Planning Authorities (DoEHLG, 2009)

Vulnerability Class	Land Use and Types of Development which include
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).
Less Vulnerable Development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions.
	Land and buildings used for holiday or touring non-static holiday caravans and camping, subject to specific warning and excavation plans.
	Land and buildings used for agriculture and forestry.
	Waste treatment (except landfill and hazardous waste).
	Mineral working and processing, and;
	Local transport infrastructure.
Highly Vulnerable Development	Garda, ambulance, fire stations and command centres should be operational during flooding.
	Hospitals.
	Emergency access and egress points.
	Schools.
	Dwelling houses, student halls of residence and hostels.
	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 in the event of flooding.

Source - Planning System and Flood Risk Management Guidelines for Planning Authorities, November 2009 DoEHLG.

Harbour Office, Port Road, Lisahally, Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com

Table 5.4.2: Matrix of Vulnerability Versus Flood Zone as taken from Table 3.1 of The Planning System and Flood Risk Management - Guidelines for Planning Authorities (DoEHLG, 2009)

	Flood Zone A High Probability	Flood Zone B Moderate Probability	Flood Zone C Low Probability
Water Compatible Development	Development Appropriate	Development Appropriate	Development Appropriate
Less Vulnerable Development	**Justification Test Required**	Development Appropriate	Development Appropriate
Highly Vulnerable Development	**Justification Test Required**	**Justification Test Required**	Development Appropriate

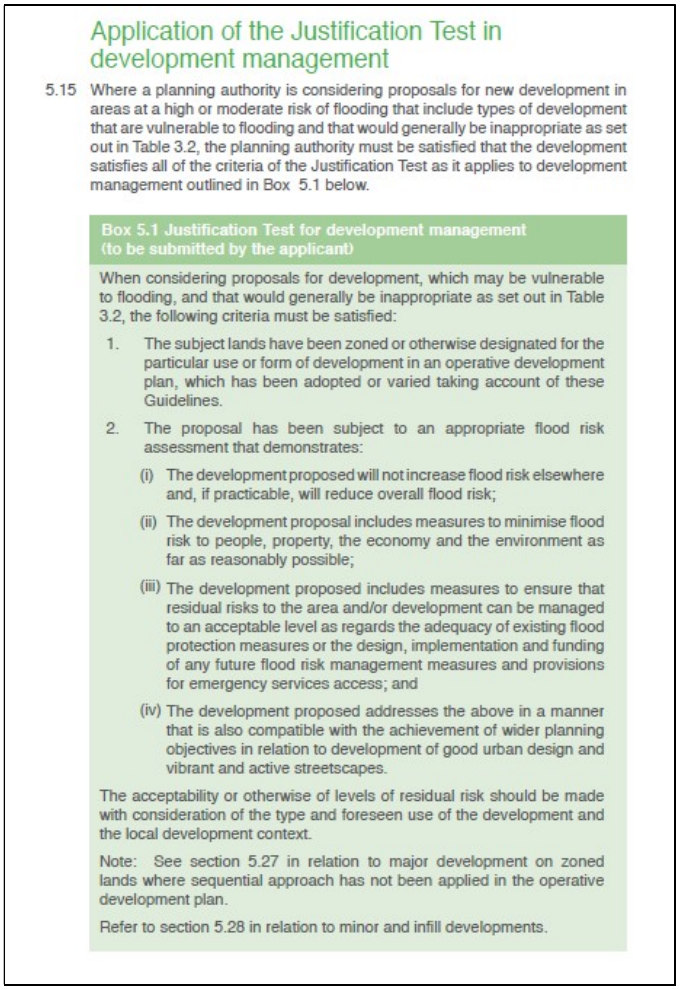
Consideration of the proposed development with Table 5.4.1 above would confirm the Vulnerability Class as Highly Vulnerable Development (Dwelling Houses). Under further consideration of Table 5.4.2 the proposed development falls within Flood Zone A and B, therefore the development could be deemed subject to a Justification Test.

Review of the proposed site plan has identified only a small portion of the southern boundary is impacted by Flood Zone A and B, with the proposed dwellings all outside these zones. With the proposed layout indicating the access road will be within the Flood Zone A and B, a review of Table 5.4.1 (Local transport infrastructure) and consideration of Table 5.4.2 (Flood Zone A) the development is deemed subject to a Justification Test.

This development is considered integral to meeting the core objectives for housing as outlined in the Donegal County Development Plan 2018-2024 Table 2A.6: The Core Strategy Table.

3.12 Application of the Justification Test

The following information box is taken from the County Donegal Development Plan 2018-2024 (as varied).



Application of the Justification Test in development management

5.15 Where a planning authority is considering proposals for new development in areas at a high or moderate risk of flooding that include types of development that are vulnerable to flooding and that would generally be inappropriate as set out in Table 3.2, the planning authority must be satisfied that the development satisfies all of the criteria of the Justification Test as it applies to development management outlined in Box 5.1 below.

Box 5.1 Justification Test for development management (to be submitted by the applicant)

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, 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.
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;
   - (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
   - (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; and
   - (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.

The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: See section 5.27 in relation to major development on zoned lands where sequential approach has not been applied in the operative development plan.

Refer to section 5.28 in relation to minor and infill developments.

3.12.1 Step 1 – Zoned Lands

In the first step for the proposed site Justification Test, while considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the subject lands would be required to 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.

In accordance with the County Donegal Development Plan 2018-2024 the site is identified as outside of the Settlement Boundary as seen in Map 15.41 Gleneely within Appendix E.
However, the site is bounded to the south with the Gleneely River, it is still in proximity to numerous residential dwellings on the Carn road, and Fox Wood housing development.

3.12.2 Step 2 – Appropriate Flood Risk Assessment

Step 2 under the Justification test is to determine the proposal has been subject to an appropriate flood risk assessment that demonstrates the criteria in Box 5.1. For this assessment each point has been taken separately and detailed below:

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

The proposed development has only partial affected areas covered by Flood Zone A and B. The developed site will collect the rainfall within dedicated Storm sewer network with a discharge manhole supply the existing Gleneely River. The Storm Sewer discharge will be limited to Green Field run off and controlled by a flow control device.

The 0.88 ha application site is currently an undeveloped Greenfield site, with unmaintained overgrown hedge lines, shrubbery, hawthorns, and rushes. The site is currently not being utilised for any purpose. The majority of the site is considered to have a permeable surface area. The rainfall on the current site either flows towards the lower lying areas located to the southern boundary of the site, evaporates or percolates into the subsoil. The Greenfield run-off rate for the existing site has been calculated as 8.80 L/Sec. Attenuation of the rainfall events will be incorporated with the Storm Network using oversized Pipes and Manhole Rings. Limited Storm discharge to Greenfield runoff creates a theoretical Net balance to existing conditions versus future conditions with the impermeable area increased.

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

The proposed development has only partial affected areas covered by flood Zone A and B, and no dwellings will be constructed within this area. As described in part “i” the site will be limited to Green field runoff and attenuation of the rainfall events will be incorporated with the Storm Network using oversized Pipes and Manhole Rings. Limited Storm discharge to Greenfield runoff creates a theoretical Net balance to existing conditions versus future conditions with the impermeable area increased. Therefore, the watercourse will not be negatively impacted in the future scenario.

The OPW Flood Maps and reports do not record any flooding or re-occurring flooding at the proposed site. The site is currently not affected by flooding from a 1:200-year Coastal flooding event.

To further safeguard against the risk of flooding and effects of the climate changes, Foyle Consulting Engineers recommends that a minimum freeboard of 600mm should be provided to the access road, and therefore a finished level of 34.02m. Furthermore, the FFL of the Dwellings should be set at a minimum of 150mm above surrounding Ground Level. The provision of this freeboard is a precaution will ensure the new houses or the access road does not flood during the 1 in 100 yr. fluvial event.

The extent of the Flood Zone will not be affected in any way by the proposed development as there will be no increase in storm water discharge, no loss of flood plain volume and the calculated flood water levels will not be altered as a result of the development. This will result in no net increase in the discharge to the neighboring water courses and therefore will not increase flood risk to the proposed site or neighboring sites.

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; and

As described in part "i" the site will be limited to Green field runoff and attenuation of the rainfall events will be incorporated with the Storm Network using oversized Pipes and Manhole Rings. Limited Storm discharge to Greenfield runoff creates a theoretical Net balance to existing conditions versus future conditions with the impermeable area increased. Therefore, the watercourse no not be worse of in the future scenario. The provision of this attenuation is a precaution will ensure the new site does not flood during the 1 in 100 yr. fluvial event.

As previously mentioned, no dwellings will be constructed in Zone A or B flood zones and the road will be constructed at a level of 34.02m and above which includes a freeboard safety factor.

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.

Parts I, ii, iii cover details of the proposed storm attenuation and restricted discharge of Greenfield Runoff. They address the wider planning objective, due to the net zero balance to the stream and surrounding areas. The requirement for these houses is highlighted within the County Donegal Development Plan 2018-2024 where this development is considered integral to meeting the core objectives for housing as outlined in the Donegal County Development Plan 2018-2024 Table 2A.6: The Core Strategy Table.

On review of the information the justification weighs in favour of the site to proceed. The site being restricted to Greenfield runoff and incorporating its own attenuation system through large pipes and manhole rings to contain a 1 in 100-year storm event (including Climate Change) therefore resulting in no net increase in the discharge to the neighboring water courses.

The proposed dwellings are situated out of the flood zones and finished floor levels are to be set 150mm above the surrounding ground levels and road network, which will be designed to have a free board above the existing Q100 level.

4.0 DEVELOPMENT FEASIBILITY

4.1 Pre-development

Donegal County Council Housing, Corporate & Culture Services team are seeking planning approval for proposed site of 10 residential dwellings. The development will have 1 phase and units will be constructed running parallel to the site road (R238) frontage, in an aim to meeting the core objectives for housing as outlined in the Donegal County Development Plan 2018-2024 Table 2A.6: The Core Strategy Table.

The site is currently an undeveloped Greenfield site. with unmaintained overgrown hedge lines, shrubbery, hawthorns and rushes. The site is currently not being utilised for any purpose. Site Photos from a walk over survey can be found in Appendix A.

The proposed development has only partial affected areas covered by flood Zone A and B.

4.2 Post-development

The proposed development will consist of 10 new residential dwellings, access road, car parking, landscaping, and associated site works. A plan of the proposed development is contained within Appendix H.

Post development, the site will have an impermeable area of 0.27ha. The developed site will collect the rainfall within dedicated Storm sewer network with a discharge manhole restricting flow to Greenfield run-off with the use of a flow control device. The storm will discharge into the Gleneely River via a Headwall set-up. The Greenfield run-off rate for the existing site has been calculated as 8.80 L/Sec. Attenuation of the rainfall events will be incorporated with the Storm Network using oversized Pipes and Manhole Rings. Limited Storm discharge to Greenfield runoff creates a theoretical Net balance to existing conditions versus future conditions with the impermeable area increased.

Foyle Consulting Engineers used Causeway Flow modelling software to design the Storm system utilising a flow control device with a restricted discharge of 8.80 l/s. Simulations for the 2-year, 30 year and 100-year return period events have been assessed, using Causeway Flow, with a 10% increase in rainfall as a result of climate change included with an additional 10% added to the impermeable drainage area to allow for urban creep. The indicative storm drainage layout for the site is contained within Appendix G of this report. The proposed development internal storm sewer design and construction will be completed to an adoptable standard.

The calculations in Appendix F confirm the proposed site storm drainage system, including the flow control and attenuation, is adequate to provide sufficient storage for the 1 in 100-year storm event plus the 10% climate change allowance. Attenuation is provided in the form of oversized pipes and large diameter manholes creating a storage volume in excess of 59.2m³ within the road network.

Exceedance conditions result in above ground flood flow occurring either when the capacity of the drainage system is exceeded or where the rate of runoff exceeds the inlet capacity of the drain. Without good design, flood flow will follow default pathways leading to flooding of properties. It is possible to avoid this by setting proposed ground levels that will direct flood flows away from the proposed properties.

The analysis also demonstrates that, whilst the storm drainage system may become surcharged within 300mm of proposed manhole or road gully cover levels during the 1 in 100-year return period event, no out of system flooding will occur. To safeguard against potential pluvial flood risk to the development, final development levels and gradients will be re-profiled as necessary to remove any isolated low-lying areas and/or have appropriate surface water drainage infrastructure installed to remove any standing water. In addition, the finished floor levels of the proposed residential units should be located at least 150mm above adjacent ground levels. In the event that the proposed system becomes surcharged during a storm greater than the 1 in 100yr storm event then the storm water surface flow will be managed to ensure there is no risk of flooding to the proposed properties.

4.3 Post-development-Potential Archaeological Site

Examination of the OSI 25 Inch and 6 Inch maps do not identify anything of Archaeological interest on the proposed site, however, if during the construction process anything of Archaeological interest is discovered then the appropriate organisations should be informed.

4.4 Overland flow originating from the site and potentially affecting elsewhere.

The proposed development will increase the storm water runoff rate which has been used for the drainage design for the proposed development to ensure there is no increased risk of flooding on site or off site. There will be no increased risk due the following reasons:

- Proposed development levels selected to direct overland flow towards drainage networks.
- Finished Floor levels will be selected to be 150mm above surrounding ground levels.
- No formal drainage to back gardens, with drainage taking place via percolation through the soil to mimic the natural undeveloped drainage regime.
- The proposed development access roads and sewer network will be designed to intercept any overland flow and direct towards storm drainage system.
- The proposed development storm network system will be designed to include a flow control and attenuation for the 100-year return event.
- Any low-lying area will be re-profiled as part of the proposed development and the overland flow will be intercepted by the network of roads and associated storm drainage system. This will prevent surface water ponding within the proposed development site.

4.5 Foul Drainage

A foul sewer network will be constructed to an adoptable standard and will transfer foul flows from the constructed residential units to an an on-site treatment facility to Donegal CC and Irish Water Standards. Permission to discharge treated effluent into the Gleneely River will be obtained from Donegal County Council prior to the discharge of any foul flows from the proposed site.

5.0 Conclusion

Foyle Consulting Engineers have prepared this Flood Risk Assessment to be submitted in support of the Full Planning Application for the proposed development.

In summary:

- The proposed development site consists of 10 residential dwelling housing units with associated site works to include an access road, car parking, footpaths, and landscaping. Separate foul and storm drainage networks will service the development.
- The site is currently an undeveloped Greenfield site. with unmaintained overgrown hedge lines, shrubbery, hawthorns, and rushes. The site is currently not being utilised for any purpose.
- The site identified for the proposed development is located on the southern outskirts of Gleneely village, Co. Donegal. The site has a watercourse known as Gleneely River running parallel to the southern boundary, flowing from East to West converging with Culdaff River before entering the Culdaff Estuary with the North Atlantic Ocean.
- The site has an area of approximately 0.88 Hectares.
- A review of the OPW Flood maps indicate the site is not covered by any generated CFRAM Flood Maps. However, the National Indicative Fluvial Mapping indicates fluvial flooding (1:100yr and 1:1000yr) to the proposed site.
- It is proposed to limit the storm water discharge from the proposed developed site to that of the Greenfield Run-off. Foyle Consulting Engineers calculated a Greenfield run-off rate of 8.80/sec. Causeway Flow Design Report within Appendix F of this report prove that 1 in 100-year storm event will be contained within the proposed storm drainage system that includes a flow control and attenuation storage of 59.2m³ and therefore is considered to be designed to exceedance.
- The post development storm water discharge rate will be limited by flow control and attenuation to the consented rate. The proposed attenuation measures will be sized up to and including the 100-year rainfall event (plus 10% climate change) and therefore no part of the site floods during a 1 in 100-year return period event. This proposal will be submitted to Donegal County Council for approval. An indicative storm sewer layout for the proposed development is contained within Appendix G of this report.
- To safeguard against potential pluvial flood risk to the development or neighbouring sites, final development levels and gradients will be re-profiled as necessary to remove any isolated low-lying areas and/or have appropriate surface water drainage infrastructure installed to remove any standing water. In addition, the finished floor levels of the proposed residential units should be located at least 150mm above adjacent ground levels. In the event that the proposed system becomes surcharged during a storm greater than the 1 in 100yr storm event then the storm water surface flow will be managed to ensure there is no risk of flooding to the proposed properties.
- The foul sewer network will be designed to transfer foul flows from the constructed residential units to an on-site treatment plant. Also, the foul network system will have to take into consideration the proposed storm water network system as there may be clearance issues at crossover points. Permission to discharge treated effluent into the Gleneely River will be obtained from Donegal County Council prior to the discharge of any foul flows from the proposed site.

- The preliminary design has therefore shown that an exceedance surface water event can be dealt with without the need to revise the layout of the proposed development.
- Both the foul and storm sewer networks for the proposed development will be designed and constructed to an adoptable standard for Donegal County Council.
- The review of the site-specific flood risks: flooding of watercourses, overland flow from high ground surrounding the site and surcharged storm water systems determined few sources and pathways for flooding to this site and each of these are considered to be low risk at present.
- The proposed development will increase the storm water runoff rate. This increased storm water runoff rate has been used for the drainage design for the proposed development to ensure there is no increased risk of flooding on site or off site.
- This development is considered integral to meeting the core objectives for housing as outlined in the Donegal County Development Plan 2018-2024 Table 2A.6: The Core Strategy Table.

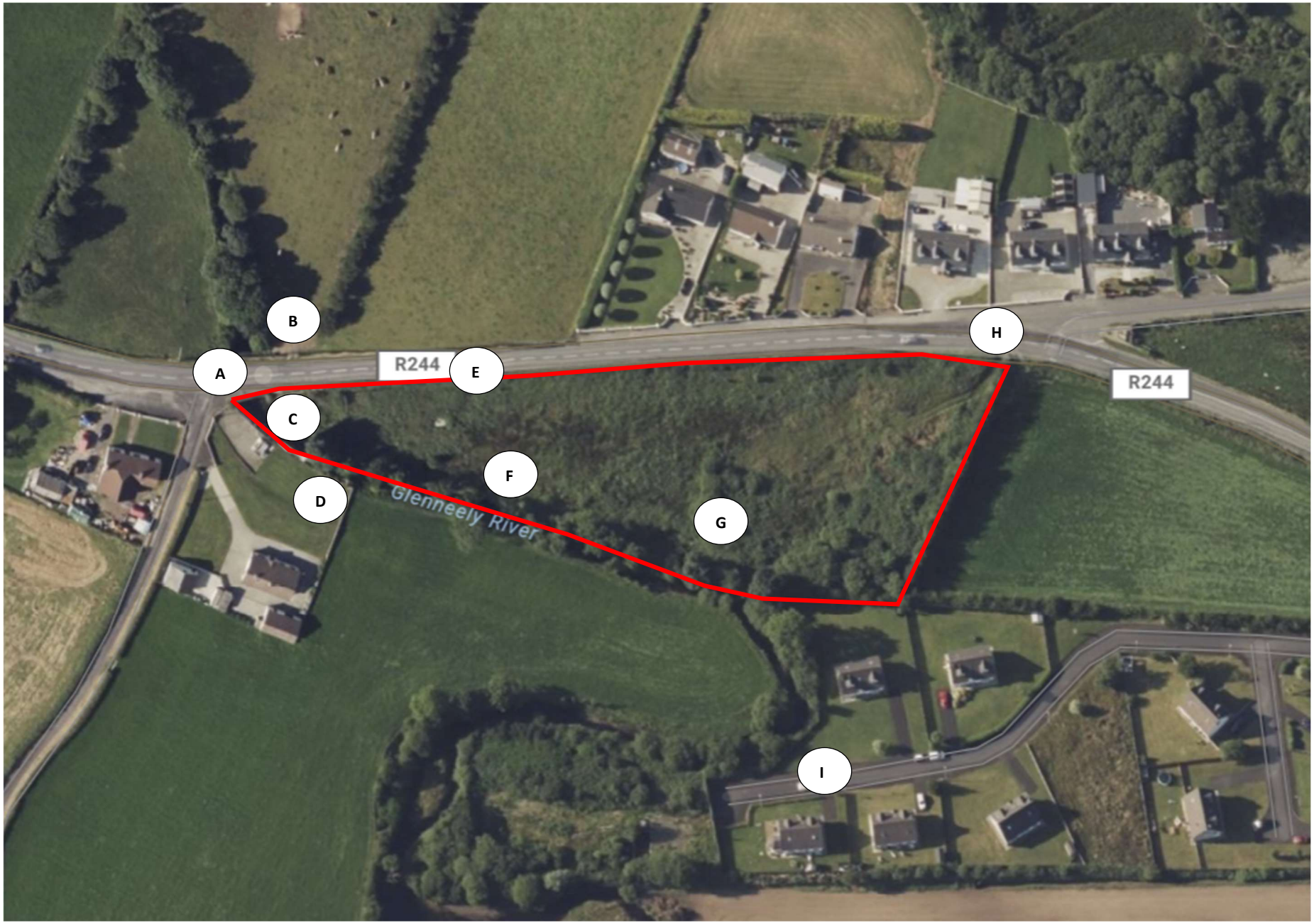
As it has been documented within this report there will be no increased flood risk to the proposed development and no adverse impacts to other developments or features of importance to nature conservation, archaeology, or the built heritage and therefore the proposed developed for this site should be considered acceptable.

Appendix A

SITE WALK OVER PHOTOGRAPHS

Harbour Office, Port Road, Lisahally,
Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com

Site Walkover Photo Locations



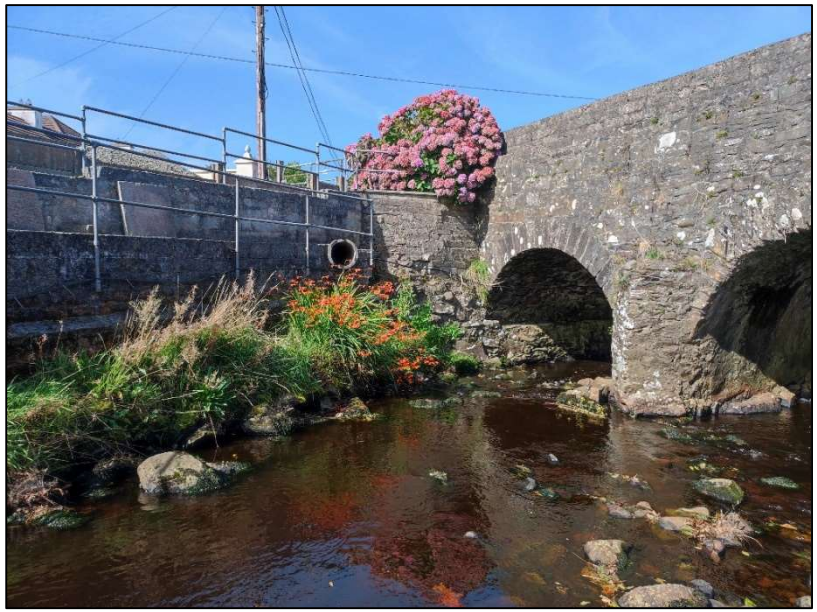
Site Walkover Photos – Location A

(Looking North)

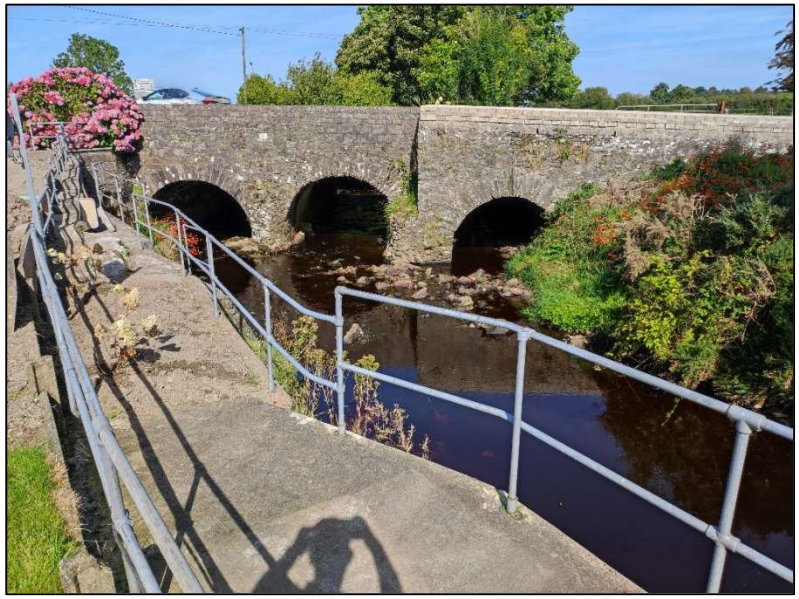
(Looking South)

Site Walkover Photos – Location B

Site Walkover Photos – Location C



Site Walkover Photos – Location D



Site Walkover Photos – Location E

Site Walkover Photos – Location F

Site Walkover Photos – Location G

Site Walkover Photos – Location H

Site Walkover Photos – Location I

Appendix B

OPW FLOODING INFORMATION

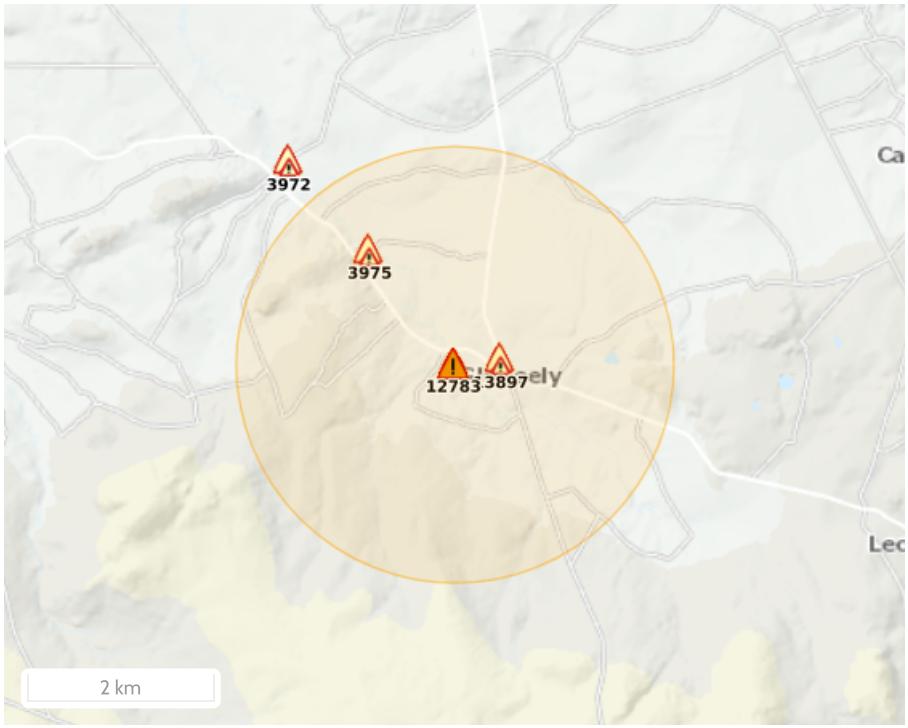
Harbour Office, Port Road, Lisahally,
Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com

Past Flood Event Local Area Summary Report

Report Produced: **11/10/2023 12:10**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "**Website**"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

3 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Flooding at Gleneely - 2015 (ID-12783)	n/a	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
2.	Flooding at Gleneely - Recurring (ID-13897)	n/a	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
3.	Culdaff River Aghatubrid Recurring (ID-3975)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		

MINUTES OF MEETING

Reference:	**P4D403A – F310 – 011 – 004 – 2761**	**Page 1 of 5**
Project No.:	**P4D403A**	
Project Title:	**OPW Flood Hazard Mapping – Phase 1**	
Purpose of Meeting:	**Donegal County Council – Oral Report – Area Executive Engineer – Inishowen**	
Participating:	**Area Roads Manager**	**Donegal County Council**
	Area Executive Engineer	**Donegal County Council**
	Supervisors	**Donegal County Council**
	Search Manager	**ESBI**
Venue:	**Carndonagh**	
Date of Meeting:	**11/01/06**	
Copies to:	**Donegal CC**	
Compiled by:	**Search Manager ESBI**	
Status	**Final**	
Approved for ESBI:	**Search Manager ESBI**	
Approved for Donegal County Council	**Area Executive Engineer**	
Date:	**21/03/2006**	

Meeting with Electoral Area Engineers for Inishowen 11/01/06

The Electoral Area Engineers and supervisors outlined 57 areas that are or were prone to flooding. These are: -

C1. Ballygorman/Killure – River overflows its banks every year through a combination of heavy rain and high tides. A significant area is covered.
Flood Id = 3949

C2. Stewbridge Bridge 1 – River Glennagannon overflows its banks once or twice a year through a combination of heavy rain and high tides.
Flood Id = 3950

C3. Carndonagh - River Glennagannon overflows its banks once or twice a year through a combination of heavy rain and high tides.
Flood Id = 3952

C4. Esky Bay – Low lying land is flood by exceptional high tides every year. The road is liable to flood.
Flood Id = 3955

C5. Goorey - Low lying land is flood by exceptional high tides every year. A stretch of the R242 is liable to flood.
Flood Id = 3961

C6. Malin - Low lying land is flood by exceptional high tides every year. The road is liable to flood.
Flood Id = 3962

C7. Carndonagh 2 River Glennagannon overflows its banks every year after heavy rain. The road is liable to flood.
Flood Id = 3966

C8. Culdaff- River Culdaff overflows its banks every year after heavy rain. A significant area is covered.
Flood Id = 3968

C9. Gleneely - River Culdaff overflows its banks every year after heavy rain. A significant area is covered.
Flood Id = 3972

C10. Aghatubrid - River Culdaff overflows its banks every year after heavy rain. The road is liable to flood.
Flood Id = 3975

C11. Cashel - River Glentogher overflows its banks every year after heavy rain.
Flood Id = 3978

C12. Glentogher - River Glentogher overflows its banks every year after heavy rain. The road is liable to flood.
Flood Id = 3979

C13. Binnion - River Clonmany overflows its banks every year through a combination of heavy rain and high tides. A significant area is covered.
Flood Id = 3981

C14. Muff – Liberty and Kilderry streams overflows their banks once or twice a year through a combination of heavy rain and high tides. Road is liable to flood and properties are affected.
Flood Id = 3985

C15. Corvish - River Glennagannon overflows its banks once or twice a year through a combination of heavy rain and high tides.
Flood Id = 3986

C16. Lackboy - River overflows its banks every year through a combination of heavy rain and high tides.
Flood Id = 3987

C17. Cloghorna - River overflows its banks every year through a combination of heavy rain and high tides. One side of the road is liable to flood.
Flood Id = 3988

C18. Meenadiff/Glasmullan – A combination of the River Clonmany overflowing its banks and runoff from high land causes flooding every year after heavy rain. The road is liable to flood.
Flood Id = 3989

C19. Carrick - River Owenboy overflows its banks every year after heavy rain. A significant area is covered. Properties may be affected.
Flood Id = 3990

C20. Magherabane – Runoff from high ground causes flooding every year after heavy rain. The road is liable to flood.
Flood Id = 3991

C21. Strogill Beach - River overflows its banks through a combination of heavy rain and high tides. Not every year
Flood Id = 3992

C22. Luddan – A combination of low lying flat land and streams overflowing their banks cause flooding every year after heavy rain.
Flood Id = 3993

C23. Craigtown - A combination of a river overflowing its banks and runoff from high land causes flooding every year after heavy rain.
Flood Id = 3994

C24. Glebe Large - River overflows its banks through a combination of very heavy rain and high tides. The road is liable to flood and properties are affected. Not every year.
Flood Id = 3995

C25. Burnfoot 1(The Slab) - River Burnfoot overflows its banks every year through a combination of heavy rain and high tides. A significant area is covered. The road is liable to flood
Flood Id = 3996

C26. Burnfoot 2(The Slab) - River Burnfoot overflows its banks every year through a combination of heavy rain and high tides. A significant area is covered. The road is liable to flood and properties are affected
Flood Id = 3997

C27. Cristaghkeel - Runoff from high ground causes flooding every year after heavy rain. The road is liable to flood.
Flood Id = 3998

C28. Magherabeg - River overflows its after very heavy rain. Not every year.
Flood Id = 3999

C29. Ballymagae - Runoff from high ground causes water to flow down the road into a property after very heavy rain
Flood Id = 4000

C30. Ross Point - River overflows its banks every year through a combination of heavy rain and high tides. The land is low lying and is protected by embankments. Development is taking place in the area.
Flood Id = 4001

C31. Mill Bay - Low lying land is flood by exceptional high tides approximately once every year. The road is liable to flood.
Flood Id = 4002

C32. Baylet – Fresh water lake level rises every year and floods a significant area after heavy rain.
Flood Id = 4003

C33. Ballyederowen 1 - River Burnfoot overflows its banks every year after heavy rain.
Flood Id = 4004

C34. Ballyederowen 2 - Runoff from high ground causes flooding after very heavy rain approximately once every 5 years. The road is liable to flood.
Flood Id = 4005

C35. Lagnadavaugh - Runoff from high ground causes flooding after very heavy rain approximately once every 5 years. The road is liable to flood.
Flood Id = 4006

C36. Garvary - Runoff from high ground causes flooding after very heavy rain approximately once every 2 years. The road is liable to flood.
Flood Id = 4007

C37. Glen Bridge - River Burnfoot overflows its banks every year after heavy rain. The road is liable to flood.
Flood Id = 4008

C38. Ballyederowen 3 – A combination of low lying land and Rivers Burnfoot and Skeoge overflowing their banks every year due to heavy rain and high tides.
Flood Id = 4009

C39. Skeoge Road - River Skeoge overflows its banks once or twice a year through a combination of heavy rain and high tides. Road is liable to flood approximately once every 5 years
Flood Id = 4010

C40. Bridge End 1 - River Skeoge overflows its banks every year after heavy rain. The road is liable to flood.
Flood Id = 4011

C41. Bridge End 2 - Runoff from high ground causes flooding after very heavy rain approximately once every 2 years. The road is liable to flood.
Flood Id = 4012

C42. Bridge End 3 - Runoff from high ground causes flooding after very heavy rain approximately once every 2 years. The road is liable to flood.
Flood Id = 4013

C43. Inch – Low lying land floods every year after heavy rain. A significant area is flooded
Flood Id = 4014

C44. Trady Point – Low lying land floods every year after heavy rain. A significant area is flooded
Flood Id = 4015

C45. Carrownmaddy - Runoff from high ground causes flooding after very heavy rain approximately once every 2 to 3 years. The road is liable to flood.
Flood Id = 4016

C46. Bridge End 4 - Runoff from high ground causes flooding after very heavy rain approximately once every 2 years. The road is liable to flood.
Flood Id = 4017

C47. Blanket Nook - Low lying land floods every year after heavy rain. A significant area is flooded
Flood Id = 4018
C48. Glar - Low lying land floods every year after heavy rain. A significant area is flooded
Flood Id = 4019
C49. Moyle - River overflows its banks every year after heavy rain.
Flood Id = 4020
C50. Moylemoss - River overflows its banks every year after heavy rain.
Flood Id = 4021
C51. Newtown Cunningham 1 - A combination of low lying land and a stream overflowing its banks every year due to heavy rain and high tides. County Council pump house is affected.
Flood Id = 4022
C52. Newtown Cunningham 2 - A combination of a river overflowing its banks and runoff from high land causes flooding every year after heavy rain. The road is liable to flood and properties are affected.
Flood Id = 4023
C53. Murlough - A combination of low lying land and a stream overflowing its banks every year due to heavy rain and high tides.
Flood Id = 4024
C54. Roosky - A combination of low lying land flat land and runoff from high land cause flooding every year after heavy rain. The road is liable to flood. The problem has been exacerbated by recent development
Flood Id = 4025
C55. Coxtown - Low lying land floods every year after heavy rain.
Flood Id = 4026
C56. Carrigans – Stream and River Foyle overflows their banks every year after heavy rain and high tides.
Flood Id = 4027
C57. Monglass - Low lying land floods every year after heavy rain.
Flood Id = 4028

Summary

The council does install, unblock and replace culverts to alleviate flooding

Appendix C

Q100 Calculations

Harbour Office, Port Road, Lisahally,
Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Bernard McLaughlin
Site name:	Carn Road, Gleneely
Site location:	Gleneely

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	55.24107° N
Longitude:	7.15632° W
Reference:	54139248
Date:	Oct 25 2023 15:53

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	2708

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1180	1180
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	5860.52	15525.13
1 in 1 year (l/s):	4981.44	13196.36
1 in 30 years (l/s):	9669.86	25616.47
1 in 100 year (l/s):	11428.01	30274.01
1 in 200 years (l/s):	12600.12	33379.04

DO NOT SCALE: ALL DIMENSIONS TO BE VERIFIED BY THE CONTRACTOR.
ANY OMISSIONS OR ERRORS SHOULD BE REPORTED TO THE ENGINEER.

Sightlines of 92m are achievable each way setback 3 m from edge of road

New entrance off public Road

Line of Flood Zone A

Existing third party treatment plant

Line of Flood Zone B

CARN ROAD

92 metre visibility splay

92 metre visibility splay

Killycooly Bridge

WILDFLOWER MEADOW / COMMUNITY GARDEN AREA

HT6 3B 5P FFL=35.50
HT3 2B 4P FFL=35.00
HT3 2B 4P FFL=35.25
HT3 2B 4P FFL=35.50
HT3 2B 4P FFL=35.75
HT6 3B 5P FFL=36.00

Footpath
Proposed Parking
Footpath
Proposed Parking

OPEN GREEN SPACE

Proposed Treatment Plant

Proposed Percolation Area

Proposed Treatment Plant

Proposed new decking path and Gabion retaining wall along river with concrete path over and timber fence.

Maintain mature trees along riverbank.

2m path to be provided along River Walk.

Existing River

Gleneely

Gleann

Daoile

REV	DESCRIPTION	BY	CHK	APP	DATE

Donegal County Council

FOYLE CONSULTING ENGINEERS
HARBOUR OFFICE, PORT ROAD
LISAHALLY
L'DERRY.BT47 6FL

TEL: +44 (0)28 71865757
FAX: +44 (0)28 71861656
e-mail: admin@foylece.com

Project:

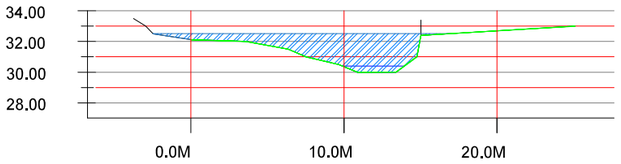
Carn Road, Gleneely, Co. Donegal

Drawing Title:

Proposed Drainage Layout

Scale @ A1	Drawn	Date	Checked	Date
1:500	BMcL	Oct 23	BMcL	Oct 23

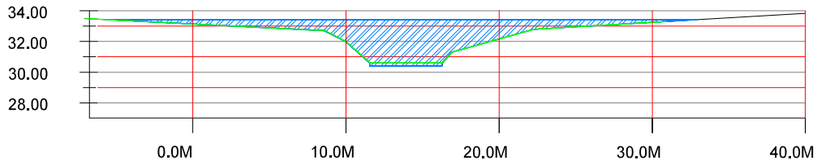
Project No.	Drawing No.	Revision
F2941	005	



Section A-A

Horizontal Scale 1:500

Vertical Scale 1:500



Section B-B

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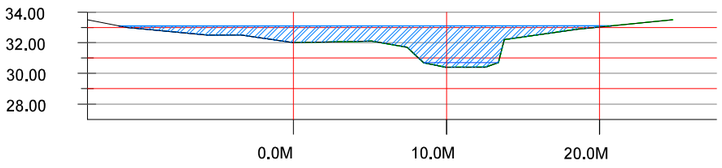
Vertical Scale 1:500



Section C-C

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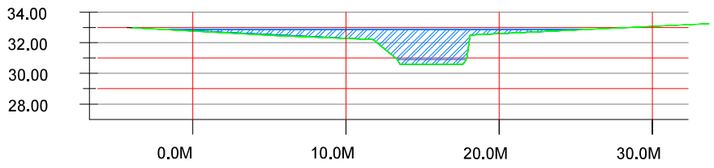
Vertical Scale 1:500



Section D-D

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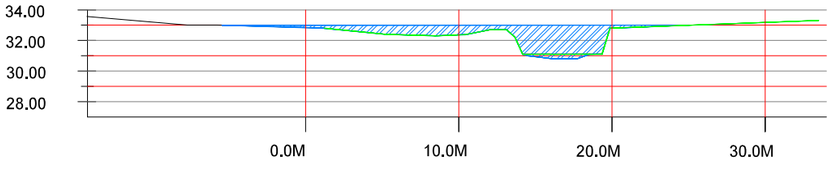
Vertical Scale 1:500



Section E-E

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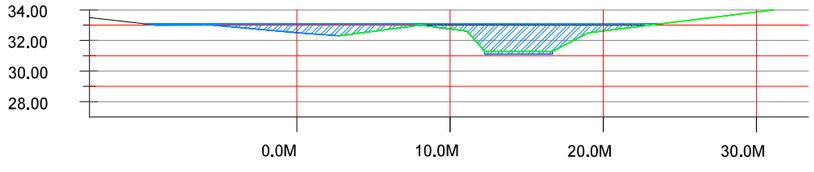
Vertical Scale 1:500



Section F-F

Horizontal Scale 1:500

Vertical Scale 1:500

REV	DESCRIPTION	BY	CHK	APP	DATE

Donegal County Council

FOYLE CONSULTING ENGINEERS
HARBOUR OFFICE, PORT ROAD
LISAHALLY
L'DERRY,BT47 6FL

TEL: +44 (0)28 71865757
FAX: +44 (0)28 71861656
e-mail: admin@foylece.com

Project:

Carn Road, Gleneely, Co. Donegal

Drawing Title:

Q100 Cross Sections

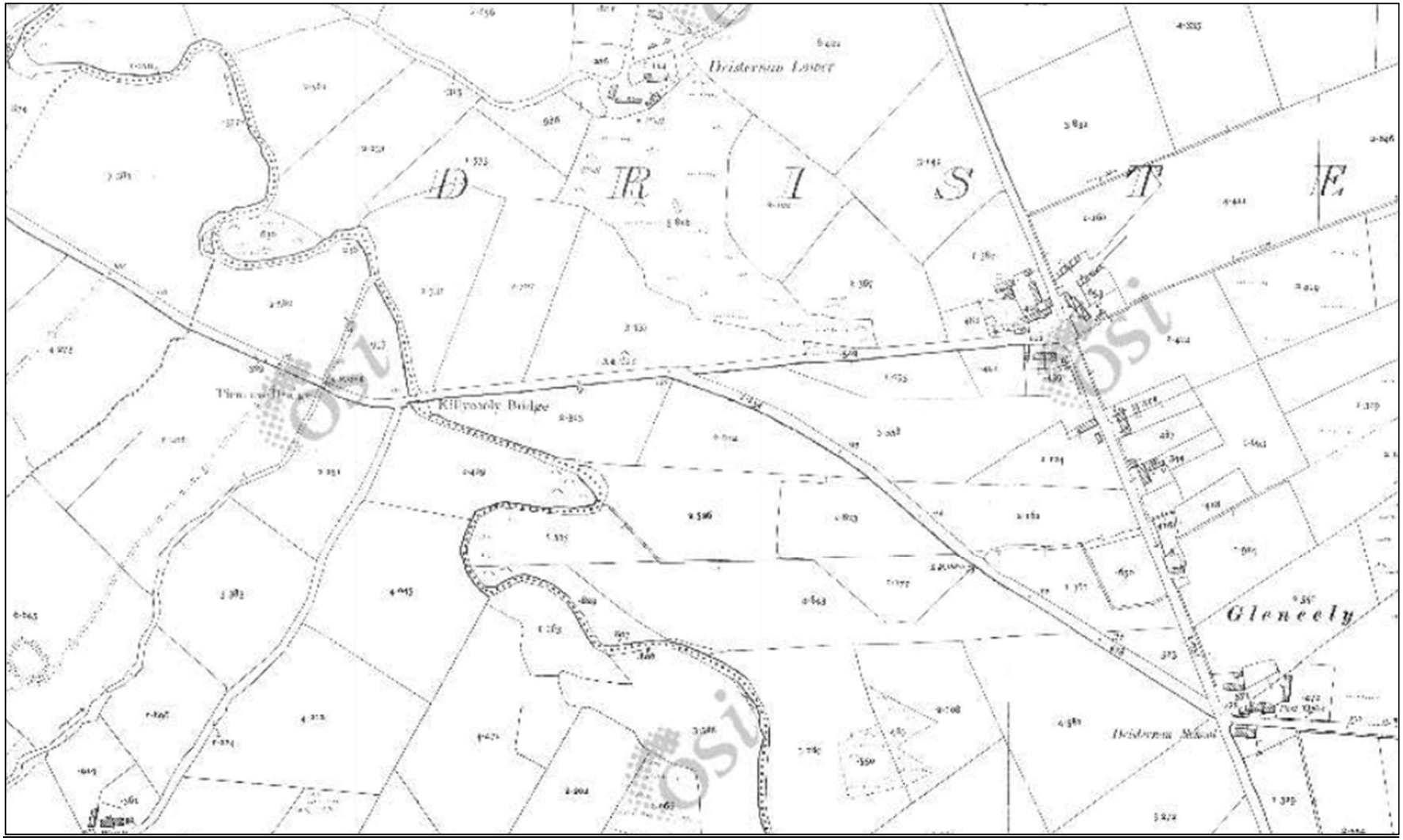
Scale @ A1	Drawn	Date	Checked	Date
1:200	BMcL	Oct 23	BMcL	Oct 23

Project No.	Drawing No.	Revision
F2941	004	

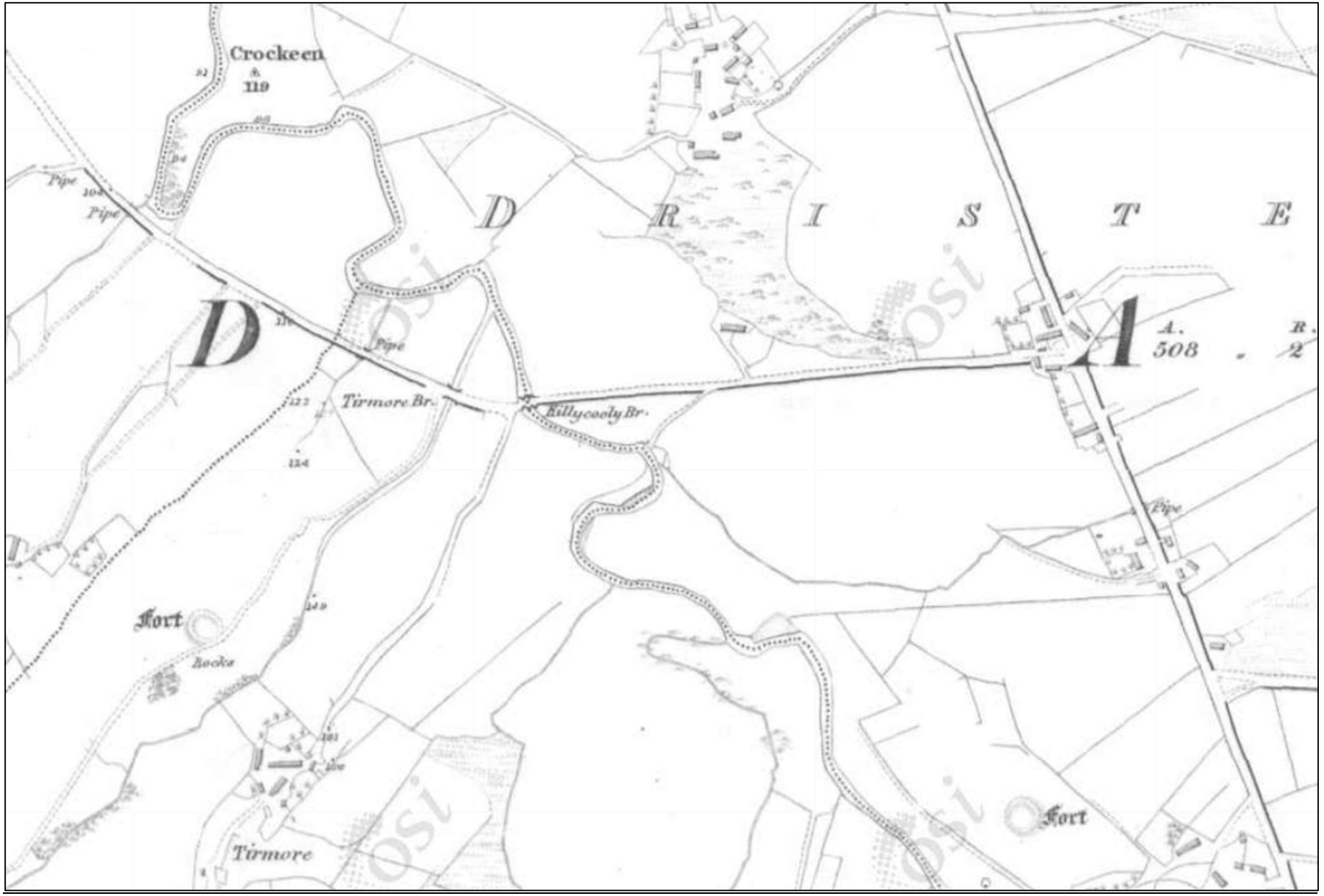
Appendix D

OSI 6 INCH MAP & OSI 25 INCH MAP

Harbour Office, Port Road, Lisahally,
Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com



Irish Townland and Historical Map - MapGenie 25 Inch – ITM



Irish Townland and Historical Map -MapGenie 6 Inch First Edition Black

Appendix E

DONEGAL DEVELOPMENT PLAN 2018-2024

Draft County Donegal Development Plan 2018 - 2024

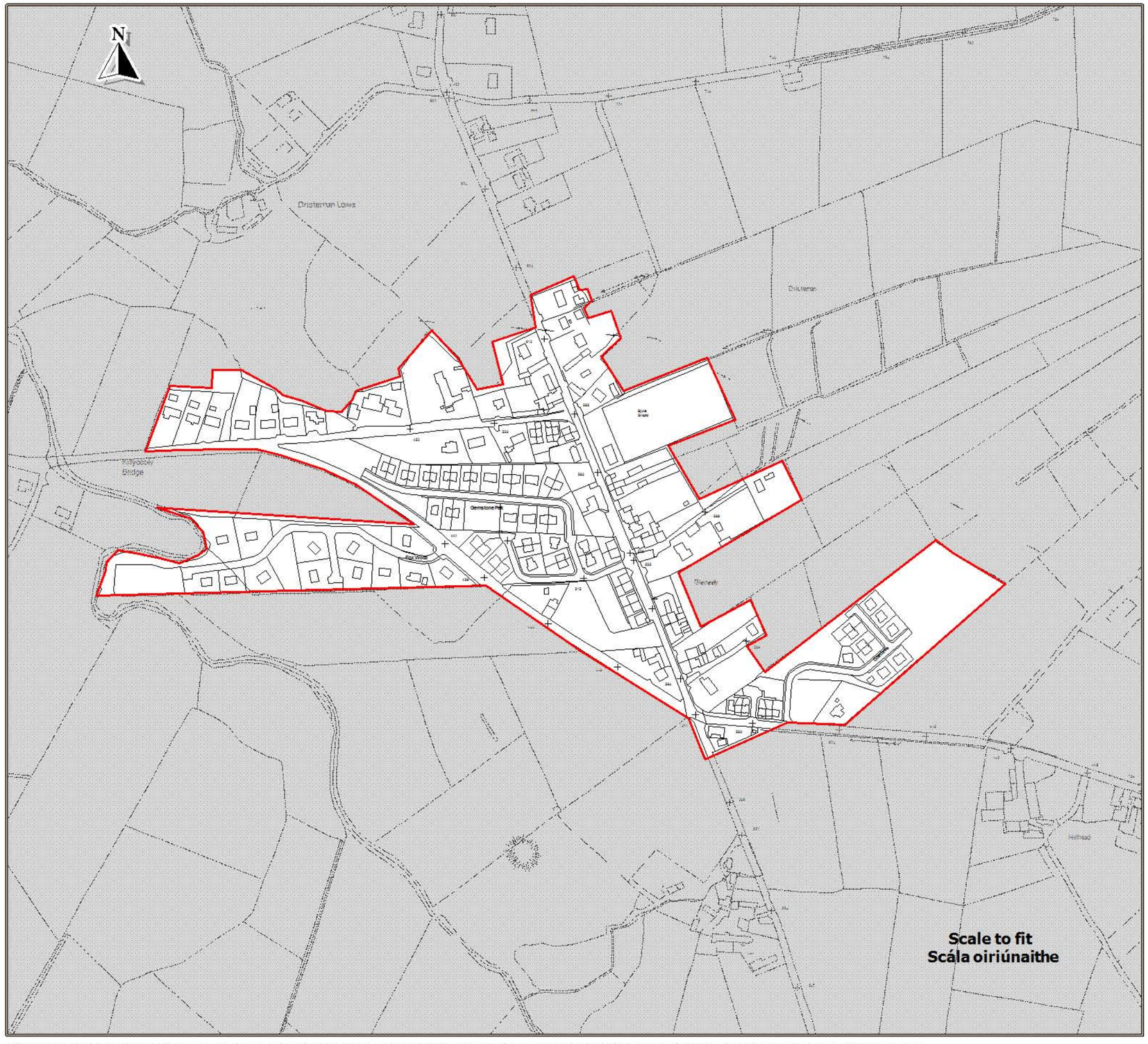
Dréacht Plean Forbartha Contae Dhún na nGall 2018 - 2024

Layer 3 - Map 15.41
Sraith 3 - Léarscáil 15.41

Gleneely
Gleann Daoile

Settlement Framework
Creatlach Lonnaíochta

Settlement Boundary
Teorainn Lonnaíochta



Source - Donegal County Council
Foinse - Comhairle Chontae Dhún na nGall

To be read in conjunction with relevant accompanying text contained in the front section of this appendix as well as other relevant objectives & policies of the CDP.
Le Léamh i gcomhar leis an téacs ábhartha tionlacain atá chun tosaigh sa chuid seo den aguisín chomh maith le cuspóirí agus beartais ábhartha eile sa PFC.

Appendix F

CAUSEWAY FLOW DESIGN REPORT

Harbour Office, Port Road, Lisahally,
Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	SM_01	SM_02	19.244	0.600	33.900	32.800	1.100	17.5	300	5.08	50.0
2.001	SM_02	SM_03	9.973	0.600	32.800	32.240	0.560	17.8	450	5.12	50.0
2.002	SM_03	SM_04	8.760	0.600	32.240	31.775	0.465	18.8	600	5.15	50.0
1.000	SM_06	SM_05	45.520	0.600	33.200	32.800	0.400	113.8	900	5.26	50.0
1.001	SM_05	SM_04	41.578	0.600	32.800	31.775	1.025	40.6	900	5.40	50.0
1.003	SM_07	Headwall	16.361	0.600	31.769	31.494	0.275	59.5	300	5.68	50.0
1.002	SM_04	SM_07	4.860	0.600	31.775	31.769	0.006	810.0	300	5.55	50.0

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SM_01	653661.770	944114.450	35.480	1.580	1200	0	2.000	33.900	300
SM_02	653663.460	944095.280	34.510	1.710	1800	1 0	2.000 2.001	32.800 32.800	300 450
SM_03	653669.810	944087.590	34.040	1.800	1800	1 0	2.001 2.002	32.240 32.240	450 600
SM_04	653678.570	944087.580	33.970	2.195	2400	1 2 0	2.002 1.001 1.002	31.775 31.775 31.775	600 900 300
SM_05	653720.050	944090.440	35.000	2.200	1800	1 0	1.000 1.001	32.800 32.800	900 900
SM_06	653765.460	944093.600	36.120	2.920	1800	0	1.000	33.200	900
Headwall	653664.900	944073.730	32.000	0.506	1200	1	1.003	31.494	300
SM_07	653678.570	944082.720	34.100	2.331	1200	1 0	1.002 1.003	31.769 31.769	300 300

Node SM_04 Online StormBrake™ Control

Flap Valve	x	Design Flow (l/s)	8.8
Replaces Downstream Link	x	Product Code	FPM-SB1-01850-00880-1100
Invert Level (m)	31.775	Min Outlet Diameter (m)	0.150
Design Depth (m)	1.850	Min Node Diameter (mm)	1200

Results for 2 year +10% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SM_01	11	33.915	0.015	1.2	0.0180	0.0000	OK
15 minute winter	SM_02	10	32.825	0.025	4.6	0.0696	0.0000	OK
60 minute winter	SM_03	46	32.531	0.291	5.7	0.7730	0.0000	OK
60 minute winter	SM_04	46	32.532	0.757	26.1	4.3607	0.0000	SURCHARGED
15 minute winter	SM_05	11	32.849	0.049	19.2	0.1726	0.0000	OK
15 minute winter	SM_06	11	33.223	0.023	2.1	0.0600	0.0000	OK
30 minute summer	Headwall	39	31.544	0.050	8.8	0.0000	0.0000	OK
30 minute summer	SM_07	39	31.821	0.052	8.8	0.0583	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SM_01	2.000	SM_02	1.2	0.623	0.004	0.0387	
15 minute winter	SM_02	2.001	SM_03	4.6	1.255	0.006	0.3106	
60 minute winter	SM_03	2.002	SM_04	3.8	0.099	0.002	1.8275	
60 minute winter	SM_04	1.002	SM_07	8.8	0.795	0.228	0.0543	
15 minute winter	SM_05	1.001	SM_04	18.6	0.374	0.006	10.2345	
15 minute winter	SM_06	1.000	SM_05	2.0	0.247	0.001	0.3938	
30 minute summer	SM_07	1.003	Headwall	8.8	1.118	0.061	0.1285	26.3

Results for 30 year +10% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SM_01	10	33.920	0.020	2.3	0.0243	0.0000	OK
60 minute winter	SM_02	58	33.185	0.385	13.3	1.0725	0.0000	OK
60 minute winter	SM_03	58	33.180	0.940	14.6	2.4963	0.0000	SURCHARGED
60 minute winter	SM_04	57	33.180	1.405	41.4	8.0882	0.0000	SURCHARGED
60 minute winter	SM_05	55	33.176	0.376	31.2	1.3255	0.0000	OK
15 minute winter	SM_06	11	33.230	0.030	3.9	0.0790	0.0000	OK
30 minute winter	Headwall	101	31.544	0.050	8.8	0.0000	0.0000	OK
480 minute winter	SM_07	328	31.821	0.052	8.8	0.0583	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SM_01	2.000	SM_02	2.3	0.755	0.008	0.4053	
60 minute winter	SM_02	2.001	SM_03	9.1	1.105	0.012	1.5094	
60 minute winter	SM_03	2.002	SM_04	-13.0	0.132	-0.008	2.4675	
60 minute winter	SM_04	1.002	SM_07	8.8	0.795	0.228	0.0543	
60 minute winter	SM_05	1.001	SM_04	19.5	0.332	0.006	18.3902	
15 minute winter	SM_06	1.000	SM_05	3.8	0.296	0.002	1.8816	
480 minute winter	SM_07	1.003	Headwall	8.8	1.118	0.061	0.1285	133.9

Results for 100 year +10% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SM_01	10	33.922	0.022	3.0	0.0274	0.0000	OK
120 minute winter	SM_02	94	33.438	0.638	7.1	1.7800	0.0000	SURCHARGED
120 minute winter	SM_03	96	33.436	1.196	7.1	3.1754	0.0000	SURCHARGED
120 minute winter	SM_04	96	33.435	1.660	31.6	9.5564	0.0000	SURCHARGED
120 minute winter	SM_05	96	33.429	0.629	30.9	2.2188	0.0000	OK
120 minute winter	SM_06	98	33.434	0.234	7.7	0.6171	0.0000	OK
60 minute summer	Headwall	160	31.544	0.050	8.8	0.0000	0.0000	OK
15 minute winter	SM_07	93	31.821	0.052	8.8	0.0583	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SM_01	2.000	SM_02	3.0	0.825	0.011	0.6905	
120 minute winter	SM_02	2.001	SM_03	5.7	1.017	0.007	1.5802	
120 minute winter	SM_03	2.002	SM_04	7.7	0.101	0.005	2.4675	
120 minute winter	SM_04	1.002	SM_07	8.8	0.795	0.228	0.0543	
120 minute winter	SM_05	1.001	SM_04	-16.5	0.278	-0.005	23.0224	
120 minute winter	SM_06	1.000	SM_05	-6.2	0.230	-0.003	13.7484	
15 minute winter	SM_07	1.003	Headwall	8.8	1.118	0.061	0.1285	52.1

Appendix G

DRAINAGE DRAWINGS

Harbour Office, Port Road, Lisahally,
Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com

DO NOT SCALE: ALL DIMENSIONS TO BE VERIFIED BY THE CONTRACTOR.
ANY OMISSIONS OR ERRORS SHOULD BE REPORTED TO THE ENGINEER.

REV	DESCRIPTION	BY	CHK	APP	DATE

Donegal County Council

FOYLE CONSULTING ENGINEERS
HARBOUR OFFICE, PORT ROAD
LISAHALLY
L'DERRY,BT47 6FL

TEL: +44 (0)28 71865757
FAX: +44 (0)28 71861656
e-mail: admin@foylece.com

Project:

Carn Road, Gleneely, Co. Donegal

Drawing Title:

Q100 Flood Plain Plan

Scale @ A1	Drawn	Date	Checked	Date
1:500	BMcL	Oct 23	BMcL	Oct 23

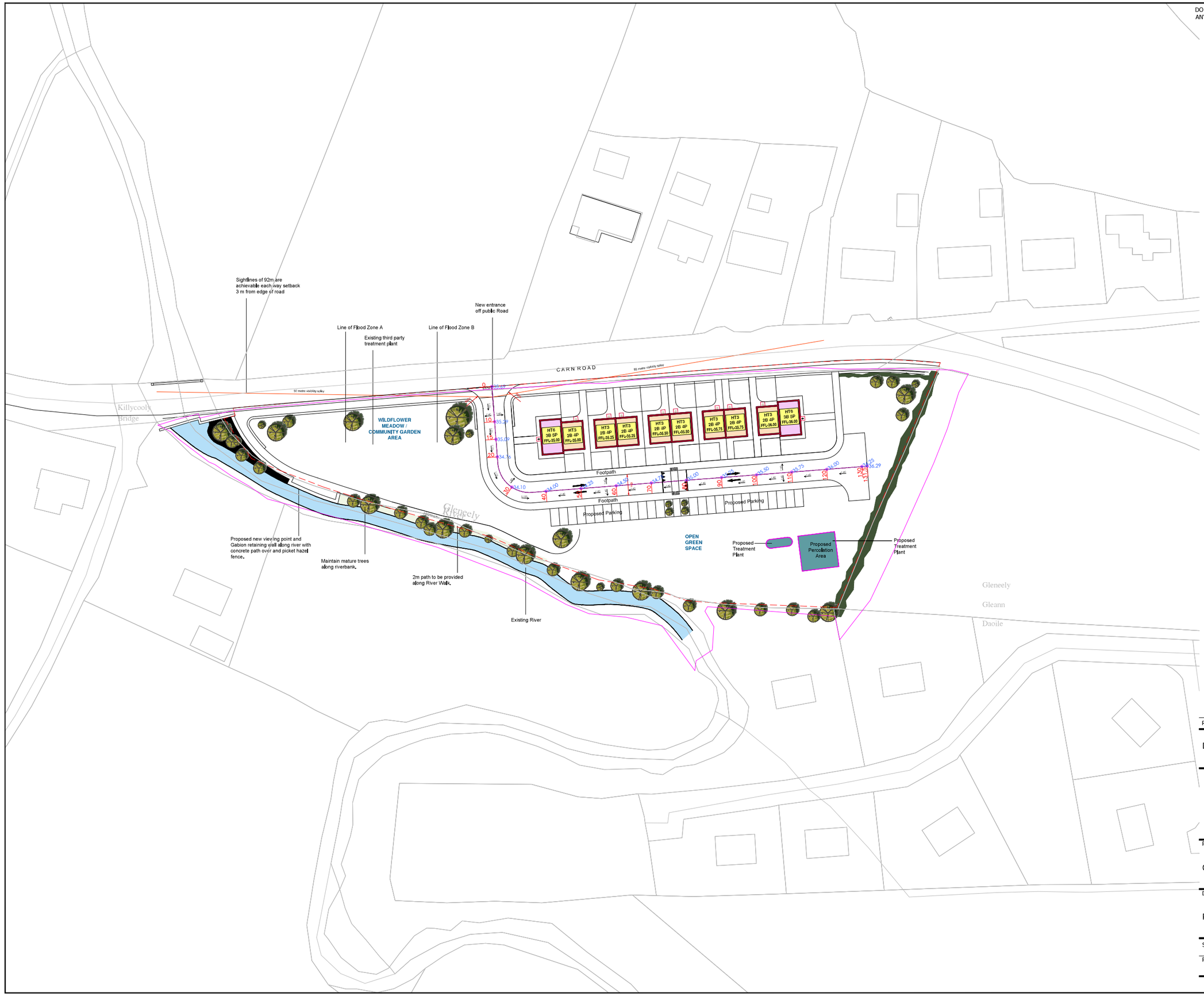
Project No.	Drawing No.	Revision
F2941	003	

Appendix H

PROPOSED SITE LAYOUT

Harbour Office, Port Road, Lisahally,
Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com

DO NOT SCALE: ALL DIMENSIONS TO BE VERIFIED BY THE CONTRACTOR.
ANY OMISSIONS OR ERRORS SHOULD BE REPORTED TO THE ENGINEER.



REV	DESCRIPTION	BY	CHK	APP	DATE

Donegal County Council

FOYLE CONSULTING ENGINEERS
HARBOUR OFFICE, PORT ROAD
LISAHALLY
L'DERRY,BT47 6FL

TEL: +44 (0)28 71865757
FAX: +44 (0)28 71861656
e-mail: admin@foylece.com

Project:

Carn Road, Gleneely, Co. Donegal

Drawing Title:

Proposed Site Layout

Scale @ A1	Drawn	Date	Checked	Date
1:500	BMcL	Oct 23	BMcL	Oct 23

Project No.	Drawing No.	Revision
F2941	002	

Appendix I

TOPOGRAPHICAL SURVEY

Harbour Office, Port Road, Lisahally,
Londonderry, N. Ireland. BT47 6FL
Tel: 028 7186 5757
Fax: 028 7186 1656
Email: admin@foylece.com

DO NOT SCALE: ALL DIMENSIONS TO BE VERIFIED BY THE CONTRACTOR.
ANY OMISSIONS OR ERRORS SHOULD BE REPORTED TO THE ENGINEER.

REV	DESCRIPTION	BY	CHK	APP	DATE

Donegal County Council

FOYLE CONSULTING ENGINEERS
HARBOUR OFFICE, PORT ROAD
LISAHALLY
L'DERRY,BT47 6FL

TEL: +44 (0)28 71865757
FAX: +44 (0)28 71861656
e-mail: admin@foylece.com

Project:

Carn Road, Gleneely, Co. Donegal

Drawing Title:

Site Layout

Scale @ A1	Drawn	Date	Checked	Date
1:500	BMcL	Oct 23	BMcL	Oct 23

Project No.	Drawing No.	Revision
F2941	001	