Corrib Causeway Phase 1, Dyke Road

Site Specific Flood Risk Assessment

Galway City Council

Project number: 60710277
60710277-ACM-XX-XX-RP-CE-10-0004-P3

1 March 2025

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
01	14.03.25	Issued for planning		Emma McKendrick	Regional Director

Distribution List

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1. Introduction

1.1 Project Background

This Site-Specific Flood Risk Assessment (SSFRA) relates to the development of the Corrib Causeway Phase 1 lands at Dyke Road, Terryland Galway (Refer to **Figure 1-1** & **Figure 1-2**). The Dyke Road site is located on the edge of Galway City Centre, Galway.

The SSFRA has been prepared to accompany the planning application for a new residential development on the site.

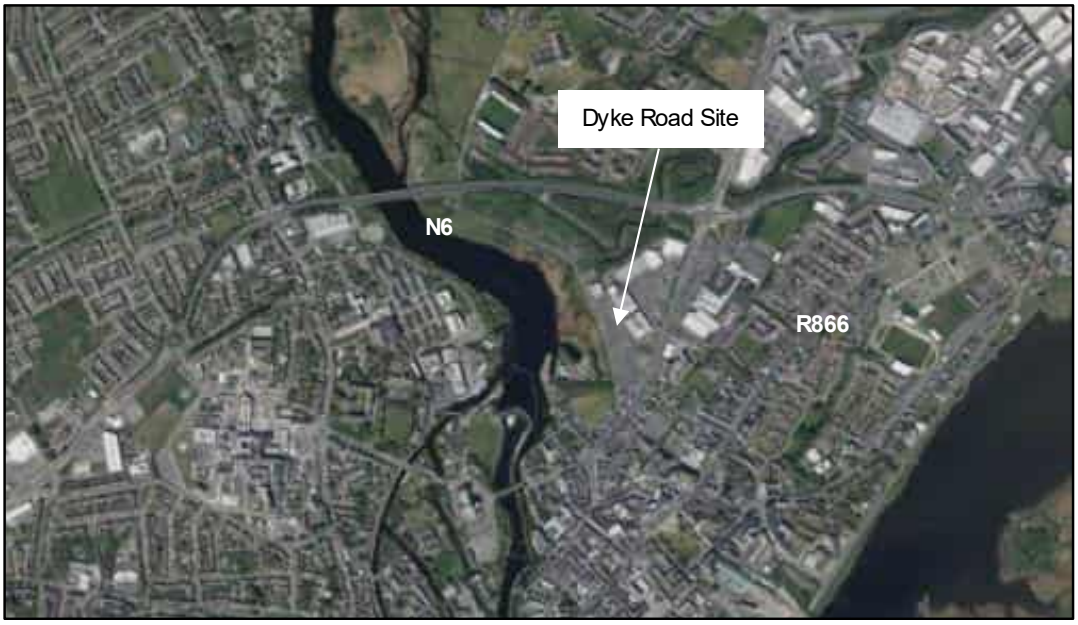


Figure 1-1: Site Location Map

Figure 1-2: Phase 1, Tóchar na Coiribe Vision, LDA & MOLA Architecture 2023

The Dyke Road site forms part of a strategic brownfield landbank located on the edge of Galway City Centre which has been identified for comprehensive redevelopment by the Galway City Development Plan 2023-2029. The proposed development of the site will be undertaken in three distinct phases (Refer to **Figure 1-3** and **Figure 1-4**):

- Phase 1 lands are designated for residential development.
- Phase 2 is anticipated to comprise of commercial development. Retail, hotel, and community function / theatre.
- Phase 3 Black Box Theatre to be relocated and the existing building to be demolished (current size based on OS data). Phase 3 is anticipated to comprise of 62 residential apartments.

Figure 1-3: Project Phasing, Stage 1 Masterplan, MOLA Architecture 2023

Figure 1-4: Emerging Design Proposal, Tóchar na Coiribe Vision, LDA and MOLA 2024

1.2 Existing Development

The existing development consists of a tarmacadam car park which spans over phases 1 & 2 respectively. The most northern part of the existing development is home to the Black Box Theatre which lies outside the current red line boundary. The topography of the entire site naturally falls from south to north.

A topographic survey undertaken by Apex Surveys in October 2023 of the overall landholding indicates that ground levels on the site range from 3.84m at the northern end of the site to 7.12m in the southern portion of the site. There is a small retaining wall in the southern portion of the site where the car park levels step up from about 6.0m to around 7.0m. The ground levels on the phase 1 lands typically range from 4.8m to 5.9m with the level in the centre of the site typically being around 5.3m.

It must be noted that the entire site is of hardstanding area. Refer to **Figure 1-5** below.

Figure 1-5: Existing Development

1.3 Proposed Development

The proposed development will consist of the construction of a new residential development of 219 no. apartment units and a childcare facility (approx. 241 sq m) in the form of 1 no. new residential block (5 - 9 storeys over lower ground floor level) with associated car parking, bicycle parking, public and communal open spaces, and all ancillary works on a site area of 1.144 ha.

The proposed development will provide for:

a) 219 no. residential apartment units (109 no. 1-bedroom units, 100 no. 2-bedroom units and 10 no. 3-bedroom units) each with an associated private open space area in the form of a balcony/terrace.

b) A raised pedestrian boardwalk along the western elevation of the proposed building.

c) Open Space (approx. 2,778 sq m) is proposed in the form of (a) public open space (approx. 1,183 sq m) to the west of the proposed building fronting on to Dyke Road accommodating outdoor seating, planting, a sunken garden and pedestrian pathways and connections; and (b) communal open space (approx. 1,605 sq m) to the east of the proposed building in the form of a courtyard including outdoor seating, planting, a children's play area and outdoor sports equipment.

d) A childcare facility (approx. 241 sq m) at ground floor level with dedicated external play area (approx. 61 sqm) at surface level.

e) A total of 33 no. new car parking spaces at surface level to serve the proposed residential development (including 2 no. accessible spaces). In addition, 2 no. set down / drop off spaces are proposed to serve the childcare facility.

f) A total of 465 no. bicycle parking spaces to include 330 no. standard residential spaces, 100 no. visitor spaces, 25 no. cargo bicycle spaces and 10 no. bicycle parking spaces dedicated for the childcare facility staff, all at surface / lower ground floor level.

g) Vehicular access to serve the development is proposed via Dyke Road at 2 no. new locations along the western site boundary (to the north west and south west of the main development site). Pedestrian and Cyclist access is also proposed throughout the site via Dyke Road and a new pedestrian crossing is also delivered at Dyke Road. The proposed development will extinguish the existing pedestrian connection between Galway Retail Park and the subject site as part of wider proposals for local improvements to permeability.

h) The removal of 389 no. existing car parking spaces (311 no. from Car Park 1 and 78 no. from Car Park 2) is proposed to provide for the new development. An overall total of 165 no. existing car parking spaces will be maintained in Car Park 2.

i) The extinguishment of the main existing vehicular entrance serving Car Park 1 and Car Park 2 at Dyke Road with provision made for a new vehicular access point (to the south of the main development site) to facilitate continued access to existing Car Park 2 and the remaining car parking spaces (165 no.).

j) The removal of existing bring bank facilities including 2 no. clothing banks and 8 no. bottle banks from Dyke Road.

k) 2 no. telecommunications lattice towers (overall height 6.45 m and 7.67 m) affixed to the rooftop supporting 9 no. 2m 2G/3G/4G antennas; 9 no. 0.8m 5G antennas; 6 no. 0.3m microwave transmission links; together with all associated telecommunications equipment and cabinets. The proposed overall building height including the telecommunications towers is approx. 38.18 m (+43.18 AOD).

The development will also provide for all associated site development works, infrastructure, excavation and clearance works including decommissioning the existing Black Box Theatre waste water pumping station, provision for a new pumping station complete with below ground emergency storage, all boundary treatment/retaining walls, public lighting, internal roads and pathways, ESB substations, switch rooms, water tank rooms, cleaner store and WC, meter rooms, facilities management office, parcel store, comms rooms, plant room, generator room / associated plant space, bin storage, bicycle stores, hard and soft landscaping, play equipment, below ground attenuation tanks, nature based SUDs features, green roofs, roof plant, new and replacement site services and connections for foul drainage, surface water drainage and water supply.

This planning application is accompanied by an Environmental Impact Assessment Report and Natura Impact Statement.

1.4 Galway City Council Development Plan 2023-2029

In the preparation of this SSFRA, AECOM has considered the Galway City Council Development Plan (2023 - 2029). Chapter 9, which focuses on Environment and Infrastructure, is particularly relevant to the production of this report.

1.4.1 Galway City Council Development Plan – Flood Risk Assessment

The Galway City Council Development Plan 2023-2029 can play a significantly important role in protecting the city from major flood events, the city is predominantly vulnerable to flooding, due to the location of the city along the Atlantic Ocean and the River Corrib. This requires a thorough approach to flood management.

As noted above, the GCC Development Plan can play an important role in flood management. This is achieved using policies and land use zoning. Currently, large portions of the natural flood plains of the River Corrib and coast have been protected from compromising development. In addition, there are other policies within the GCC Development Plan in relation to the control of surface water drainage and management which also support flood management. In the preparation of the Galway City Council

Development Plan, in accordance with *The Planning System and Flood Risk Management, Guidelines for Planning Authorities (*2009), a Strategic Flood Risk Assessment (SFRA) has been carried out to assess the implications for planning policy of flood risk. The SFRA adopts a largely precautionary approach to land use zoning to avoid directing development towards areas at risk of flooding. Areas subject to development and identified as being at risk of flooding, are assessed through a justification test (refer to **Section 5.2** and **Section 5.3**), to determine their suitability and requirements for site-specific flood risk assessment and detailed mitigation are considered on a site by site basis.

The Office of Public Works (OPW) is the lead agency for flood risk management. In 2011 the OPW completed a national Preliminary Flood Risk Assessment (PFRA), carried out under the EU Floods Directive, which identified areas of potentially significant flood risk. Subsequent to this, the OPW undertook the Catchment Flood Risk Assessment and Management study (CFRAMs) which was completed in December 2017 and established a long-term strategy and measures for the management of flood risk in the city and wider Corrib catchment. It concluded that a flood relief scheme would be a viable and effective option to protect the city against fluvial and tidal flood risk, to provide for future resilience, and to enable the city to develop in a sustainable way.

1.4.2 Galway City Council Development Plan – Flood Risk Policies

Table 1-1: Galway City Council Development Plan - Flood Risk Policy

Policy 9.1 Flood Risk

1. Support, in co-operation with the OPW, the implementation of EU Flood Risk Directive (2007/60/EC), the Flood Risk Regulations (SI No, 122 of 2010) and the DECLG and OPW Guidelines for Planning Authorities, the Planning System and Flood Risk Assessment Management (2009), updated/superseding legislation or departmental guidelines and have regard to the findings and relevant identified actions of the Corrib Catchment Flood Risk Management (CFRAM) Study.
2. Support and facilitate the implementation of the Coirib go Cósta Galway City Flood Relief Scheme in conjunction with the OPW to support a climate resilient city, protect against flooding and minimise the impact of future climate events. Support in general the associated mitigation and adaptation measures in order to prevent flooding and coastal erosion, subject to appropriate environmental, visual, built heritage and other relevant considerations.
3. Ensure the recommendations of the Strategic Flood Risk Assessment (SFRA) for the Galway City Development Plan 2023-2029 are taken into consideration in the assessment of developments in identified areas of flood risk and require site specific Flood Risk Assessment (FRA) and associated design and construction measures appropriate to the scale and nature of the development and the risks arising, in all areas of identified flood risk including on sites where a only small proportion of the site is at risk of flooding and adopt a sequential approach in accordance with the Planning System and Flood Risk Management Guidelines for Planning Authorities (2009)
4. Protect and promote sustainable management and uses of water bodies and watercourses from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands, and natural floodplains.
5. Ensure flood risk is incorporated into the preparation of any future local area plans, framework plans and masterplans in the city.
6. Ensure any proposed measure designed to alleviate flooding/coastal erosion is subject to Appropriate Assessment in accordance with Article 6 of the EU Habitats Directive, where appropriate.
7. Continue to protect the coastal area and the foreshore and avoid inappropriate development in areas at risk of coastal erosion and/or would cause and escalate coastal erosion in adjoining areas.
8. Protect and maintain, where feasible, undeveloped riparian zones and natural floodplains along the River Corrib and its tributaries.

1.4.3 Correspondence with Galway City Council

As part of the flood risk assessment of the site, AECOM have been liaising on an ongoing basis with Galway City Council, as both the applicant, for information sharing purposes and also for agreement on the approach to flood risk management for this zoned site. Correspondence received from GCC on 23rd

February 2023 informed the basis of the approach to flood mitigation and risk assessment presented in this SSFRA and is included below in its entirety:

"The subject site is identified as being at flood risk located for the most part within Flood Zone A.

Section 2.25 of the Planning System and Flood Risk Management - Guidelines for Planning Authorities (2009) states the following:

"The provision of flood protection measures in appropriate locations, such as in or adjacent to town centres, can significantly reduce flood risk. However, the presence of flood protection structures will be ignored in determining flood zones. This is because areas protected by flood defences still carry a residual risk of flooding from overtopping or breach of defences and the fact that there may be no guarantee that the defences will be maintained in perpetuity".

The Strategic Flood Risk Assessment (SFRA) carried out as part of the Galway City Development Plan 2023-2029 (carried out by JBA Consulting) includes a plan making justification test for this site in accordance with the Planning System and Flood Risk Management - Guidelines for Planning Authorities (2009).

The SFRA states that development proposals for the site will need to consider appropriate finished floor levels and mechanisms for managing residual flood risks.

The SFRA also states that:

Development of the regeneration site will require site specific assessment and plans for the area should include the following additional flood management measures:

- *Highly vulnerable development will be located above the 0.1% AEP level, with an appropriate freeboard. This may be achieved through setting the ground floor at a suitable height or by located highly vulnerable uses (and particularly sleeping accommodation) at first floor level.*

- *An emergency plan and evacuation procedure in the event of an embankment failure will be prepared along with any planning proposal for the site.*

- *Basements will be discouraged, and if included will be accessed from a level above the recommended finished floor level and fully sealed to ensure no water ingress. (section 7.7)*

Following further review by JBA consultants, they reiterate that the Plan Justification Test confirms that the existing defence cannot be relied upon; that the SFRA recommends land raising as a solution and that site specific Flood Risk Assessment is required for any proposed development.

The Coirib go Cósta Galway City Flood Relief Scheme fluvial/tidal hydraulic model has augmented JBA's CFRAM hydraulic model with updated latest available hydrometric, hydrological, infill survey data (Channel, Structure, Culvert, CCTV, Flood Defence and LiDAR) and inclusion of additional tributaries to ensure the project objectives are met.

A site-specific Flood Risk Assessment is essential to assess residual risk of breach or overtopping of the Dyke Road embankment and consider setting levels accordingly. With regard to flood compensation storage, while it is noted that the SFRA tested the loss of storage and found negligible impacts, the site-specific Flood Risk Assessment is required to assess this in detail.

As part of the Coirib go Cósta Galway City Flood Relief Scheme, the Dyke Road embankment is being considered and ground investigation works for this element of the scheme are being progressed. A timeline cannot be provided at this time for improvement works to the embankment.

GCC have agreed with the OPW to prioritise the ground investigation survey for the embankment and the results will inform the extent of works which may be required. It is likely that ground investigations could be completed in Q2 2024."

The most recent advice received from GCC on 8th January 2025 is that the ground investigation works are to commence shortly.

2. The Planning System and Flood Risk Management Guidelines

In September 2008 “The Planning System and Flood Risk Management Guidelines for Planning Authorities” (the Guidelines) were published by the Department of the Environment, Heritage and Local Government in Draft format. In November 2009 the adopted version of the document was published. These are the current guidelines for Flood Risk Management.

The Guidelines provide guidance on flood risk and development. A precautionary approach is recommended when considering flood risk management in the planning system. The core principle of the Guidelines is to adopt a risk based sequential approach to managing flood risk and to avoid development in areas that are at risk. The sequential approach is based on the identification of flood zones for river and coastal flooding.

The objective of a Site-Specific Flood Risk Assessment (FRA) is to assess all types of flood risk to a development. The assessment should investigate potential sources of flood risk and includes for the effects of climate change. The assessment is required to examine the impact of the development and the effectiveness of flood mitigation and management procedures proposed. It should also present the residual risks that remain after those measures are put in place.

This approach is based on the identification of flood zones for river and coastal flooding. “Flood Zones” are geographical areas used to identify areas at various levels of flood risk. It should be noted that these do not consider the presence of flood defences, as the risks remain of overtopping and breach of the defences. There are three flood zones defined (refer to **Figure 2-1**):

2.1 Flood Zones

The Guidelines include definitions of Flood Zones A, B and C as defined below. It will be noted that these do not consider the presence of flood defences, as risks remain of overtopping and breach of the defences.

Flood Zone A (high probability of flooding) is for lands where the probability of flooding is greatest (greater than 1% or the 1 in 100 for river flooding and 0.5% or 1 in 200 for coastal flooding).

Flood Zone B (moderate probability of flooding) refers to lands where the probability of flooding is moderate (between 0.1% or 1 in 1,000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1,000 and 0.5% or 1 in 200 for coastal flooding).

Flood Zone C (low probability of flooding) refers to lands where the probability of flooding is low (less than 0.1% or 1 in 1,000 for both river and coastal flooding).

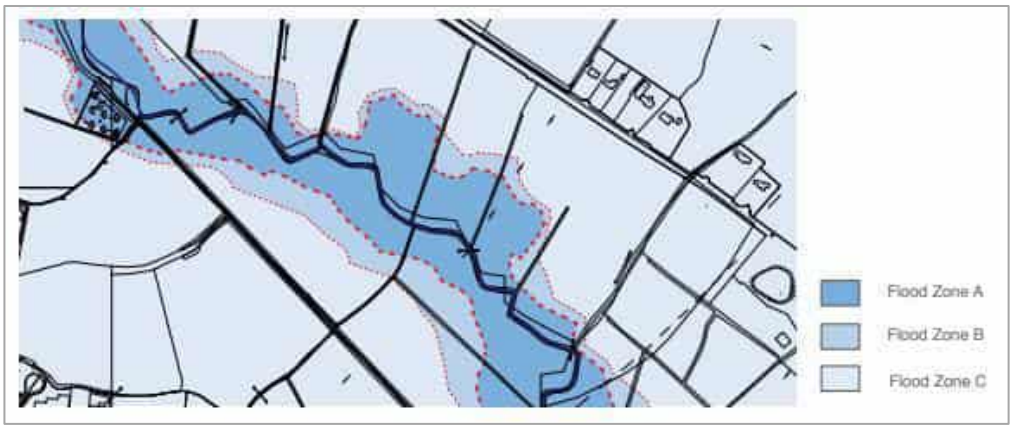


Figure 2-1: Indicative Flood Zone Map (Extract from the Guidelines, Figure 2.3)

The Flood Zones are based on an undefended scenario and do not take into account the presence of flood protection structures such as flood walls or embankments. This is to allow for the fact that there is a residual risk of flooding behind the defences due to overtopping or breach and that there may be no guarantee that the defences will be maintained in perpetuity.

Once the flood zone has been identified, the guidelines set out the different types of development appropriate to each zone. Exceptions to the restriction of development due to potential flood risks are provided for through the use of the **Justification Test** (Refer to **Section 5.2** and **Section 5.3**), where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated. This recognises that there will be a need for future development in existing towns and urban centres that lie within flood risk zones, and that the avoidance of all future development in these areas would be unsustainable.

The Guidelines set out a staged approach to assessment. The stages of assessment are:

Flood Risk Identification (Stage 1) - Identification of any issues relating to the site that will require further investigation through a Flood Risk Assessment.

Initial Flood Risk Assessment (Stage 2) - Involves establishment of the sources of flooding, the extent of the flood risk, potential impacts of the development and possible mitigation measures.

Detailed Flood Risk Assessment (Stage 3) - Assess flood risk issues in sufficient detail to provide quantitative appraisal of potential flood risk of the development, impacts of the flooding elsewhere and the effectiveness of any proposed mitigation measures.

This report addresses the requirements of a Stage 1, 2 and 3 Flood Risk Assessment.

2.1.1 Flood Risk Impact on Surrounding Properties

As set out in the Guidelines, the design of all new development should ensure that the flood risk to surrounding properties is not increased as a result of the development. This is generally achieved through the incorporation of Sustainable Drainage Systems and compensation for any loss of floodplain as a precautionary response to the potential incremental impacts in the catchment.

3. Flood Risk Identification (Stage 1)

The proposed site is located adjacent to Dyke Road, Galway. The site is situated ±140 m east from the River Corrib and ±205 m south from the Terryland Stream. The existing site levels range from 6.91 m OD Malin to 4.72 m OD Malin. **Figure 3-1** below, illustrates the location of the proposed site relative to the nearby water bodies.

3.1 History of Flooding

As part of the overall exercise to establish the potential flood risk to the proposed development, AECOM carried out a review of available and recorded information on flooding in the area. The following sources were consulted as part of the review:

- OPW Flood Records, and
- Historic Flood Records.

3.1.1 OPW Flood Hazard Mapping

The Office of Public Works (OPW) collates available reports of flooding from all sources (e.g. fluvial, pluvial, coastal, etc.) on a nationwide basis. The OPW's website (www.floodmaps.ie) was consulted to obtain reports of recorded flooding within and surrounding the site. No records of flood events in the vicinity of the site are available on the OPW website. The information available on this website does indicate that the area including and surrounding the site benefits from Arterial Drainage and the presence of defences. **Figure 3-1** below illustrates the information available on recorded flooding events with 'Benefitting Lands' hatched in red. A copy of the records available for this area is included in **Appendix A.**

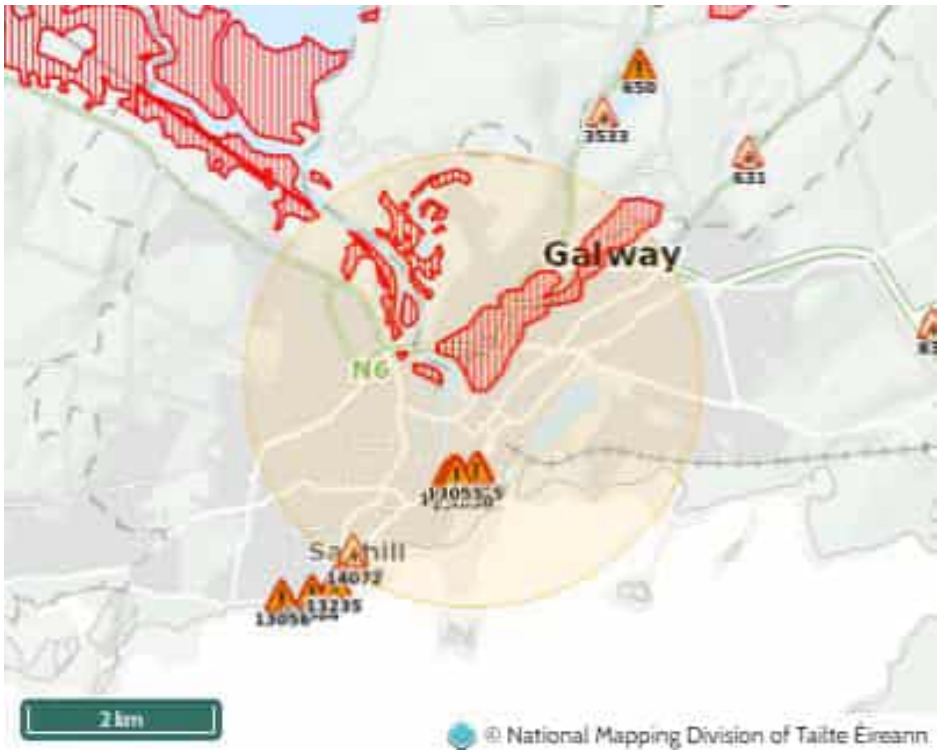


Figure 3-1: OPW Recorded Events – Benefitting Areas Shown in Red

3.1.2 Historic Flooding – Osi

Historical information available on OSi.ie was revised to identify historic flood plains and areas liable to flooding (blue hatch). **Figure 3-2** is an extract from the Historic 6" mapping available on OSi.ie. This mapping indicates that a large area of land in this area is historically liable to flooding. The extent of the area hatched in blue appears to be similar to that of the defended areas noted on the OPW flood hazard mapping.

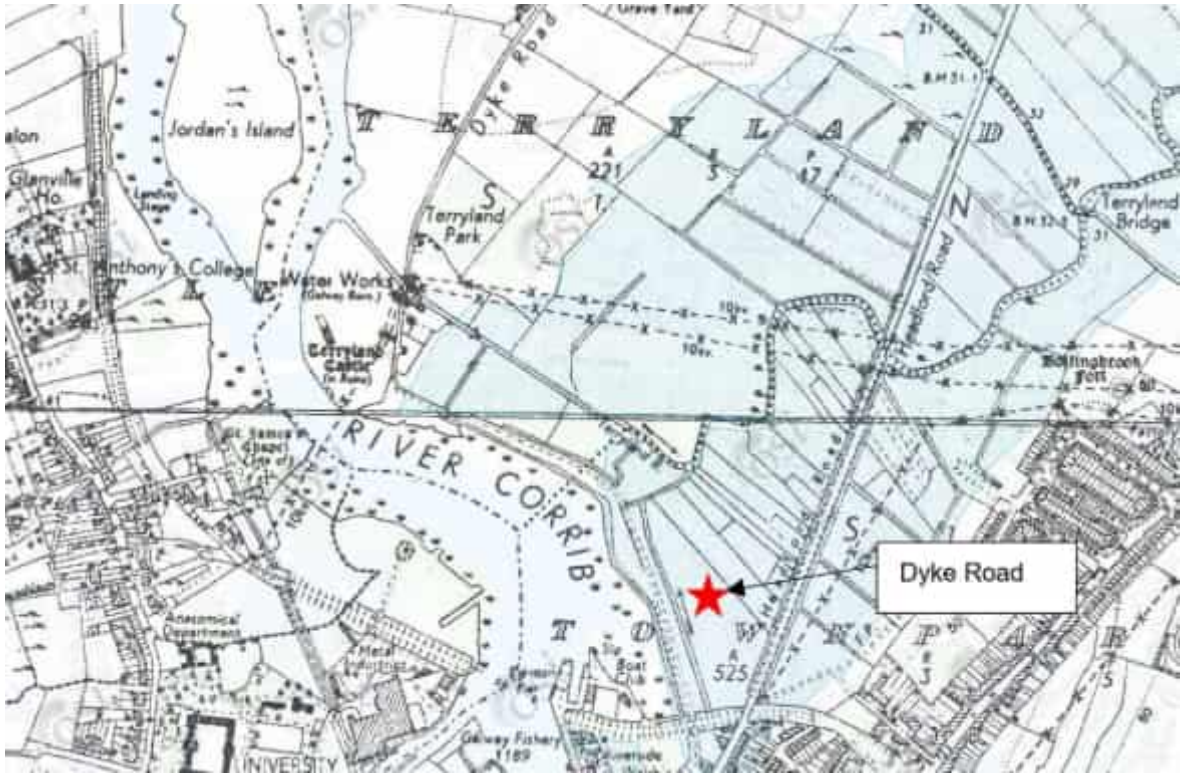


Figure 3-2: Historical Flood Plains Indicated in Blue Hatch

3.2 CFRAM Mapping

Figure 3-3 is an extract from the CFRAM Mapping available for the Dyke Road area. The full map is available in **Appendix B**. The mapping indicates that the flood defence embankment (green line) provides protection to the site up to the 1% AEP event water level (1-in-100-year return period event/ Flood Zone A). This is denoted by the black diagonal hatching in **Figure 3-3**. The site is shown to be at risk of flooding during a 0.1% AEP event (1-in-1000-year return period flood event/ Flood Zone B).

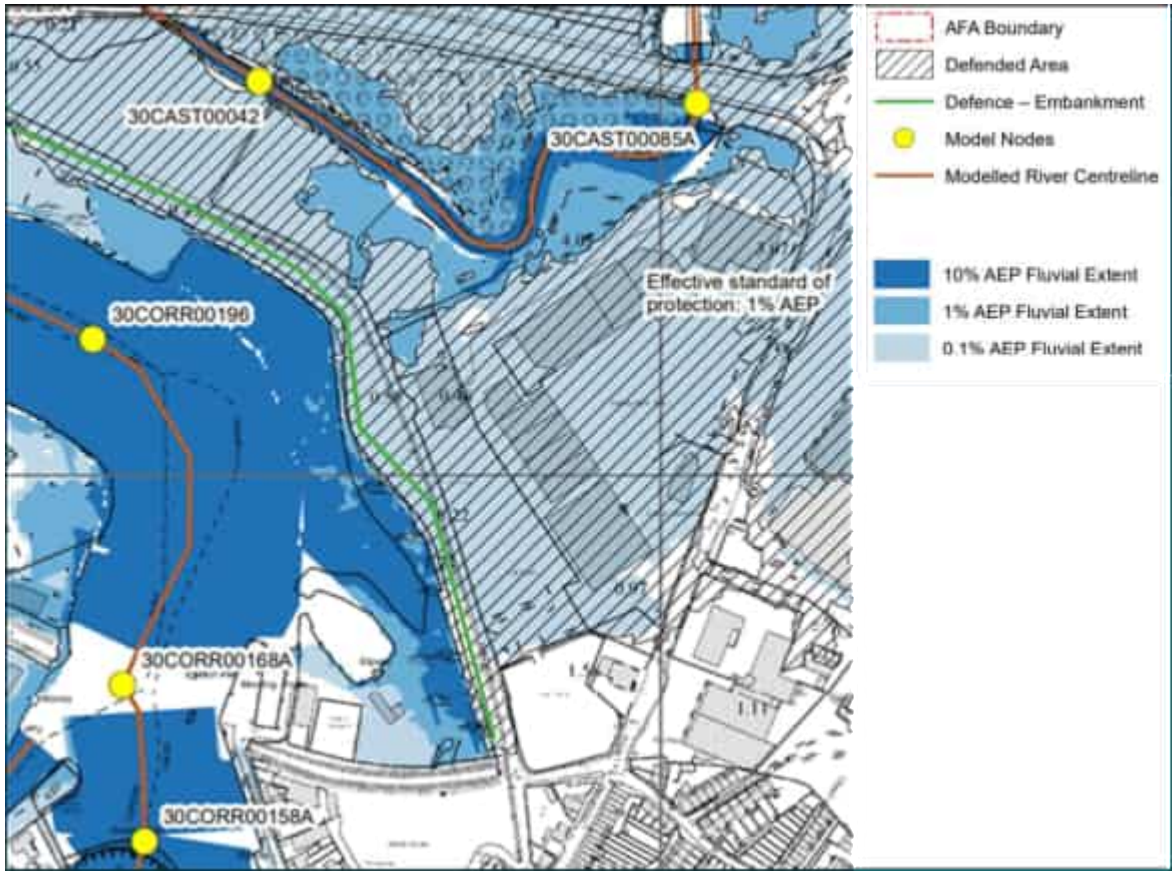


Figure 3-3: Extract from CFRAM Map: W30GLW_EXFCD_F4_08 (December 2017) Western CFRAM Study

3.3 Galway City Development Plan 2023-2029 Strategic Flood Risk Assessment (JBA Consulting)

As part of the Galway City Development Plan 2023 – 2029, which was adopted on 24th November 2022 and came into effect on 4th January 2023, a Strategic Flood Risk Assessment (SFRA) was prepared by JBA Consulting (Version P07 09/06/2022).

As part of the SFRA, a review of the site has been undertaken (included in Section 7.7 - Dyke Road Car Park and Headford Road Retail Area - Part of Headford Road and Dyke Road Regeneration Site). An extract showing the predicted extents of Flood Zones A and B in included in **Figure 3-4**. The Phase 1 and 3 lands are located in Flood Zone A and the Phase 2 lands are in Flood Zone B. The figure also shows the extent of defended areas within the site, as a benefit of the Dyke Road flood defence embankment.

Figure 3-4: Extract from SFRA Flood Risk Mapping (Section 7.7)

3.3.1 JBA Flood Risk Assessment of the subject lands for GCCDP

The following is extracted from the JBA Flood Risk Assessment of the Dyke Road and Headford Road Retail Area compiled by JBA Consulting:

Table 3-1: Site Specific Flood Risk Assessment (JBA Consulting)

Description	Comments
Benefitting from Defences (flood relief scheme works)	*The site benefits greatly from the Dyke Road defence in Galway City and is directly adjacent to the embankment. This embankment will be subject to assessment, and possible remediation, under the Coirib go Costa FRS.*
Sensitivity to Climate Change	*Low – moderate. The extent will increase slightly with climate change. The depths however will be the greatest increase as climate change progresses. The frequency of the Dyke Road embankment overtopping is likely to increase also.*
Residual Risk	*Dyke road overtopping or breach*
Historic Flooding	*The land is marked 'liable to floods' on the 1829-41 6" historic OS maps. This is before the construction of the Dyke embankment and no record of flooding is known since.*
Surface Water	*Should the site be developed, the FRA would be required to consider surface water management and discharge, whether this is to the Terryland River directly or into the surface water system, particularly during (but not limited to) flood events.*

Commentary on Flood Risk:

The Terryland River is a distributary of the River Corrib and discharges its flow into a sinkhole to the northeast of the subject site. Flow into the Terryland River is controlled by the old Waterworks Weir. If a groundwater event or blockage occurs in the sinkhole, water will back and pond in the floodplain. This type of flooding will be very slow and the inflow at Waterworks Weir can be limited so the risk of this occurring is quite low. Due to the slow nature of the event, it likely that the cause can be remediated before damage can occur.

The River Corrib is prevented from flooding into the Terryland area by the Dyke Road defence. The Dyke road embankment is shown to prevent the River Corrib entering the area in the defended 1% AEP fluvial event. This does not include sufficient freeboard however and does not meet the standard of protection required for a formal defence. The embankment is critical to preventing flood risk to the subject site. The embankment is modelled to overtop in the 0.1% AEP event.

Development Considerations:

The sites are close to the city centre and are earmarked for significant future redevelopment. It is an important objective for the council to develop here, and as such meets Part 2 of the Justification Test, as shown in Appendix C.1. The sites conform to level 1 in the retail hierarchy and complements the retail/commercial offer of the City Centre. They contribute to the function of the City Centre as a Regional Retail Centre. "The CFRAM study has identified that defences along the Dyke Road are critical and should be raised and strengthened in order to support intensification of land use behind it." The Coirib go Costa FRS reflects the outcomes of the CFRAM and should include for works to remediate the Dyke Road defences.

Part 3 of the Justification Test has been carried out and included a detailed flood risk assessment and model runs. The model runs carried out show that the site is currently defended to the 1% AEP standard of protection, but that the embankment height is variable and does not include a freeboard allowance. There is a high residual risk of flooding in both the 0.1% AEP event and when climate change is considered, when the embankment is overtopped and a high volume of water from the Corrib is allowed to fill the site and surrounding lands. Flood levels in the 0.1% AEP result in between 0.5 and 1.5m of flooding across the site. To test the feasibility and impact of raising ground levels to the site, a block of land representing the footprint of the currently developed area was raised in the model to 6.4m, which is the same level that the site filled to in the existing scenario model run. The model run showed the site still provides a certain amount of conveyance, but shallow depths (of less than 100mm) were modelled across the site. The increase in flood extent in other areas was negligible.

As with the Headford Road Shopping Centre, development proposals for the sites will need to consider appropriate finished floor levels and mechanism for managing residual flood risks. However, the Stage 3 FRA undertaken in this assessment has demonstrated that the principle of land raising is acceptable. Development of the regeneration site will require site specific assessment and plans for the area shall include the following additional flood management measures:

- *Highly vulnerable development will be located above the 0.1% AEP level, with an appropriate freeboard. This may be achieved through setting the ground floor at a suitable height or by located highly vulnerable uses (and particularly sleeping accommodation) at first floor level.*
- *An emergency plan and evacuation procedure in the event of an embankment failure will be prepared along with any planning proposal for the site.*
- *Basements will be discouraged, and if included will be accessed from a level above the recommended finished floor level and fully sealed to ensure no water ingress*

As noted above, JBA completed a site-specific flood risk assessment of the site. The flood risk assessment did not include for compensatory storage. The SSFRA undertaken assumed the lands would be raised, however that approach wasn't deemed feasible as:

- The lands will be developed in 3 phases,
- Raising the lands to mitigate the flood risk increases the volume of flood compensation storage required to such an extent that the land would be undevelopable. The JBA site specific flood risk assessment deemed the loss of storage had negligible impacts, however JBA advised that the applicant site-specific Flood Risk Assessment was required to assess this in detail, and
- Significant retaining structures would be required around the perimeter of the lands.
- Box 5.1 of the Guidelines requires a number of criteria to be satisfied including the requirement for the development to achieve the wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

The approach taken by the design team is to set the building Finished Floor Level (FFL) at 7.28m, with the external ground level at circa 5m. The building will essentially be on stilts with only the cores extending down to external ground level. While only the cores and necessary structural elements extend down to the ground the lower ground level façade will not be fully permeable as screens / louvres are proposed. In doing so the flood storage volume currently available on site can be maintained. Refer to **Section 5.5.1** for further details on the existing and proposed flood storage volume.

Further, the SFRA Flood Risk Map produced by JBA was based on the CFRAM hydraulic model. The Coirib go Cósta Galway City Flood Relief Scheme (FRS) fluvial/tidal hydraulic model prepared by Arup has augmented JBA's CFRAM hydraulic model with updated latest available hydrometric, hydrological, infill survey data (Channel, Structure, Culvert, CCTV, Flood Defence and LiDAR) and inclusion of additional tributaries to ensure the FRS project objectives are met. Of particular note is the actual topographic survey of the flood embankment.

4. Initial Flood Risk Assessment (stage2)

4.1 Potential Sources of Flooding

4.1.1 Fluvial Flooding

The main source of flooding risk at the site is fluvial flooding. Fluvial flooding is caused by the water level in a river, lake or stream rising and overflowing the banks.

4.1.1.1 River Corrib

The main source of flooding on the Dyke Road site is from the River Corrib. The SFRA states:

> *The River Corrib is prevented from flooding into the Terryland area by the Dyke Road defence. The Dyke Road embankment is shown to prevent the River Corrib entering the area in the defended 1% AEP fluvial event. This does not include sufficient freeboard however and does not meet the standard of protection required for a formal defence.*

Refer to the sections on the CFRAM and SFRA for more details on the flooding due to the River Corrib.

Real-time water levels of the River Corrib are available on www.waterlevels.ie. The Galway Barrage gauge (Ref 30099) and the Dangan gauge (Ref 30098) updates water levels every 15 minutes.

The River Corrib system is a slow-to-flood system, providing additional time to evaluate and prepare for flooding.

4.1.1.2 Terryland Stream and Castlegar Swallow Holes

As per the Galway City – County Geological Site Report (Hennessy et al., 2020. Geological Survey Ireland), The Terryland River is a distributary of the River Corrib and has a rather unusual flow regime in so much as it is a bi-directional flowing river, which either:

1. Flows out of the River Corrib and disappears underground (acts as a sink),
2. Or rises and flows to the Corrib, via two estavelles (acts as a spring).

It is believed that the general groundwater flow direction is from the Ballindooley Lough area southwards into an underground conduit system. The two estavelles noted above (Eastern and Western) are located within the karst depression. It is understood that the estavelles are connected to Galway Bay or Lough Atalia via the underground conduit system, however, the precise discharge locations into the Galway Bay or Lough Atalia remain unidentified.

The Terryland River (European Code IE_WE_30T010500) is designated for several sensitivities including:

- Hydromorphology pressures
- Urban run-off pressures
- River waterbody risk (‘At risk’) under the Water Framework Directive

The GCCDP SFRA states:

> *Flow into the Terryland River is controlled by the old Waterworks Weir. If a groundwater event or blockage occurs in the sinkhole, water will back and pond in the floodplain. This type of flooding will be very slow and the inflow at Waterworks Weir can be limited so the*

risk of this occurring is quite low. Due to the slow nature of the event, it likely that the cause can be remediated before damage can occur.

The Galway Waterworks or Old Terryland Waterworks, is a three-bay single-storey waterworks building built on double-arch bridge-like structure spanning artificial waterway with a pumping station associated with it. This structure contains two penstock locks that control flows on the Terryland Stream from the River Corrib. The Waterworks are located upstream of the site of interest. Future removal or failure of the penstocks could increase flood risk to the site.

4.1.2 Coastal Flooding

Coastal flooding is the result of sea levels which are higher than normal and result in sea water overflowing onto the land. Mapping published as part of the OPW CFRAM study is used to evaluate the coastal flood risk to the Proposed Development. From a review of this mapping and predicted flood water levels, it can be seen that the coastal flood risk at the site is low.

4.1.3 Pluvial Flooding

Pluvial flooding is the result of rainfall-generated overland flows which arise before run-off can enter a watercourse or sewer. It is usually associated with high intensity rainfall. The CFRAM mapping available for the site indicates that the pluvial flood risk to the development is low.

4.1.4 Groundwater Flooding

Ground Investigations Ireland Ltd carried out the site investigation between April and June 2024. GII drilled five (5) rotary cores to a depth as noted in the **Table 4-1** below, for the purposes of monitoring ground water levels and gas monitoring. The locations of the rotary cores / monitoring wells are indicated in **Figure 4-1**.

It was noted in the Ground Investigation Report that;

Groundwater strikes are noted on the exploratory hole logs (refer to the Ground Investigation Report) where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BRC1, BRC02, BRC04 and BRC05 to allow the equilibrium groundwater level to be determined.

Figure 4-1: Ground Investigations Ireland Ltd - Site Investigation Locations

Readings were taken from only four (4) rotary cores during the ground site investigation. BRC 03 did not encounter groundwater during drilling.

The water depths recorded are included in **Table 4-1** below. Based on the below, the only ideal location which can be considered for infiltration is near BRC04 (south of the proposed development). However,

based on the two (2) soakaway tests completed (refer to **Figure 4-1** above for locations of the infiltration test pits), IT01 and IT02, the water level dropped too slowly to allow calculation of 'f' the soil infiltration rate. Therefore, these locations are not recommended as suitable for infiltration.

Table 4-1: Ground Investigation Ireland Ltd - Groundwater Monitoring

Borehole	Date	Time	Depth (m BGL)	Groundwater (m BGL)
BRC01	26.06.2024	11:10	10.50	0.17
BRC02	26.06.2024	10:32	10.10	0.87
BRC03	26.06.2024	Unknown	10.30	No groundwater encountered during drilling.
BRC04	26.06.2024	09.25	6.50	2.25
BRC05	26.06.2024	09.55	6.10	1.30

The ground levels are proposed to be shaped too circa. 5m OD Malin. The site Geotechnical Investigations (GI) have been completed and confirmed that poor ground is present to reasonable depths. Given the ground conditions at the site, the proposed foundation system for the building structure consists of Odex piles supporting reinforced concrete pile caps and ground beams. Piles will be drilled to competent rock.

For the remainder of the site, a grid of unreinforced concrete rigid inclusion will be driven to competent ground. A geotextile will be placed across the site above rigid inclusions and a load transfer platform will be constructed from compacted granular material over which services/site roadways/parking can be built.

This type of foundation scheme does not require surcharging or vertical drainage to consolidate the existing ground strata so there will be no impact on the ground water regime.

4.2 Estimate of Flood Levels and Flood Zone

4.2.1 Topography of the Site

The Dyke Road site is in a low-lying area, with ground levels ranging from around 4m to 7m. **Figure 4-2** below provides a visual presentation of the site levels.

As noted in **Section 1.2**, A topographic survey undertaken by Apex Surveys in October 2023 of the overall landholding indicates that ground levels on the site range from 3.84m at the northern end of the site to 7.12m in the southern portion of the site. There is a small retaining wall in the southern portion of the site where the car park levels step up from about 6.0m to around.7.0m.

The ground levels on the phase 1 lands typically range from 4.8m to 5.9m with the level in the centre of the site typically being around 5.3m.

The Road levels of Dyke Road generally fall from South to North starting from the Junction of Dyke Road (L1004) and Headford Road (R866). The Dyke / Headford Road Junction starts at a level of 7.43m (centre of the junction) and falls to the Dyke Road low point of 4.31m which is located at the entrance of the existing entrance of the Black Box Theatre (Proposed Phase 3). North of the proposed site, the Dyke Road then rises from a level of 4.31m to 7.79m near the Bothar Na dTreabh (N6) bridge.

The topographic survey confirmed that the flood defence wall (noted in **Section 3**) ranges from 6.54m OD Malin to 7.29m OD Malin.

Figure 4-2: The Dyke Road Site and Surrounding Area - Visual Representative of Ground Levels

Refer to **Appendix C**. for the topographic survey.

4.2.2 Site Levels Adopted in Galway City Development Plan 2023-2029 SFRA

Section 7.7 of the JBA Consulting Galway City Development Plan 2023-2029 Strategic Flood Risk Assessment notes that the existing ground levels on the site range from 4.7m to 5.3m AOD. These levels were likely derived from LiDar.

However, based on the information in **Section 1.2** and **Section 4.2.1** a topographic survey of the site and surrounding area has now been undertaken to assist with the development of the planning stage designs, It has been established that the ground levels on the site range from 3.84m at the northern end of the site to 7.12m in the southern portion of the site. There is a small retaining wall in the southern portion of the site where the car park levels step up from about 6.0m to around.7.0m.

The ground levels on the phase 1 lands typically range from 4.8m to 5.9m with the level in the centre of the site typically being around 5.3m.

Further, as noted in **Section 4.2.1** above, the topographic survey confirmed that the flood defence (noted in **Section 3**) ranges from 6.54m OD Malin to 7.29m OD Malin.

The JBA hydraulic model estimate flood depths in the 0.1% AEP event on the site vary between 0.5m and 1.5m.

4.2.3 Proposed Floor Levels

From the CFRAM flood levels **Node 30CORR00196** is located closest to the subject site within the River Corrib and the estimated water levels at this node for the 1% AEP Event (Flood Zone A) and 0.1% Event (Flood Zone B) are set out in **Table 4-2** below.

Node 30CAST00085A is located closest to the subject site on the Terryland Stream. Thus, the Terryland Stream has been considered for fluvial flooding.

Table 4-2: CFRAM Fluvial Flood Levels – Modelled Water Level (m OD)

Node Point	10% AEP	1% AEP	0.1% AEP
30CORR00235A	6.29	6.65	7.23
30CORR00217	6.20	6.54	7.05
30CORR00196	6.15	6.48	6.98
30CORR00168A	6.10	6.41	6.9
30CORR00158A	6.02	6.33	6.8
30CORR00134A	4.00	4.45	5.69
30CORR00114	3.83	4.29	5.61
30CORR00110A	3.70	4.10	5.42
30CAST00029A	3.70	4.24	6.08
30CAST00042	3.57	4.16	6.03
30CAST00085A	3.53	4.15	6.28

Residential development is classed as **highly vulnerable** and, if the site is undefended, it is to be located above the 1% AEP level with a climate-change allowance plus 300mm freeboard.

The climate-change allowance is 500mm for coastal flooding, or a 20% increase in flood volume for fluvial flooding. Taking a conservative approach by adopting a 500mm climate-change allowance, with 300mm freeboard equates to a proposed **residential Finished Floor Level (FFL) of 7.28m OD.**

It must also be noted that an FFL of 7.28m provides protection against a 0.1% AEP event plus 300mm freeboard. However, basements are not recommended, and the proposed development therefore does not include basements.

The proposed roads levels within the site are proposed to tie into the existing Dyke Road. The north access road to the development is proposed to tie into the existing Dyke Road at 5.0m OD and loop to the east of the proposed development to a level of 5.06m OD. The south access road is proposed to tie into the existing Dyke Road at 6.13m OD and rise to a level of 7.15m OD.

4.3 OPW Maintained Flood Defences

The development site and surrounding lands benefit from OPW maintained embankments and channels. The embankment and channel now form part of an OPW Arterial Drainage Scheme, under the Arterial Drainage Act, 1945, under which the OPW is required to maintain drainage works in proper repair and effective condition.

The area surrounding the site is located within the Corrib Clare Arterial Drainage Scheme which includes an existing embankment along the River Corrib and channel maintenance works on the Terryland channel. These have not been taken into consideration in the establishment of the fluvial flood zones or in the assessment of the proposed development.

Figure 4-3 (taken from the OPW website https://maps.opw.ie/drainage/map/) illustrates the extent of channel maintenance, embankments and benefitting lands in the vicinity of the development site.

Figure 4-3: OPW Channel Maintenance & Embankments

4.3.1 Dyke Road Flood Protection Embankment

The site benefits from the Dyke Road Flood Protection Embankment (lime green line in **Figure 4-3**). The existing flood defence structure, consists of a stone wall and embankment of 600m length and runs in a northwest to southeast direction between the River Corrib and the Terryland/Castlegar area). The wall consists of a large stone crest, which also forms part of a local footpath. The embankment ties into the Clifden Rail embankment at the south.

The hydraulic model developed by JBA demonstrates that the site is only defended to the 1% AEP standard of protection, and that the embankment height is variable and does not include a freeboard allowance or climate-change allowance. Further JBA have advised that the existing defence cannot be relied upon as referenced in **Section 1.4.3**.

The wall has history of seepage problems and experienced some damage from a flood event around 2007 which was subsequently repaired by the OPW.

With respect to the existing flood defence structure, the topographic survey undertaken by Apex Surveys in October 2023 (Appendix C), the lowest level of the flood defence structure adjacent to the site is approximately 6.54m OD Malin, which is marginally higher than the 1% AEP level. With caution, it must be noted that the existing flood defence structure does not defend the proposed site from the 1% AEP event, including freeboard and 500mm climate change allowance.

Galway City Council has shared topographic survey data from Murphy Geospatial (dated August 2021) that indicates that the lowest portion of the flood defence structure is at 6.6m OD Malin, which is similar to the level of 6.54m OD Malin that Apex Surveys recorded.

4.3.2 Coirib go Cósta Flood Relief Scheme

The OPW, working in partnership with Galway City Council (GCC) and other Local Authorities, commissioned and have completed the Western Catchment Flood Risk Assessment and Management (CFRAM) Study. The Western CFRAM Study Area included Galway City as an Area for Further Assessment (AFA) and concluded that a flood relief scheme would be viable and effective for the

community. Subsequently, Galway City Council appointed Arup to deliver Coirib go Cósta - the Galway City Flood Relief Scheme.

As part of the Coirib go Cósta Flood Relief Scheme (CgC GCFRS) the Dyke Road embankment is being considered. The current levels of the embankment do not include a free board allowance or an allowance for climate change as noted in Section 4.3.1 above. Further, an intrusive investigation & assessment of the flood defence structure is being undertaken as part of the CgC GCFRS to determine if the flood defence is fit for purpose.

GCC stated that the CgC scheme is developing the works for the Dyke Road embankment improvements. However, GCC stated that there is no programme for this works that can be provided. Ground investigations are yet to commence and given the proximity to an SAC and protected structure the works will be significant to develop, design and execute.

GCC indicated that the hydraulic flood model that is being developed as part of the CgC GCFRS does not differ significantly from the SFRA/JBA model in the vicinity of the Dyke Road site, and that the main differences between the models are related to coastal flooding. It is noted that the JBA model was primarily developed using LiDAR information as opposed to topographic survey data. However, the model for the Coirib go Cósta scheme was developed using both Lidar data and topographical data from a survey completed in late 2021.

4.4 Climate Change

Advice on the expected impacts of climate change and the allowances to provide for future flood risk management in Ireland is given in the "*OPW Assessment of Potential Future Scenarios, Flood Risk Management Draft Guidance*", 2009. Two climate change scenarios are considered, the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The MRFS is intended to represent a 'likely' future scenario based on the wide range of future predictions available. The HEFS represents a more 'conservative' future scenario at the upper boundaries of future projections. Based on these two scenarios, the OPW recommended allowances for climate change are given in **Table 4-3** below.

Table 4-3. Recommended allowances for climate change

Parameter	MRFS	HEFS
Extreme Rainfall Depths	+20%	+30%
Flood Flows	+20%	+30%
Mean Sea Level Rise	+500 mm	+1000 mm
Land Movement	-0.5 mm/year *	-0.5 mm/year *
Forestation	-1/6Tp**	-1/3Tp** +10% SPR***

Notes:

* Applicable to the southern part of the country (Dublin – Galway and south of this).

** Reduce the time to peak (Tp) by a third; this allows for potential accelerated run-off that may arise as a result of drainage of afforested land.

*** Add 10% to the Standard Percentage Run-off (SPR) rate; this allows for increased run-off rates that may arise following felling of forestry.

Source: OPW Assessment of Potential Future Scenarios for Flood Risk Management

5. Flood Risk Management

Chapter 3 of the *Planning System and Flood Risk Management (DEHLG/ OPW, 2009)* describes the key principles of a risk based sequential approach to managing flood risk. The sequential approach is aimed at directing development toward land that is at low risk of flooding. **Figure 5-1** is extracted from the Guidelines and illustrates the sequence in which a site must be assessed from a flood risk standpoint. Specifically, the order in which the planning authority must be satisfied from a flood risk perspective is to *Avoid* (locate in an area that is not flood prone), then *Substitute* (if in a flood prone zone, then substitute the type of development), *Justify* (if substitution does not reduce flood risk sufficiently, then perform Justification Test) and *Mitigate*. This section discusses the sequential approach recommended in the Guidelines with regard to the proposals.

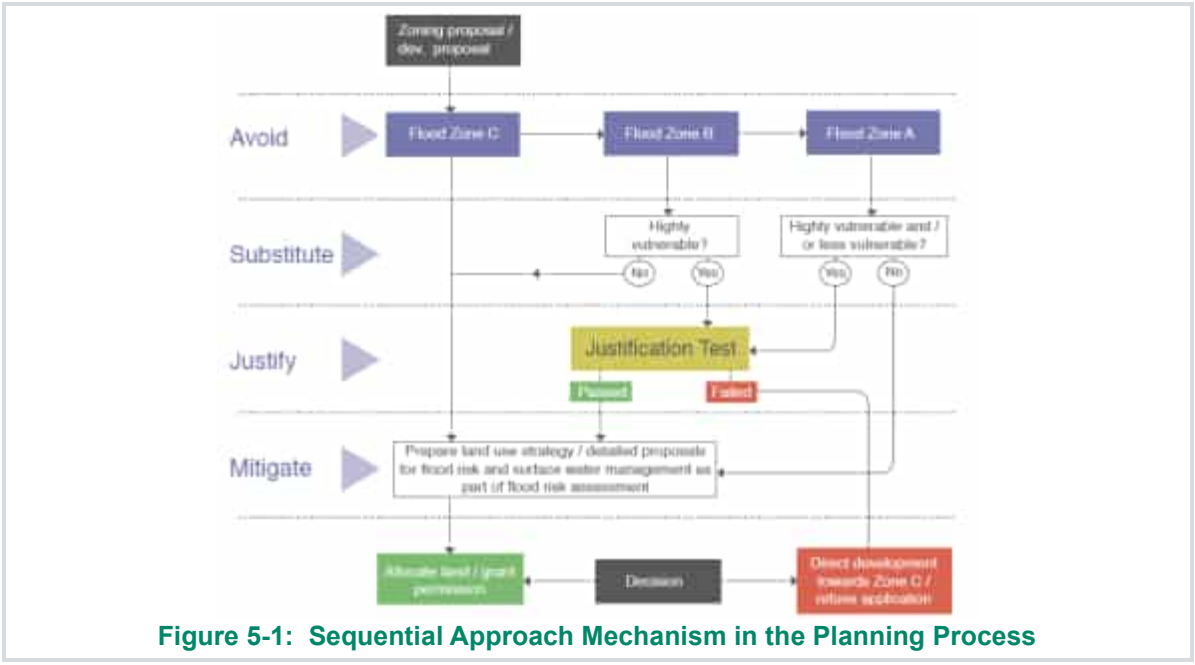


Figure 5-1: Sequential Approach Mechanism in the Planning Process

5.1 Sequential Approach

The first stage of the sequential approach is to avoid development in areas at risk of flooding. Flood Zones associated with river and coastal flooding are identified as Flood Zones A, B and C (Please refer to **Section 2.1** for definitions). The planning implications for each of the flood zones include:

Flood Zone A – High probability of flooding: most types of development would be considered inappropriate in this zone. Development in this zone should be avoided or only considered in exceptional circumstances, such as in city and town centres where the Justification Test has been applied. Water compatible development such as docks or marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation would be considered appropriate in this zone.

Flood Zone B – Moderate probability of flooding: highly vulnerable development would generally be considered inappropriate in this zone, unless the requirements of the Justification Test can be met. Less vulnerable development and water compatible development would be considered appropriate in this zone. In general, less vulnerable development should only be considered in this zone if adequate lands or sites are not available within Flood 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 be adequately managed.

Flood Zone C – Low probability of flooding: Development in this zone is considered 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.

With reference to the above, the proposed site is located within **Flood Zone A – High Probability of Flooding**, where most types of development would be considered inappropriate in this zone. Development in this zone should be avoided or only considered in exceptional circumstances, such as in city and town centres where the Justification Test has been applied. Furthermore, as noted in **Section 4.3.1** and **Section 4.3.2** above, the flood embankments / defence structures can't be relied on.

The second stage of the sequential approach is to substitute the type of development to one less vulnerable to flooding. **Figure 5-2** is taken from the Guidelines and describes the types of development that would be appropriate for each vulnerability class.

Vulnerability class	Land uses 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).

*Uses not listed here should be considered on their own merits

Table 3.1 Classification of vulnerability of different types of development

Figure 5-2: Classification of Vulnerability (Table 3.1 taken from Guidelines)

Table 5-1: Matrix of Vulnerability (Table 3.2 taken from Guidelines) below, describes the vulnerability class versus the different flood zones to illustrate appropriate developments and those that would be required to meet the Justification Test.

Table 5-1: Matrix of Vulnerability (Table 3.2 taken from Guidelines)

	FLOOD ZONE A	FLOOD ZONE B	FLOOD ZONE C
Highly Vulnerable Development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less Vulnerable Development	Justification Test	Appropriate	Appropriate
Water Compatible Development	Appropriate	Appropriate	Appropriate

Table 3.2: Matrix of Vulnerability versus flood zone to illustrate appropriate developments and that required to meet the Justification Test

In accordance Table 3.1 and Table 3.2 of Guidelines, the proposed development is a residential accommodation complex which would be classified as **'Highly Vulnerable Development'** and therefore will need to **satisfy the requirements** of **The Justification Test**.

5.2 Galway City Development Plan 2023-2029: Strategic Flood Risk Assessment – Justification Test

The JBA Consulting Galway City Development Plan 2023-2029 Strategic Flood Risk Assessment includes the Dyke Road Car Park & Headford Road Retail Area Justification Test (Box 4.1) for the development of the subject lands. The SFRA proposes that the subject lands pass Part 1 and 2 of the Justification Test on the basis that the site is close to the city centre and earmarked for future redevelopment.

The Part 3 Justification Test for the subject site states that "*the site benefits greatly from the Dyke Road defence in Galway and is directly adjacent to the embankmen*t". It further states that "*Part 3 of the Justification Test has been carried out and included a detailed flood risk assessment and model runs. The model runs carried out show that the site is currently defended to the 1% AEP standard of protection, but that the embankment height is variable and does not include a freeboard allowance. There is a high residual risk of flooding in both the 0.1% AEP event and when climate change is considered, when the embankment is overtopped and a high volume of water from the Corrib is allowed to fill the site and surrounding lands. Flood levels in the 0.1% AEP result in between 0.5 and 1.5m of flooding across the site*".

As noted in **Sections 4.3.1** above, the topographic survey undertaken by Apex Surveys, identifies that the lowest level of the flood defence structure adjacent to the site is approximately 6.54m OD, which is marginally higher than the present day 1% AEP level. This is without any allowance for climate change and doesn't provide for any freeboard. Further, an intrusive investigation & assessment of the flood defence structure is being undertaken as part of the CgC GCFRS to determine if the flood defence is fit for purpose.

Section 5.2 of the Galway City Development Plan 2023-2029 Strategic Flood Risk Assessment (SFRA) notes that where flood risk is identified at Development Management Stage a discussion is required with Galway City Council to determine an appropriate route forward. A series of pre-planning consultations with the relevant departments within GCC has been undertaken and correspondence regarding the flood risk has been ongoing. Refer to **Section 1.4.3** for more details.

5.3 Planning System and Flood Risk Management (DEHLG/ OPW, 2009) – Justification Test

The requirements of the Guidelines, Chapter 5: Flooding and Development Management Justification Test to be satisfied include:

Table 5-2: Box 5.1 Justification Test for Development Management

	Criteria	Response
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 the Guidelines.	The subject site is zoned 'CI' (Enterprise, Light Industry and Commercial) and 'RA' (Natural Heritage, Recreation and Amenity). The 'CI' zoning provides for the following objective: "To provide for enterprise, light industry and commercial uses other than those reserved to the CC Zone". Uses which are compatible with and contribute to the zoning objective include the development of regeneration and opportunity sites. The zoning objective specifically identifies that the 'CI' zoning should allow for the development of Regeneration and Opportunity Sites in accordance with the provisions of Chapter 10 and Policy 10.2 Strategic Regeneration and Opportunity Sites, particularly where it is identified to provide for mixed use development which includes for residential. In addition, the Core Strategy of the Development Plan promotes the development of regeneration and opportunity sites noting that these sites are 'targeted for housing delivery in the current plan period'. Furthermore, Policy 10.2 of the Development Plan supports the development of these regeneration and opportunity sites setting out the following: "1. Facilitate and enable the redevelopment of strategic Regeneration and Opportunity Sites in the city to support the sustainable and compact growth of the city which will add value and create more attractive places in which people can live and work and achieve alignment with the National Strategic Outcomes of the NPF and the Regional Policy Objectives of the RSES and implementation of the Core Strategy. 2. Give priority to the development of the strategic Regeneration and Opportunity sites in line with core strategy, in particular to deliver new residential neighbourhoods, on lands supported by a number of land use zonings including CC and CI, as referenced in the land use zoning objectives in Chapter 11." In consideration of the above, we note that the 'Dyke Road Car Park Regeneration Site' is identified as one of three 'Headford Road Regeneration Sites' as set out in Section 10.7 of the Development Plan. The regeneration of these lands is an identified growth enabler in the National Policy Framework and the Dyke Road site specifically is identified within the Development Plan as a national priority site for delivery of housing and other uses in collaboration with the City Council. The Development Plan sets out that as an LDA project, the residential element of the development at the Dyke Road site will include for affordable housing options. Other uses may include office/commercial uses as well as provision for civic and cultural arts infrastructure. The site is also identified as offering potential to explore innovation and research uses allied to the University of Galway given the linkage to the university made possible by the new pedestrian and cycle bridge. In summary, the site is zoned for development and residential use is specifically supported by the CI zoning objective governing the site, the core strategy and Policy 10.2 of the Development Plan. The subject

	Criteria	Response
		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 the Guidelines and therefore meets the criteria.
2.	The proposal has been subject to an appropriate flood risk assessment that demonstrates:	The existing Coirib go Cósta Flood Relief project model has been used as the baseline model for the LDA Corrib Causeway Project Hydraulic Assessment. The Assessment was undertaken by Arup and the findings are included in Appendix D and the scope and findings from the modelling are included in Section 6. The 1D/2D model was developed to assess the existing flood risk and proposed Flood Relief Scheme for the River Corrib and its main tributaries in the Galway Area.
(i)	The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk.	The hydraulic model demonstrates that there are no changes in offsite flood extents between the pre-development and post-development scenarios for the Q100_MRFS event.
(ii)	The development proposal includes measures to minimise flood risk to people, property, the economy, and the environment as far as reasonably possible.	The following mitigation measures are proposed: • The adoption of a residential Finished Floor Level (FFL) of 7.28m • External services and chambers to be watertight and flood-proof. • Critical infrastructure including the substation and the wastewater pumping station are above the 0.1% AEP flood level • Foul and Storm anti flood valves installed on connections below the 7.28m level. • Any infrastructure/ objects below the design flood level are at risk in a flood event. Mitigation measures are included in the evacuation / emergency strategy. • The provision of emergency evacuation routes above the 7.28m level.
(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	Mitigation measures proposed ensure that the residual risks can be managed to an acceptable level and include: A Flood Emergency Plan has been prepared for the proposed development and is included in Appendix E. The plan includes: • Provision of flood warnings, evacuation plans and ensuring public / residents are aware of the flood risk. This information will be provided in a welcome pack to new occupants. • Coordination of emergency plans with the relevant emergency services i.e. Local Authorities, Fire & Rescue, Civil Defence and An Garda Siochána. • Proposals to protect any infrastructure/ objects below the design flood level, such as cars and bike storage. • The flood evacuation route proposed is above both the 100 year (1%AEP) _MRFS flood level and also the 1,000 year (0.1% AEP) _MRFS event. The flood evacuation route includes for signage and other flood awareness measures to inform residents and the general public what to do (and what not to do) in the event of flooding. The flood emergency plan also includes the following proposals: • Flood monitoring and warning systems • Door closers to prohibit access to spaces below +7.28m.
(iv)	The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning	The mitigation measures have been carefully developed with the entire design team so as not to compromise the urban design. With reference to the response to Criteria 1 and Section 4.7.4 of the Architectural

Criteria	Response
objectives in relation to development of good urban design and vibrant and active streetscapes.	Design Statement (ADS) the design ensures the wider planning objectives with respect to good urban design and active streetscapes. Section 4.7.4 of the ADS notes "*Consideration of development plan guidelines, particularly The Planning System and Flood Risk Management – Guidelines for Planning Authorities, was integral to the streetscape design approach. Adhering to the principles of good urban design and the objective of fostering a vibrant, active streetscape, the design team has sought to create a well-integrated and dynamic urban environment. The proposed development aims to establish an active streetscape with varying levels of activity that clearly distinguish private and public areas. This new landscaped setting will enhance connectivity between the city and Terryland Park to the north, ensuring a seamless transition between urban and natural spaces. Moreover, the design approach aligns with broader planning objectives by promoting high-quality urban design and the creation of engaging, pedestrian-friendly streetscapes."*.

5.4 Flood Risk Management

Flood risk management under the EU Floods Directive aims to minimise the risks arising from flooding to people, property, and the environment. Minimising risk can be achieved through structural measures that block or restrict the pathways of floodwaters, such as river defences or non-structural measures that are often aimed at reducing the vulnerability of people and communities such as flood warning, effective flood emergency response, or resilience measures for communities or individual properties.

5.5 Impacts and Mitigation Measures

Understanding flood risk and identifying the potential impacts is a key step in managing flood risk. This is highlighted in Chapter 2 of the Guidelines.

When assessing the elements of flood risk at the site, the potential impacts of the development on the surrounding area must be considered. Consideration must also be made of how flooding will impact on the development and based on the likelihood or level of risk involved, recommend appropriate mitigation measures.

This Flood Risk Assessment seeks to demonstrate that the flood risk to the proposed development can be adequately managed, and the provision of the proposed additional accommodation will not have adverse impacts elsewhere.

Flooding can cause physical damage to properties and infrastructure, impact on the environment, local or regional economies and cause hardship amongst people and their communities. This section identifies the impacts associated with flooding and outlines mitigation measures that will be implemented to minimise and manage flood risk.

5.5.1 Hydrological Impacts

The potential hydrological impacts are outlined as follows:

Impact on flood levels in the river, drains and surrounding land due to interference with channel, over bank conveyance and loss of storage:

All of the above must be considered when assessing hydrological impacts of a development. This development does not include any proposals to alter any channels and is not located within an area

where significant overbank conveyance occurs. It is not considered that the proposed additional accommodation will impact on flooding elsewhere.

As outlined in previous sections, the proposals involve new build residential accommodation within an existing carpark).

As set out in the Guidelines, the design of all new development should ensure that the flood risk to surrounding properties is not increased as a result of the development. This is generally achieved through the incorporation of Sustainable Drainage Systems and compensation for any loss of floodplain as a precautionary response to the potential incremental impacts in the catchment.

When compensatory flood storage is provided, the flood storage volume needs to equal the volume lost on the site due to the space occupied by the development buildings and any raised land.

Based on the above, and the existing topography of the site (**Section 4.2.1**), AECOM confirmed that the required flood compensatory volume required for the 1% AEP Event (1:100-year) equates to an existing flood compensatory volume of **10 670.02m^3**. Refer to **Table 5-4** below.

Table 5-3: Existing Flood Compensation Volume Calculation

Event	Water Level (m AOD)	Phase	Flood Volume (m^3)
1% AEP	6.48	Existing	10 670.02

The proposed ground levels surrounding the proposed building will be maintained at circa. 5.0m OD. Additionally the proposed building will be built on stilts with only the cores and necessary structural elements extending down to the ground. This will permit the proposed development to provide the sufficient compensatory storage required. The required flood compensatory storage achieved for the 1% AEP Event (1:100-year) equates to a phase 1 flood compensatory volume of **11 668.42m^3** Refer to **Table 5-4** below.

While only the cores and necessary structural elements will extend down to the ground the lower ground level façade will not be fully permeable as screens / louvres are proposed. The permeability of the lower ground level façade has been included in the hydraulic modelling undertaken by Arup. Refer to Chapter 6 below and Appendix D.

Table 5-4: Phase 1 Flood Compensatory Volume Calculation

Event	Water Level (m AOD)	Phase	Flood Volume (m^3)
1% AEP	6.48	Phase 1	11 668.42

Increase in flow rate into the receiving river/ stream/ drain as a result of an increased rate of run-off from the developed site:

The existing development does not include attenuation storage for surface water run-off generated within the site. The proposed development will result in a net reduction in the area of the impermeable hardstanding through the introduction of soft landscaping.

The proposed development works include for the provision of two (2) attenuation tanks sized at 33.6m^3 and 39 m^3, respectively. Further, the proposed development works include a 1,799m^2 green roof which will yield a 131.2m^3, combined storage volume is to cater for the phase 1 development during a 1 in 100-year return period rainfall event with a HydroBrake to restrict the run-off to a combined discharge rate of 25 l/s. Therefore, there will be a net overall reduction in the rate of run-off discharged to the Terryland Stream when compared with the existing development.

It is noted that the aim of the proposed attenuation storage tank is to reduce the rate of surface water discharge to the Terryland Stream rather than mitigate against fluvial flood risk in the vicinity of the development. Please refer to the Infrastructure Report accompanying this application for details of the proposed surface water drainage and attenuation design.

Hydrological Impact Mitigation:

The introduction of the flood compensatory storage and the restriction in surface water run-off rates will result in a net benefit as set out in the Engineering Report which accompanies the application.

5.5.2 Infrastructural Impacts

Flooding of roadways and other transport routes can hinder access and affect local and regional economies. More significantly, emergency services can be cut off or be denied access to areas in need of an emergency response. Buildings within the development can suffer substantial damage during flood events.

5.5.3 Infrastructural Impact Mitigation

While the conditions required to generate a flood risk to the proposed development will not occur frequently, there is still a risk to the development site. The Finished Floor Level of the accommodation is above the 1% AEP level (6.48m) with a climate-change allowance (0.50m) plus freeboard (0.30m) to an FFL of 7.28m.

5.5.4 Flood Mitigation Measures

Flood resilient design will be required. The measures proposed reflect the intended building uses at lower ground and ground floor levels. The following is an overview of the flood mitigation measures that have been proposed:

- The adoption of a residential Finished Floor Level (FFL) of 7.28m, which is above the 1 in 1,000-year flood level and 1 in 100-year flood plus freeboard plus MRFS climate-change allowance.
- External electrical, mechanical, or communication ducting and chambers below the 7.28m level will be watertight and flood-proof.
- All critical infrastructure (eg wastewater pumping station and substation) are above the 1 in 1,000 year flood level and the 1 in 100-year flood plus freeboard plus MRFS climate-change allowance
- Anti-flood valves will be installed on foul and storm connections below the 7.28m level.
- Any infrastructure/ objects below the design flood level are at risk in a flood event. Mitigation measures form part of the evacuation / emergency strategy (refer to **Appendix E**). These include residents being advised to remove bikes and cars prior to the flood event occurring and doors will be locked to prevent access to the areas during a flood event.
- The provision of emergency evacuation routes above the 7.28m level.

5.5.5 Emergency plan and evacuation procedures

A Flood Emergency Plan has been prepared for the development and is included in **Appendix E** . The plan includes:

- Provision of flood warnings, evacuation plans and ensuring public / residents are aware of the flood risk. This information will be provided in a welcome pack to new occupants.

- Coordination of emergency plans with the relevant emergency services i.e. Local Authorities, Fire & Rescue, Civil Defence and An Garda Siochána.

- Proposals to protect any infrastructure/ objects below the design flood level, such as cars and bike storage.

The flood evacuation route proposed is above both the 100 year (1%AEP) _MRFS flood level and also the 1,000 year (0.1% AEP) _MRFS event.

The flood evacuation route includes for signage and other flood awareness measures to inform residents and the general public what to do (and what not to do) in the event of flooding.

The flood emergency plan also includes the following proposals:

- Flood monitoring and warning systems

- Door closers to prohibit access to spaces below +7.28m.

5.5.6 Social Impacts

Another impact of flooding is the social impact on people and communities. Severe flooding can cause physical injury and loss of life. On a lesser scale, floods can cause trauma and stress, and the ability of individuals to recover can vary depending on their circumstances including age and health (both physical and mental). Undue stress can be avoided by careful planning, early warning systems and evacuation procedures.

5.5.7 Social Impact Mitigation

As noted, there is a flood risk to the proposed development, and site-specific flood management plans have been drawn up for use in the event of an extreme flood event. The proposed finished floor levels are above the predicted 1 in 100-year return period fluvial flood water level with climate change and free board allowance. This will ensure that the ground floor and floors above will provide a place of safe refuge in the event of a flood inundating the surrounding areas.

6. Hydraulic Modelling

6.1 Scope of Hydraulic Modelling

As set out in Section 4.3.2, GCC have advised that as part of the Coirib go Cósta Flood Relief Scheme (CgC GCFRS) improvements to the Dyke Road flood defence embankment are being advanced.

The standard of protection to be provided by the flood defence embankment and the timeline for delivery of the FRS remains undefined. It is recognized as a priority by GCC.

The existing Coirib go Cósta Flood Relief project model has been used as the baseline model for the LDA Corrib Causeway Project Hydraulic Assessment. This is a 1D/2D model (Flood Modeller Pro/ Tuflow) which was developed to assess the existing flood risk and proposed Flood Relief Scheme for the River Corrib and its main tributaries for the reaches in the Galway Area.

The baseline model has been modified to exclude the stone wall which forms part of the flood defence structure so as to represent a conservative baseline condition for the site. This decision is a result of the recognition of the fragile and damaged nature of the wall that could result in its incapacity to retain extreme floods.

The scope of the hydraulic modelling is outlined in Table 6-1.

Table 6-1: Scenarios assessed as part of the hydraulic modelling

Scenario	Current	MRFS Mid-Range Future Scenario	HEFS High-End Future Scenario
Scenario 1: Predevelopment	Q100, Q1000	Q100, Q1000	Q100, Q1000
Scenario 2: Ground Regraded		Q1000	
Scenario 3: Post development (ground regrading and inclusion of walls/ louvres and building footprint)	Q100, Q1000	Q100, Q1000	Q100, Q1000
Scenario 3 Terryland Sensitivity Analysis Post Development		Q100	

To ensure a precautionary approach to the determination of finished floor levels, the provision of compensatory storage and in the determination of the impact of the development on neighbouring properties the Q100_MRFS results (1% AEP flood event) has been considered. This is line with the approach set out in the Technical Appendices to the Planning Flood Risk Management Guidelines and also the Galway City Development Plan 2023-2029: Strategic Flood Risk Assessment.

Again, to ensure a precautionary approach, the Q1000_MRFS results (0.1% AEP flood event) have also been considered with respect to the determination of the FFLs and in determination of the flood evacuation route.

Comparing the Q1000 MRFS results for scenario 2 and scenario 3 allows for the effectiveness of the voids (provided in the form of louvres) in the lower ground level façade at providing flood compensatory storage to be assessed.

Refer to **Appendix D** for the Hydraulic Model Assessment undertaken by Arup Consulting in December 2024 and issued in January 2025.

6.2 Predicted Flood Levels

The predicted flood levels using the Q100 design flows are set out in Table 6-2 and the predicted flood levels using the Q1000 design flows are set out in Table 6-3. The flood levels indicated in Table 6-2 demonstrate there is no impact to the maximum stage within the Corrib for the Q100 pre and post development scenarios, under any climate change epoch. The flood levels indicated in Table 6-3 demonstrate no impact to the maximum stage within the Corrib for the Q1000 pre and post development scenarios, under the current and MRFS climate scenarios. There is a potential 10mm increase in levels during the 0.1% AEP HEFS event within the river Corrib due to the prosed development. A 10mm change in level is considered inconsequential.

The flood levels determined for the Q100 current day flow is slightly higher than the 1% AEP event level of 6.48m taken from the CFRAM fluvial flood maps. However, a conservative approach was adopted in Chapter 4 above with regards climate change and in turn in determining the proposed residential Finished Floor Level (FFL) of 7.28m OD. Applying the flood level determined for Q100_MFRS flow and including a 300mm freeboard would result in a minimum recommended FFL of 7.09m. Hence the adopted FFL of 7.28m is conservative.

In addition, the proposed residential FFL of 7.28m also provides protection against the 0.1% AEP_MRFS flood level (6.98m) plus 300mm freeboard.

Table 6-2: Predicted Q100 Flood Levels River Corrib

Node	Location	Q100 Current		Q100 MRFS		Q100 HEFS	
		Scenario 1	Scenario 3	Scenario 1	Scenario 3	Scenario 1	Scenario 3
30CORR00185	Upstream	6.53	6.53	6.79	6.79	6.89	6.89
30CORR00178	Adjacent to site	6.52	6.52	6.79	6.79	6.89	6.89
30CORR00161	Downstream	6.37	6.37	6.65	6.65	6.77	6.77

*Note: the results have been rounded to 2 decimal places.

Table 6-3: Predicted Q1000 Flood Levels River Corrib

Node	Location	Q1000 Current		Q1000 MRFS		Q1000 HEFS	
		Scenario 1	Scenario 3	Scenario 1	Scenario 3	Scenario 1	Scenario 3
30CORR00185	Upstream	6.82	6.82	6.99	6.99	7.07	7.08
30CORR00178	Adjacent to site	6.81	6.81	6.98	6.98	7.07	7.07
30CORR00161	Downstream	6.68	6.68	6.87	6.87	6.98	6.98

*Note: the results have been rounded to 2 decimal places.

6.3 Predicted Flood Depths

The flood depths predicted for the Q100 flows within the site (locations 1 to 3) and flood evacuation route (location 4) are set out in Table 6-4 and the predicted flood depths for the Q1000 flows within the site and flood evacuation route are set out in Table 6-5. It is important to note that the flood depths in scenario 1 are relative to the existing ground levels and in scenario 3 the flood depths relate to the regraded ground levels.

Table 6-4 demonstrates that the flood evacuation route doesn't flood up to and including the 1%AEP_HEFS event. Further Table 6-5 shows no flooding of the evacuation route in the 0.1%_MRFS event.

Table 6-4: Predicted Flood Depths for Q100 event

Location within Site	Q100 Current depth m		Q100 MRFS depth m		Q100 HEFS depth m	
	Scenario 1	Scenario 3	Scenario 1	Scenario 3	Scenario 1	Scenario 3
1	0.03	0	1.26	1.02	1.54	1.31
2	0.04	0.02	1.15	0.77	1.43	0.95
3	0.02	0.03	1.13	1.16	1.41	1.44
4	0	0	0	0	0	0

Table 6-5: Predicted Flood Depths for Q1000 event

Location within Site	Q1000 Current depth m		Q1000 MRFS depth m		Q1000 HEFS depth m	
	Scenario 1	Scenario 3	Scenario 1	Scenario 3	Scenario 1	Scenario 3
1	1.32	1.08	1.78	1.56	1.97	1.75
2	1.21	0.81	1.66	1.09	1.84	1.19
3	1.2	1.22	1.64	1.63	1.82	1.79
4	0	0	0	0	0.26	0.32

6.4 Impact of Development in Q100_MRFS Flood Event

There is a general decrease in flood depth between the pre-development and post-development scenarios within the site, except for location 3, that shows a slight increase (30mm). This is mainly due to the location of Point 3. The proposed development in the Scenario 3 model impacts the flow paths on site. Flood water is squeezed between the proposed development and the elevated ground to the east resulting in a localised increase in water level.

There are no changes in offsite flood extents between the pre-development and post-development scenarios.

The maximum increase in water levels because of the development on adjacent properties is approximately 3mm. There is also a localised increase in the water level on the Dyke Road, south of the development of circa 30mm. Given the flood depths in a 1%AEP_MRFS flood event the increase in water level is considered negligible.

6.5 Terryland Sensitivity Analysis

In order to assess the impact of the removal/ failure of the Terryland Waterworks, the model was run for the Scenario 3 Q100 MRFS with the orifice units at the waterworks set to be open infinitely high.

The maximum stage results for Scenario 3 Q100 MRFS are almost identical in the River Corrib and Terryland Reach with or without the Terryland Waterworks. The slight variance is due to rounding of max water levels. This leads to the conclusion that there is no impact on flood risk to the site if the Waterworks were to fail or be removed. Arup note that there are two reasons behind this:

a) the maximum water levels are driven by the overtopping of the Corrib rather than the Terryland stream downstream of the water works and

b) in an extreme event such as the baseline Q100 MRFS, water from Terryland stream gets out of bank upstream of the waterworks and bypasses the orifice units. As such, removal of the waterworks has no impact to levels within the stream.

6.6 Permeability of Lower Ground Façade

As noted in Section 6.4 above there are no changes in offsite flood extents between the pre-development and post-development scenarios for the 1% AEP_MRFS flood event. Therefore, it can be concluded that the permeability of the lower ground façade as proposed is such that it doesn't impede the storage or flow of flood waters below the building.

When the Q1000_ MRFS design flows for scenario 2 (regraded site) and scenario 3 (post development) are compared, extended flood extents in the post development scenario is apparent to lands in the ownership of the applicant (GCC) on the west side of the Dyke Road, the depth of water is estimated to be 100 mm. The depth of flood waters on the Dyke Road to the west of the site are shown to increase by 80mm.

6.7 Flood Duration

Based on review of the design flood hydrographs included in Figure 6-1 it has been estimated that the threshold for out of bank flooding from the River Corrib will be exceeded for circa 9 and 27 days during the Q100 and Q1000 events respectively. These durations will likely increase further due to climate change.

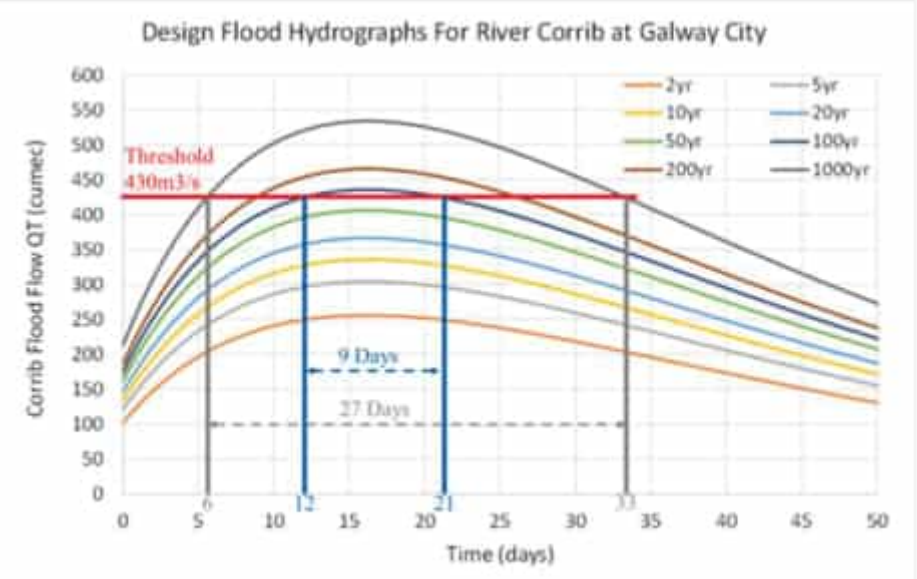


Figure 6-1 : Return Period Design Flow Hydrographs for River Corrib at Galway City (Hydro Environmental)

7. Flood Risk Discussion and Conclusion

GCC have advised that as part of the Coirib go Cósta Flood Relief Scheme (CgC GCFRS) improvements to the Dyke Road flood defence embankment are being advanced. Although the timeline for delivery of the FRS remains undefined, it is recognized as a priority.

A site-specific FRA and planning stage drawings have been developed in accordance with guidance set out in the *GCCDP SFRA and the Planning Flood Risk Management Guidelines*. This includes the provision for measures to minimise flood risk to people, property, the economy, and the environment as far as reasonably possible as per the requirements of the justification test for development management set out in Box 5.1 of the Guidelines.

The potential flood risk at the site of the proposed development has been assessed. The following risks that have been assessed are as follows:

- Hydrological,
- Infrastructure, and
- Social

The introduction of the mitigation measures set out in **Section 5.5** will adequately manage the risk identified above.

The Guidelines classify vulnerability of different types of development from a flood risk perspective. Residential development is classified as 'Highly Vulnerable Development' and should be located within Flood Zone C. The proposed development, however, is located within Flood Zone A and therefore needs to **satisfy the requirements** of **The Justification Test**.

A Development Management Justification Test has been carried out in accordance with Box 5.1 of the Guidelines. The proposed development meets the requirements of the Development Management Justification Test, and the flood risk to the development can be adequately managed, and the proposed development will not have an adverse impact elsewhere.

The proposed development works include for the provision of two (2) attenuation tanks sized at 33.6m^3 and 39 m^3, respectively. Further, the development works include a 1,799m^2 green roof which will yield a 131.2m^3, combined storage volume is to cater for the phase 1 development during a 1 in 100-year return period rainfall event with a HydroBrake to restrict the run-off to a combined discharge rate of 25 l/s. Therefore, there will be a net overall reduction in the rate of run-off discharged to the Terryland Stream when compared with the existing development.

The ground levels are proposed to be shaped too circa. 5m OD Malin. The site Geotechnical Investigations (GI) have been completed and confirmed that poor ground is present to reasonable depths. Given the ground conditions at the site, the proposed foundation system for the building structure consists of Odex piles supporting reinforced concrete pile caps and ground beams. Piles will be drilled to competent rock.

For the remainder of the site, a grid of unreinforced concrete rigid inclusion will be driven to competent ground. A geotextile will be placed across the site above rigid inclusions and a load transfer platform will be constructed from compacted granular material over which services/site roadways/parking can be built.

This type of foundation scheme does not require surcharging or vertical drainage to consolidate the existing ground strata so there will be no impact on the ground water regime.

Flood mitigation measures proposed include the following:

- The adoption of a residential Finished Floor Level (FFL) of 7.28m
- External services and chambers to be watertight and flood-proof.
- Critical infrastructure including the substation and the wastewater pumping station are above the 0.1% AEP flood level
- Foul and Storm anti flood valves installed on connections below the 7.28m level.
- Any infrastructure/ objects below the design flood level are at risk in a flood event. Mitigation measures are included as part of the evacuation / emergency strategy. These include residents being advised to remove bikes and cars prior to the flood event occurring and doors will be locked to prevent access to the areas during a flood event.
- The provision of emergency evacuation routes above the 7.28m level.

The results of the hydraulic modelling undertaken by Arup validate the design assumptions made by the design team in particular:

- The flood levels determined for the Q100 current day flow is slightly higher than the 1% AEP event level of 6.48m taken from the CFRAM fluvial flood maps. However, a conservative approach was adopted with regards to climate change and in turn in determining the proposed residential Finished Floor Level (FFL) of 7.28m OD. Applying the flood level determined for Q100_MFRS flow and including a 300mm freeboard would result in a minimum recommended FFL of 7.09m. Hence the adopted FFL of 7.28m is conservative. In addition, the proposed residential FFL of 7.28m also provides protection against the 0.1% AEP_MRFS flood level (6.98m) plus 300mm freeboard.
- There is a general decrease in flood depth between the pre-development and post-development scenarios within the site for the 1%AEP MRFS event. The exception is to the east of the building that shows a slight increase (10mm).
- There are no changes in offsite flood extents between the 1% AEP_MRFS pre-development and post-development scenarios. The maximum increase in water levels in the 1% AEP_ MRFS event as a result of the development on adjacent properties is approximately 3mm. There is also a localised increase in the water level on the Dyke Road, south of the development of circa 30mm. Given the flood depths in a 1%AEP_MRFS flood event the increase in water level is considered negligible.

Minimising changes to the natural ground profile and providing compensatory storage for any loss of flood plain storage the development proposed will ensure minimal third-party risk by displacement of flood water to other locations as a result of the proposed development.

In addition, emergency planning and evacuation procedures, coordinated with the relevant emergency services has been developed. As part of the evacuation procedure residents will be able to evacuate, if required in both the 1% AEP_MRFS flood event and the 0.1% AEP_MRFS flood event. Consideration has also been given to how the development will be serviced in both the 1% AEP_MRFS flood event and the 0.1% AEP_MRFS flood event.

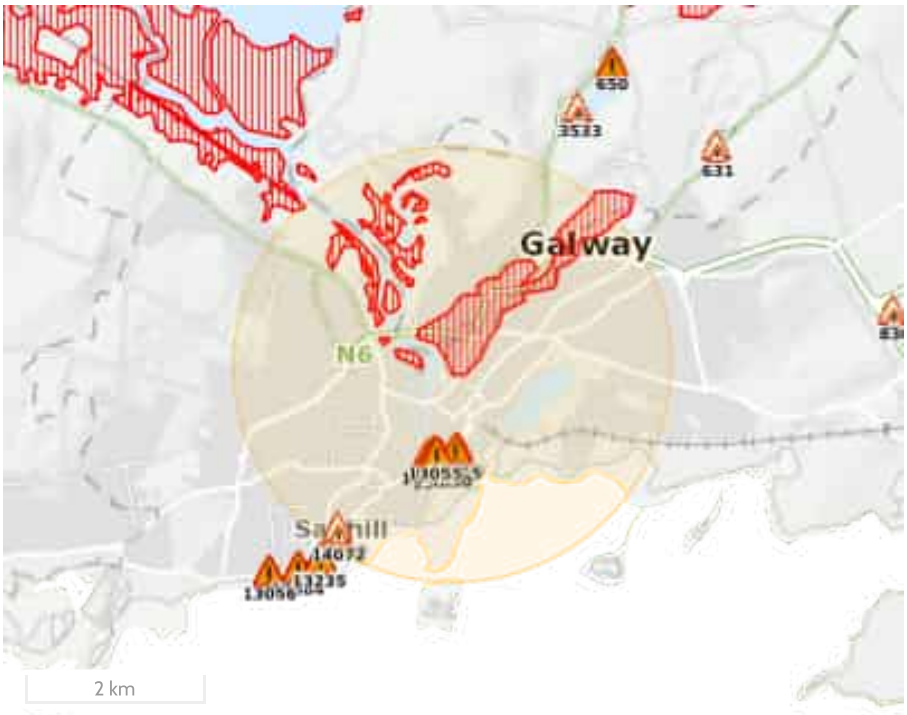
Appendix A OPW Flood Hazard Records

Past Flood Event Local Area Summary Report

Report Produced: **27/6/2024 10:45**

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

15 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Flooding at Galway City on 01/02/2014 (ID-13055)	01/02/2014	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
2.	Quay Street Galway Jan 1995 (ID-4628)	17/01/1995	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
3.	Flood Street Galway Jan 1995 (ID-4629)	17/01/1995	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
4.	Docks Galway Jan 1995 (ID-4630)	17/01/1995	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
5.	Flooding at Salthill Promenade Galway on 18/12/2019 (ID-14072)	18/12/2019	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
6.	Flooding at Spanish Arch Galway on 18/12/2019 (ID-14073)	18/12/2019	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		

	Name (Flood_ID)	Start Date	Event Location
7.	Flooding at Galway City and Salthill on 05/12/2015 (ID-13373) **Additional Information:** Reports (0) Press Archive (0)	05/12/2015	Approximate Point
8.	Flooding at Galway City on 06/12/2015 (ID-13399) **Additional Information:** Reports (0) Press Archive (0)	06/12/2015	Approximate Point
9.	Flooding at Galway City on 02/01/2016 (ID-13514) **Additional Information:** Reports (0) Press Archive (0)	02/01/2016	Approximate Point
10.	Flooding at Galway City on 16/10/2017 (ID-13555) **Additional Information:** Reports (0) Press Archive (0)	16/10/2017	Approximate Point
11.	Flooding at Galway City/ Salthill on 02/01/2018 (ID-13609) **Additional Information:** Reports (0) Press Archive (0)	02/01/2018	Approximate Point
12.	Flooding at Galway City/Salthill on 11/10/2018 (ID-13628) **Additional Information:** Reports (0) Press Archive (0)	11/10/2018	Approximate Point
13.	Flooding at Galway City on 08/02/2019 (ID-13643) **Additional Information:** Reports (0) Press Archive (0)	08/02/2019	Approximate Point
14.	Coastal flooding in Galway and Salthill on 3rd January 2014 (ID-12144) **Additional Information:** Reports (1) Press Archive (0)	03/01/2014	Approximate Point
15.	Flooding in Galway City on 28th January 2013 (ID-11900) **Additional Information:** Reports (1) Press Archive (0)	28/01/2013	Approximate Point

Appendix B CFRAM Fluvial Flood Risk Mapping

129000 129500 130000

226000 225500

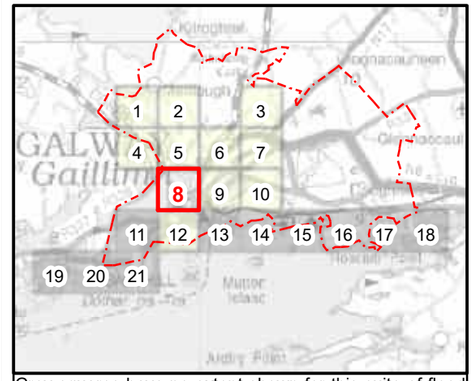
30CORR00235A
30CAST00029A
30CAST00042
30CAST00085A
30SALW00099A
30CORR00217
30CORR00196
30SALW00083A
30CORR00168A
30SALW00058A
30CORR00158A
30SALW00047A
30EGLI00120A
30SALW00036A
30EGLI00103A
30NUNS00043A
30CORR00134A
30SALR00045A
30CORR00114
30EGLI00071A
30GMRA00033
30NUNS00013A
30CORR00110A
30MACT00010A
30FRIA00005A
30EGLI00054A
30GMRA00010A

Effective standard of protection: 1% AEP

Modelled Water Level (m OD)

Node Point	10%AEP	1%AEP	0.1%AEP
30CORR00235A	6.29	6.65	7.23
30CORR00217	6.2	6.54	7.05
30CORR00196	6.15	6.48	6.98
30CORR00168A	6.1	6.41	6.9
30CORR00158A	6.02	6.33	6.8
30CORR00134A	4	4.45	5.69
30CORR00114	3.83	4.29	5.61
30CORR00110A	3.7	4.1	5.42
30CAST00029A	3.7	4.24	6.08
30CAST00042	3.57	4.16	6.03
30CAST00085A	3.53	4.15	6.28
30CAST00095	3.47	4.05	6.01
30SALW00099A	6.09	6.31	7.09
30SALW00083A	4.89	5.49	7.02
30SALW00058A	3.97	4.47	5.84
30SALW00047A	3.87	4.42	5.82
30SALW00036A	3.74	4.17	5.49
30EGLI00120A	6.09	6.4	6.9
30EGLI00103A	6.07	6.37	6.83
30EGLI00071A	6	6.25	6.57
30EGLI00054A	6	6.24	6.56
30MACT00010A	4.84	5.14	5.57
30FRIA00005A	3.56	4.06	5.53
30GMRA00033	5.98	6.22	6.52
30GMRA00010A	4.3	4.45	4.99
30NUNS00043A	6.08	6.38	6.86
30NUNS00013A	6.07	6.38	6.86
30SALR00045A	6.02	6.28	6.7

0 50 100 200 300 400 500 Metres



Grey squares have no extent shown for this suite of flood maps so no maps have been produced.

AFA Boundary
Defended Area
Defence – Embankment
Model Nodes
Modelled River Centreline

10% AEP Fluvial Extent
1% AEP Fluvial Extent
0.1% AEP Fluvial Extent

IMPORTANT USER NOTE:
THE FLOWS PRESENTED IN THIS MAP ARE RELEVANT TO THE LOCATION SHOWN ONLY. THEY SHOULD NOT BE USED WITHOUT FIRST REFERRING TO THE HYDRAULIC MODELLING REPORT TO UNDERSTAND THE CONTEXT OF THE HYDROLOGY AT THE SITE.

THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

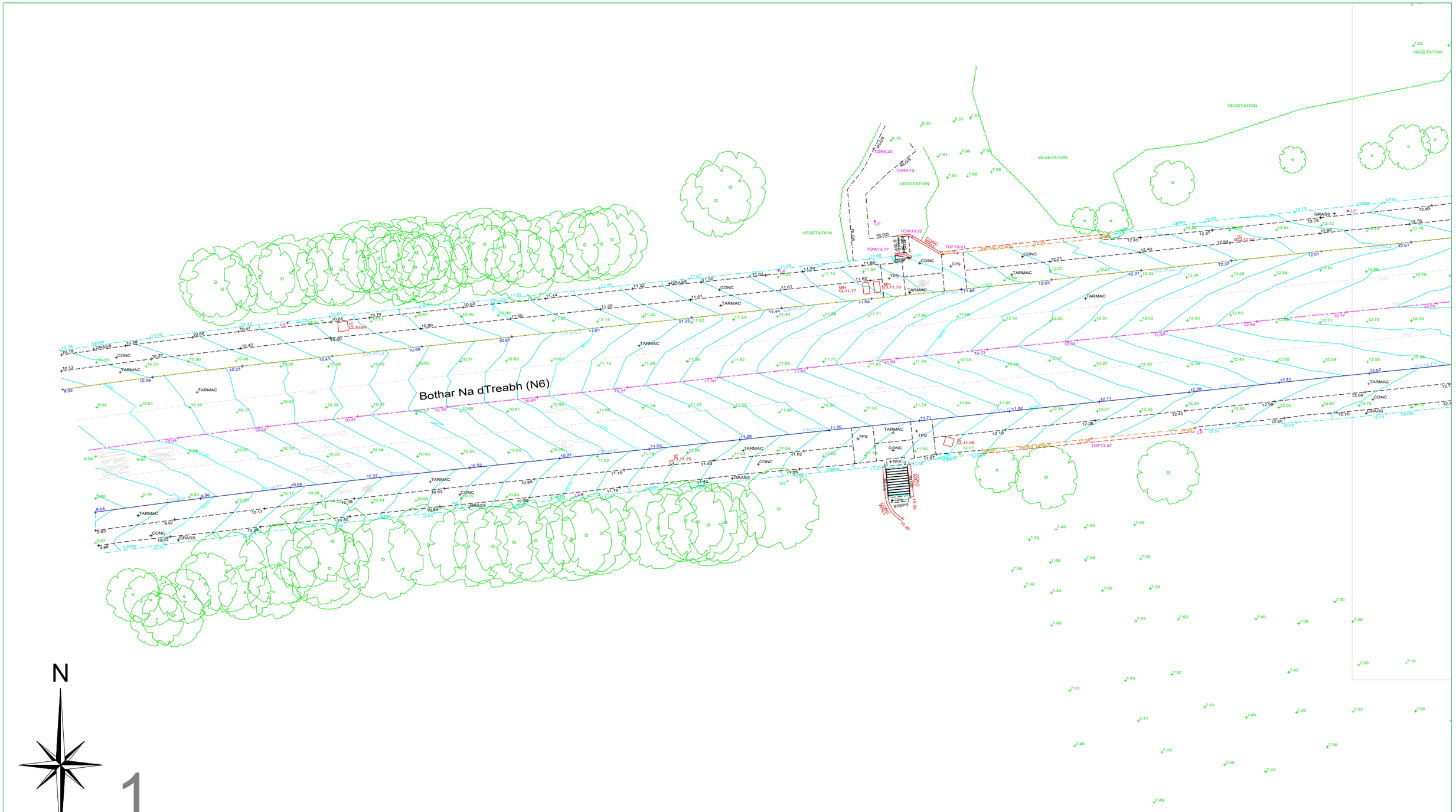
The Office of Public Works
Jonathan Swift Street
Trim
Co. Meath

JBA Consulting
24 Grove Island
Corbally
Limerick, Ireland

WESTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

Map: Galway City Flood Extent			Final
Map Type: Flood Extent			
Map Area: HPW		Source: Fluvial	Scenario: Current
Drawn by: KF	Date: Dec 2017	Scale: 1:5,000	
Checked by: TS	Date: Dec 2017		
Approved by: JC	Date: Dec 2017		Original @ A3
Map No: W30GLW_EXFCD_F4_08		**Sheet:** 8 of 21	

Appendix C Topographic Survey



APEX SURVEYS

www.apexsurveys.ie
info@apexsurveys.ie
00353 1 691 0156

RURAL/NATURAL FEATURES :

BUSH
SAPLING
TREE
HEDGE
TROUGH
CATTLE GRID

LINEWORK:

EMBANKEMENT TOP 101.50
DRAIN 101.50
BREAKLINE 101.50
BUILDING 101.50
KERB BOTTOM 101.50
WALL 101.50
PATH/CHANGE SURFACE 101.50
O/HEAD ELECTRICITY OE
O/HEAD TELECOM OT

STREET FURNITURE :

BOLLARDS	BD *
BORE HOLE	BH +
BUS STOP	BS *
CRASH BARRIER	CB
ELECTRICITY POLE	EP *
EARTHING ROD	ER +
GATE	
GROUND LIGHT	LT *
ILLUMINATED BOLLARD	BOL
LAMP POST	LP *
MARKER POST	MKR
POST	POST *
POST BOX	POST BOX +
ROADSIGN	RS * RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP *
TRAFFIC LIGHT	TL *
TRIAL PIT	TPIT +

SERVICES :

AIR VALVE	AV +
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP *
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH *
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV *
STOPCOCK	ST *

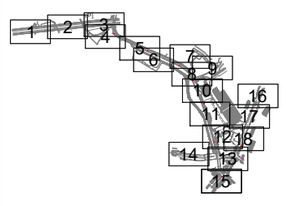
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT *
WATER METER	WM *
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



PLAN PRODUCED BY:

APEX SURVEYS

CONTACT INFORMATION:

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Unit 78 Dunboyne Business Park
Dunboyne, Co. Meath, Ireland
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info@apexsurveys.ie
00353 1 691 0156

CLIENT:

Client

PROJECT:

Dyke Road
Galway City

GRID SYSTEM: Irish Transverse Mercator
DATUM: Malin Head (OSGM15)
NOTES: Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	07/11/23	Original Drawing
002	15/11/23	Car Park Added
003	12/12/23	Additional TOW Levels Added
004	21/12/23	Contours Updated and Stations Added

SCALE : 1/200 A1

DATE : 15/11/2023

DRG No: 5999

DESCRIPTION : 2D Topographical
SURVEYED BY : C.F. & R.D.

SHEET: 1 of 18

PROCESSED BY : Jason Pringle
CHECKED BY : Alan Brady

APEX SURVEYS

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RURAL/NATURAL FEATURES :

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LINEWORK:

EMBANKEMENT TOP
DRAIN
BREAKLINE
BUILDING
KERB BOTTOM
WALL
PATH/CHANGE SURFACE
O/HEAD ELECTRICITY
O/HEAD TELECOM

STREET FURNITURE :

BOLLARDS
BORE HOLE
BUS STOP
CRASH BARRIER
ELECTRICITY POLE
EARTHING ROD
GATE
GROUND LIGHT
ILLUMINATED BOLLARD
LAMP POST
MARKER POST
POST
POST BOX
ROADSIGN
SIGN POST
TELEPHONE BOX
TELEPHONE POLE
TRAFFIC LIGHT
TRIAL PIT

SERVICES :

AIR VALVE
ARMSTRONG JUNCTION
CABLE TV IC
COVER LEVEL
EIRCOM COVER
EIRCOM JUNCTION BOX
ELECTRICAL CABLE PIT
ESAT COVER
ESB COVER
ESB JUNCTION BOX
FIRE HYDRANT
GAS VALVE
GULLY
INSPECTION COVER
MANHOLE
SEPTIC TANK
SLUICE VALVE
STOPCOCK

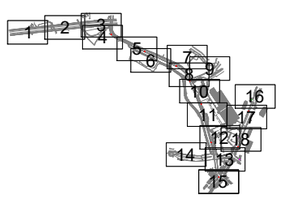
SERVICES :

SERVICE BOX (UNKNOWN)
TRAFFIC COVER
VENT
WATER METER
UNABLE TO LIFT

LEVELS :

BED LEVEL
EAVE LEVEL
FLOOR LEVEL
INVERT LEVEL
ROAD LEVEL
RIDGE LEVEL
SOFFIT LEVEL
SPOT LEVEL
TOP OF FENCE LEVEL
TOP OF WALL LEVEL
WATER LEVEL
SURVEY CONTROL STATION

SHEET LAYOUT :



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PROJECT:

Dyke Road
Galway City

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
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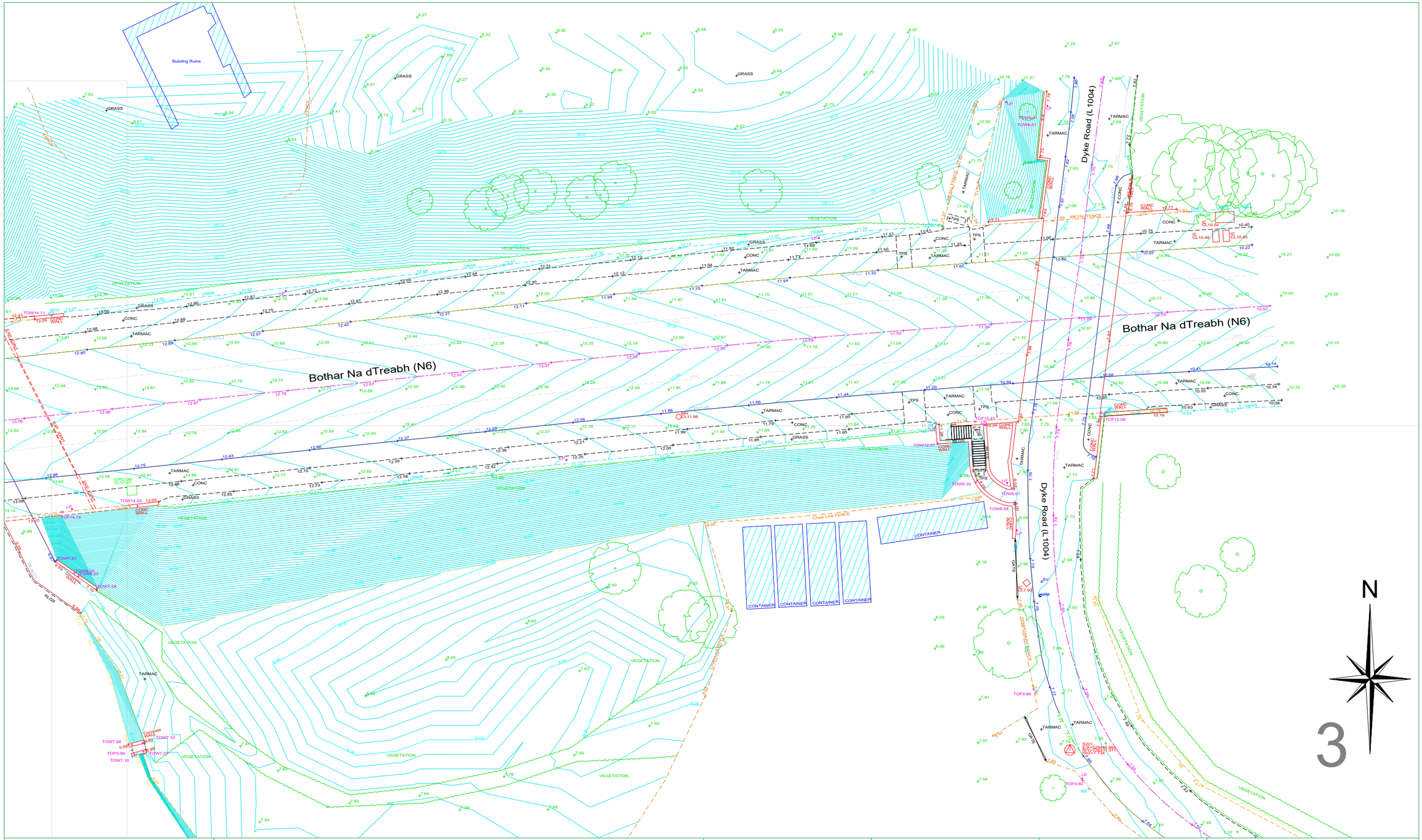
003	12/12/23	Additional TOW Levels Added
004	21/12/23	Contours Updated and Stations Added

SCALE :	1/200 A1	DATE :	15/11/2023
DRG No:	5999	DESCRIPTION :	2D Topographical
		SURVEYED BY :	C.F. & R.D.
SHEET:	2 of 18	PROCESSED BY :	Jason Pringle
		CHECKED BY :	Alan Brady



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RURAL/NATURAL FEATURES :

BUSH
SAPLING
TREE
HEDGE
TROUGH
CATTLE GRID

LINEWORK:

EMBANKEMENT TOP	101.50
DRAIN	101.50
BREAKLINE	101.50
BUILDING	101.50
KERB BOTTOM	101.50
WALL	101.50
PATH/CHANGE SURFACE	101.50
O/HEAD ELECTRICITY	OE
O/HEAD TELECOM	OT

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT

SERVICES :

AIR VALVE	AV
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

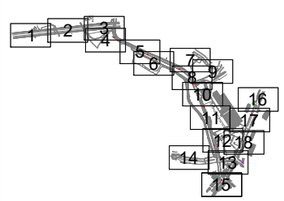
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



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CLIENT:

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PROJECT:

Dyke Road
Galway City

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	07/11/23	Original Drawing
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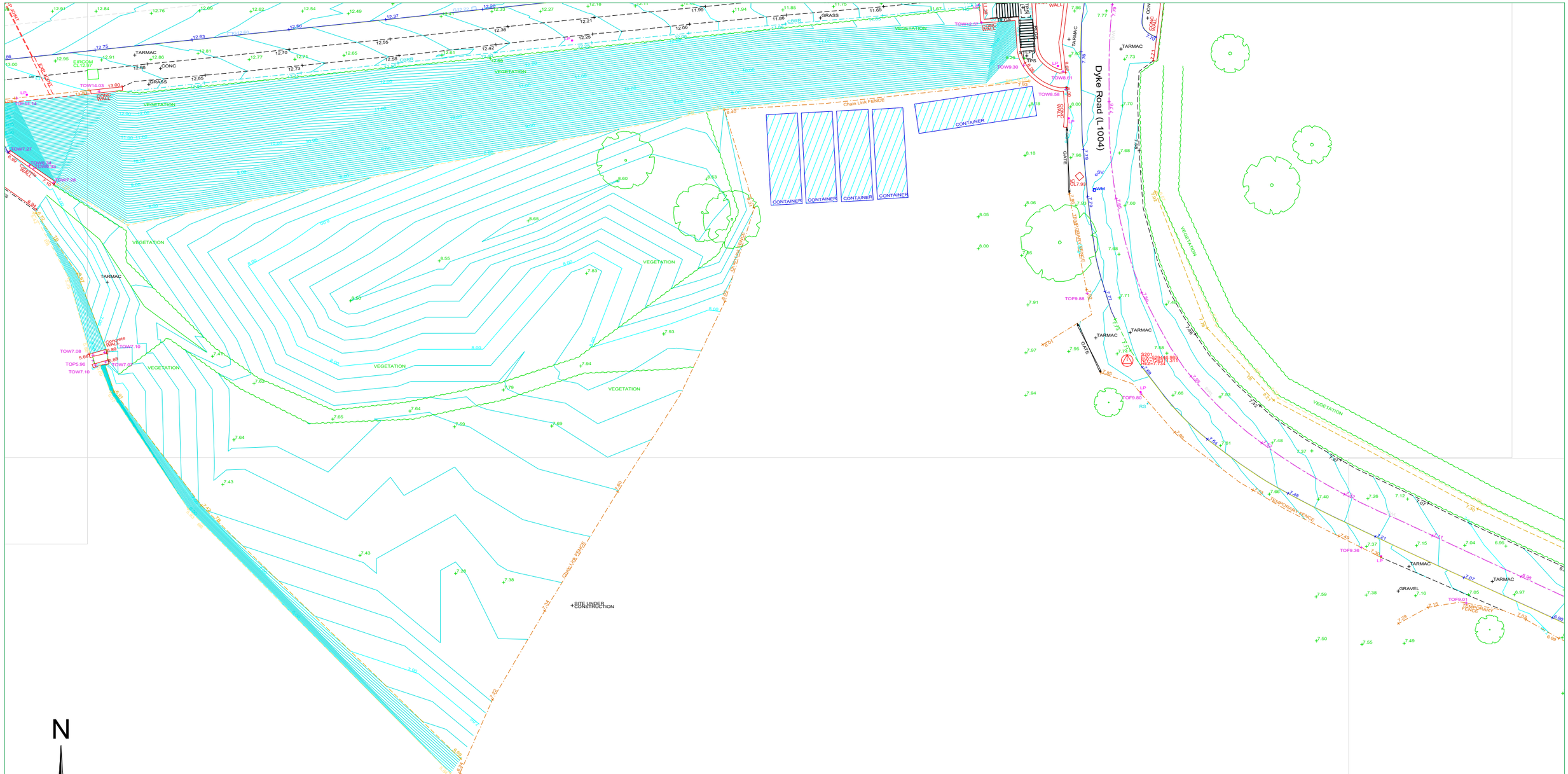
SCALE :	1/200 A1	DATE :	15/11/2023
DRG No:	5999	DESCRIPTION :	2D Topographical
		SURVEYED BY :	C.F. & R.D.
SHEET:	3 of 18	PROCESSED BY :	Jason Pringle
		CHECKED BY :	Alan Brady



4

APEX SURVEYS

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00353 1 691 0156

RURAL/NATURAL FEATURES :

BUSH
SAPLING
TREE
HEDGE
TROUGH
CATTLE GRID

LINEWORK:

EMBANKEMENT TOP
DRAIN
BREAKLINE
BUILDING
KERB BOTTOM
WALL
PATH/CHANGE SURFACE
O/HEAD ELECTRICITY
O/HEAD TELECOM

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT

SERVICES :

AIR VALVE	AV
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

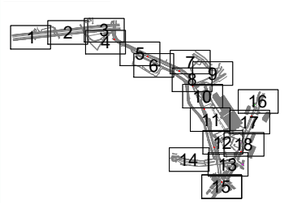
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



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CLIENT:

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GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

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No.	Date	Description
001	07/11/23	Original Drawing
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004	21/12/23	Contours Updated and Stations Added

PROJECT:

Dyke Road
Galway City

SCALE : 1/200 A1

DATE : 15/11/2023

DRG No: 5999

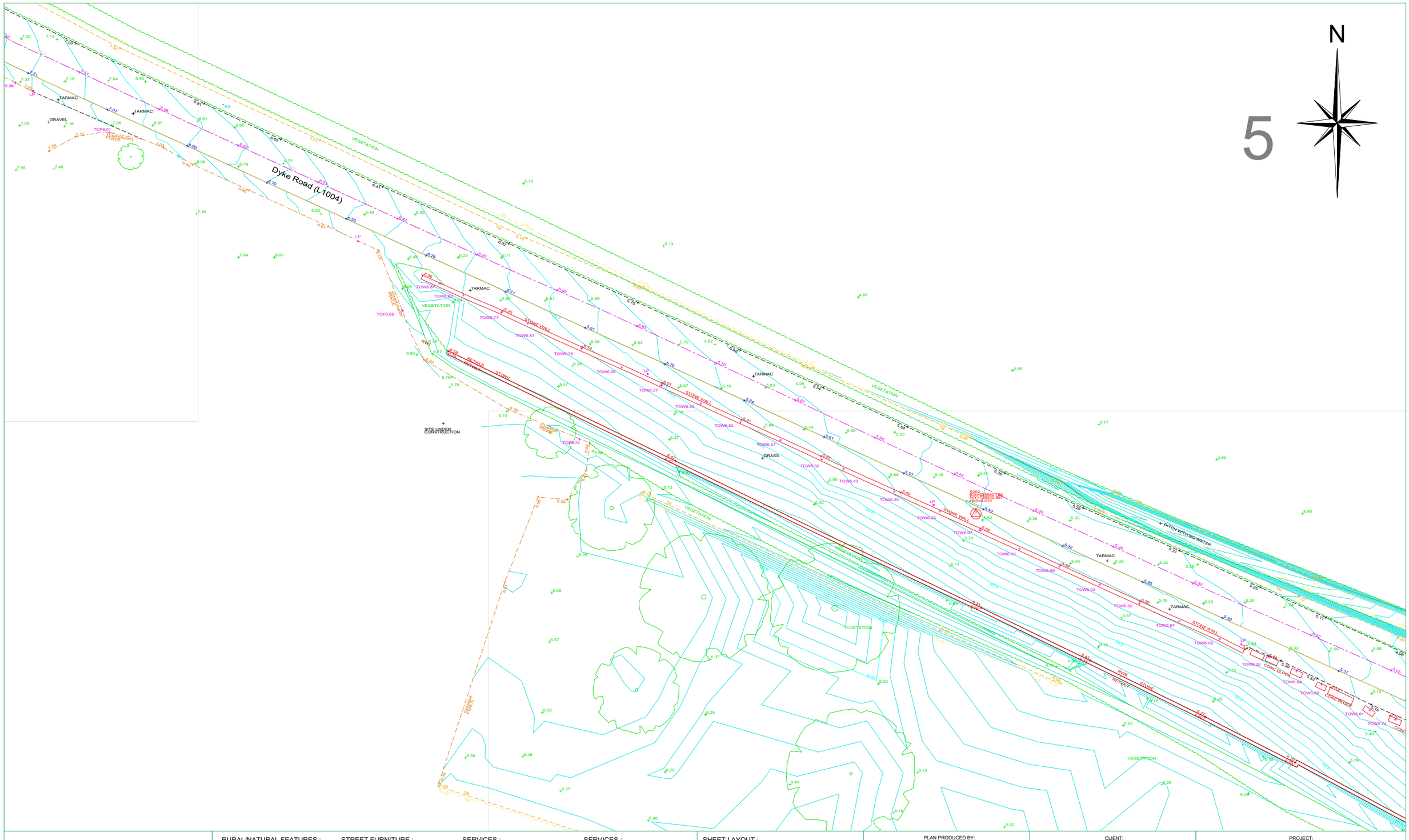
DESCRIPTION : 2D Topographical

SURVEYED BY : C.F. & R.D.

SHEET: 4 of 18

PROCESSED BY : Jason Pringle

CHECKED BY : Alan Brady



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00353 1 691 0156

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LINEWORK:

EMBANKEMENT TOP
DRAIN
BREAKLINE
BUILDING
KERB BOTTOM
WALL
PATH/CHANGE SURFACE
O/HEAD ELECTRICITY
O/HEAD TELECOM

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	ED
EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT

SERVICES :

AIR VALVE	AV
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
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GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

SERVICES :

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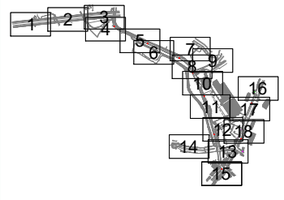
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+BED101.50
EAVE LEVEL	+E101.50
FLOOR LEVEL	+FL101.50
INVERT LEVEL	+IL101.50
ROAD LEVEL	+101.50
RIDGE LEVEL	+R101.50
SOFFIT LEVEL	+SL101.50
SPOT LEVEL	+101.50
TOP OF FENCE LEVEL	+TOF101.50
TOP OF WALL LEVEL	+TOW101.50
WATER LEVEL	+WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



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CLIENT:

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PROJECT:

Dyke Road
Galway City

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
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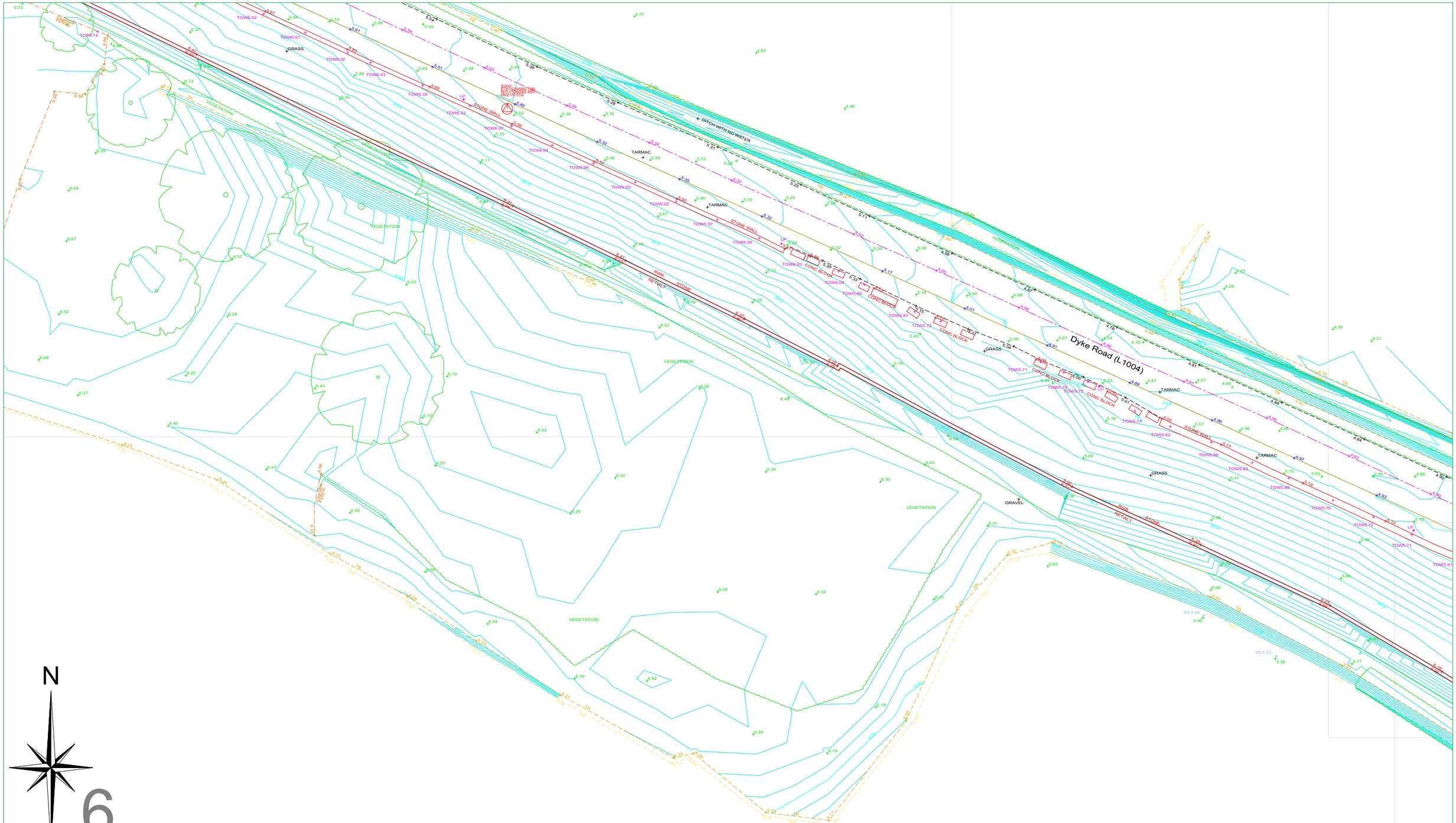
SCALE : 1/200 A1

DATE : 15/11/2023

DRG No: 5999

SHEET: 5 of 18

DESCRIPTION : 2D Topographical
SURVEYED BY : C.F. & R.D.
PROCESSED BY : Jason Pringle
CHECKED BY : Alan Brady



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BUILDING 101.50
KERB BOTTOM 101.50
WALL 101.50
PATH/CHANGE SURFACE 101.50
O/HEAD ELECTRICITY OE
O/HEAD TELECOM OT

STREET FURNITURE :

BOLLARDS	BD *
BORE HOLE	BH +
BUS STOP	BS *
CRASH BARRIER	CB
ELECTRICITY POLE	EP *
EARTHING ROD	ER +
GATE	
GROUND LIGHT	LT *
ILLUMINATED BOLLARD	BOL
LAMP POST	LP *
MARKER POST	MKR +
POST	POST *
POST BOX	POST BOX +
ROADSIGN	RS * RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP *
TRAFFIC LIGHT	TL *
TRIAL PIT	TPIT +

SERVICES :

AIR VALVE	AV +
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COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP o
ESAT COVER	ESAT
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ESB JUNCTION BOX	ESB BOX
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GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV *
STOPCOCK	ST *

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VENT	VENT *
WATER METER	WM +
UNABLE TO LIFT	UTO

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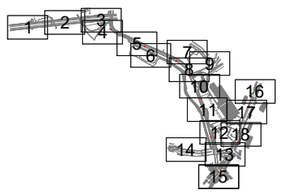
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



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CONTACT INFORMATION:

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CLIENT:

Client

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

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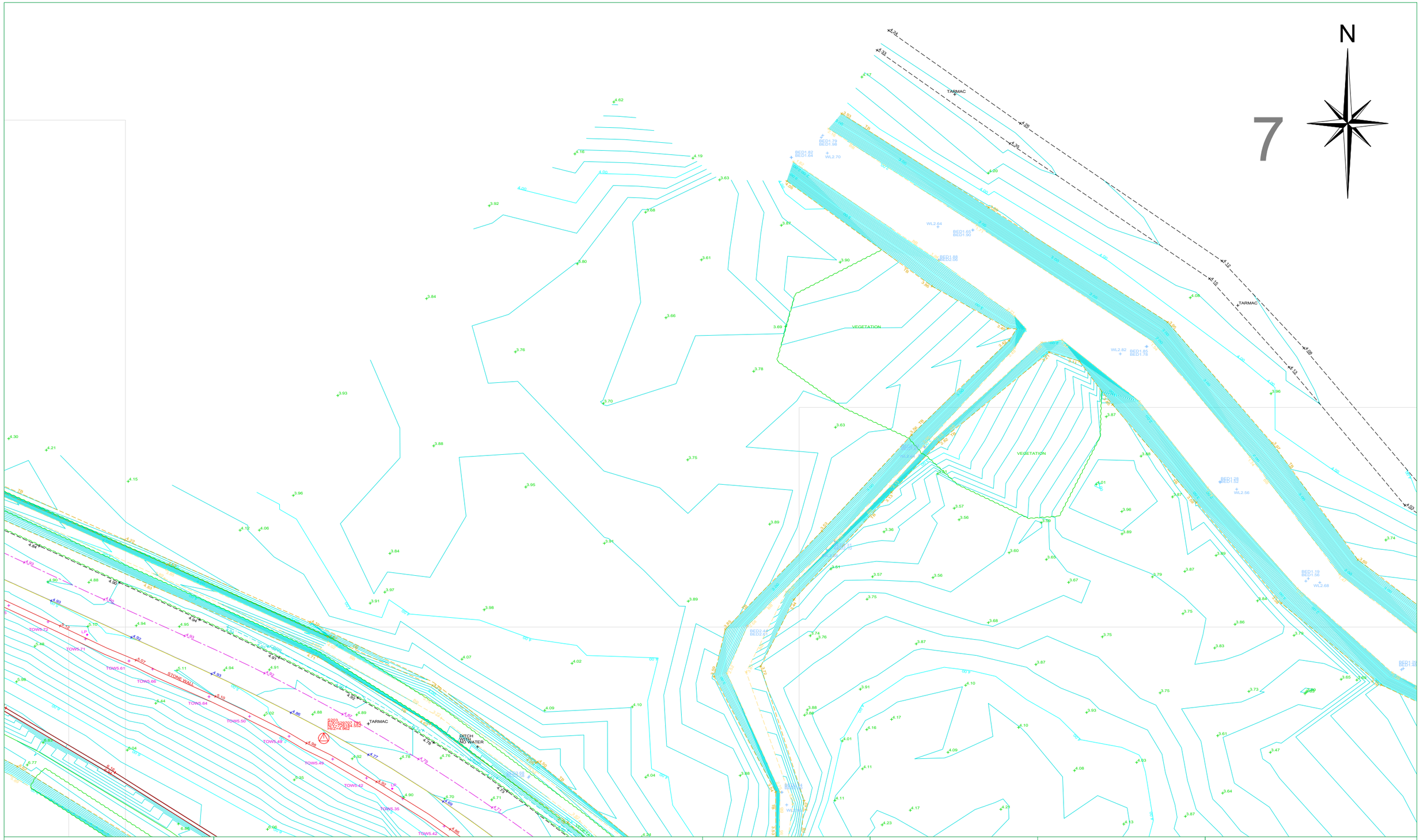
PROJECT:

Dyke Road
Galway City

SCALE :	1/200 A1	DATE :	15/11/2023
DRG No:	5999	DESCRIPTION :	2D Topographical
		SURVEYED BY :	C.F. & R.D.
SHEET:	6 of 18	PROCESSED BY :	Jason Pringle
		CHECKED BY :	Alan Brady



APEX SURVEYS

www.apexsurveys.ie
info@apexsurveys.ie
00353 1 691 0156

RURAL/NATURAL FEATURES :

- BUSH
- SAPLING
- TREE
- HEDGE
- TROUGH
- CATTLE GRID

LINEWORK:

EMBANKEMENT TOP	101.50
DRAIN	101.50
BREAKLINE	101.50
BUILDING	101.50
KERB BOTTOM	101.50
WALL	101.50
PATH/CHANGE SURFACE	101.50
O/HEAD ELECTRICITY	OE
O/HEAD TELECOM	OT

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT

SERVICES :

AIR VALVE	AV
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

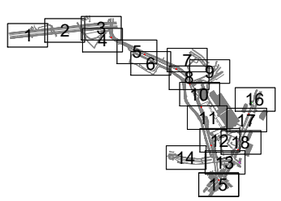
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



PLAN PRODUCED BY:

APEX SURVEYS

CONTACT INFORMATION:

Apex Surveys
Unit 78 Dunboyne Business Park
Dunboyne, Co. Meath, Ireland
www.apexsurveys.ie
info@apexsurveys.ie
00353 1 691 0156

CLIENT:

Client

PROJECT:

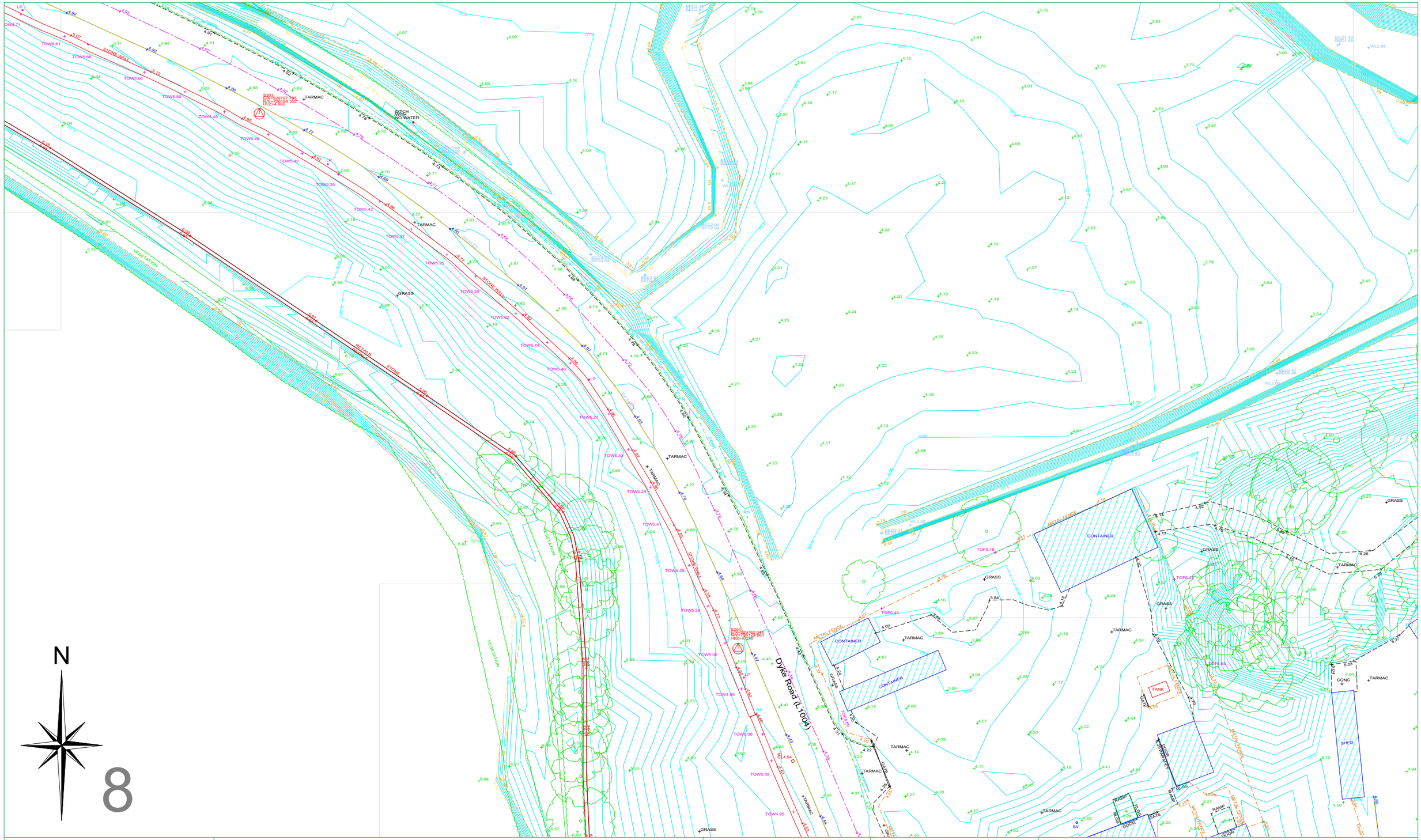
Dyke Road
Galway City

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	07/11/23	Original Drawing
002	15/11/23	Car Park Added
003	12/12/23	Additional TOW Levels Added
004	21/12/23	Contours Updated and Stations Added

SCALE :	1/200 A1	DATE :	15/11/2023
DRG No:	5999	DESCRIPTION :	2D Topographical
		SURVEYED BY :	C.F. & R.D.
SHEET:	7 of 18	PROCESSED BY :	Jason Pringle
		CHECKED BY :	Alan Brady



8

APEX SURVEYS

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RURAL/NATURAL FEATURES :

BUSH
SAPLING
TREE
HEDGE
TROUGH
CATTLE GRID

LINEWORK:

EMBANKEMENT TOP	101.50
DRAIN	101.50
BREAKLINE	101.50
BUILDING	101.50
KERB BOTTOM	101.50
WALL	101.50
PATH/CHANGE SURFACE	101.50
O/HEAD ELECTRICITY	OE
O/HEAD TELECOM	OT

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH+
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER+
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX +
ROADSIGN	RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT +

SERVICES :

AIR VALVE	AV+
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

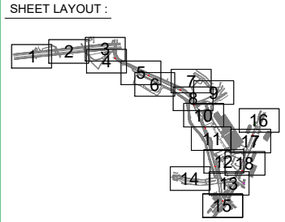
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM+
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



PLAN PRODUCED BY:

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CONTACT INFORMATION:

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00353 1 691 0156

CLIENT:

Client

PROJECT:

Dyke Road
Galway City

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

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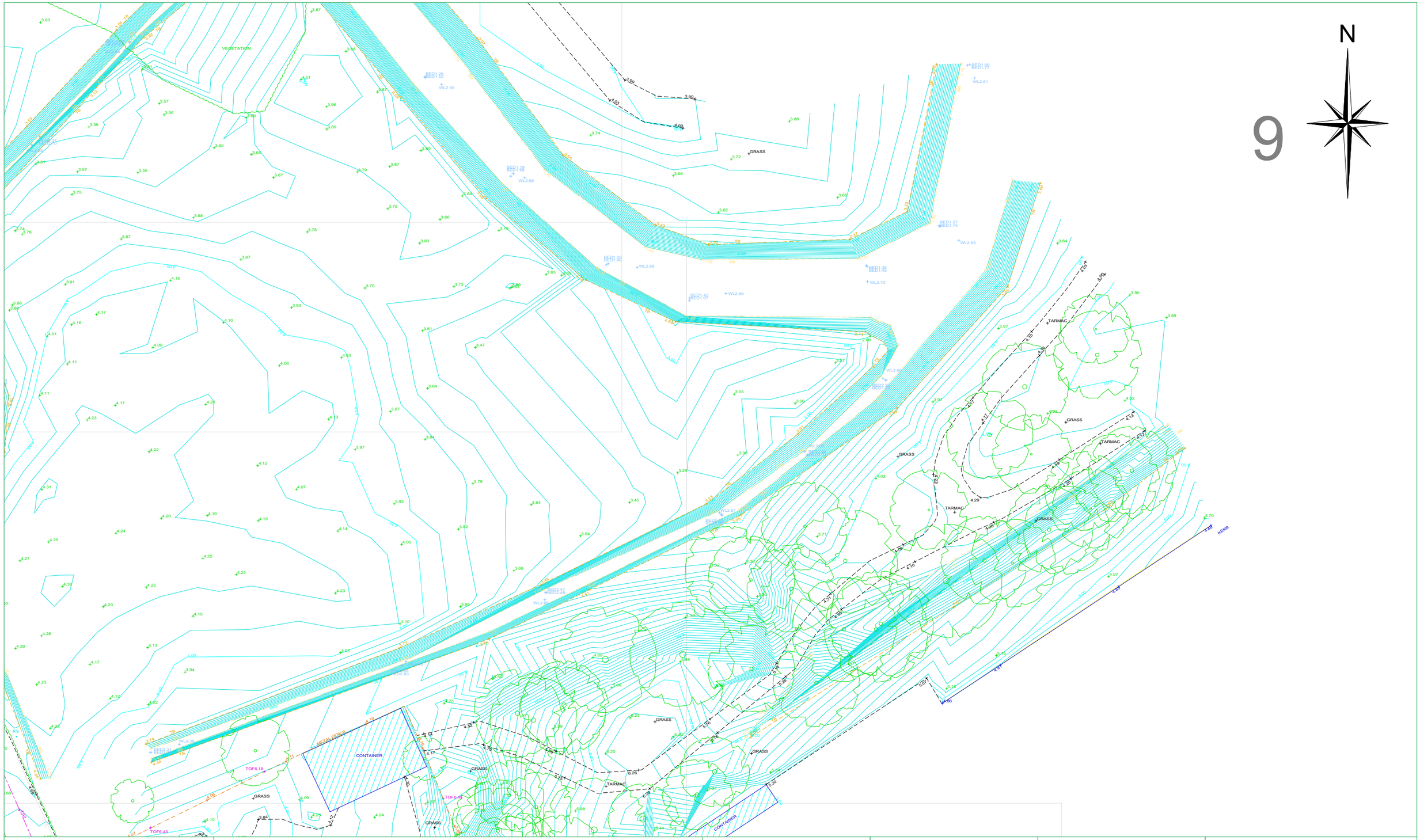
SCALE :	1/200 A1	DATE :	15/11/2023
DRG No:	5999	DESCRIPTION :	2D Topographical
		SURVEYED BY :	C.F. & R.D.
SHEET:	8 of 18	PROCESSED BY :	Jason Pringle
		CHECKED BY :	Alan Brady



RURAL/NATURAL FEATURES :

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SAPLING
TREE
HEDGE
TROUGH
CATTLE GRID

LINEWORK:

EMBANKEMENT TOP	101.50
DRAIN	101.50
BREAKLINE	101.50
BUILDING	101.50
KERB BOTTOM	101.50
WALL	101.50
PATH/CHANGE SURFACE	101.50
O/HEAD ELECTRICITY	OE
O/HEAD TELECOM	OT

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
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GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT

SERVICES :

AIR VALVE	AV
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EIRCOM JUNCTION BOX	EIRCOM BOX
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ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
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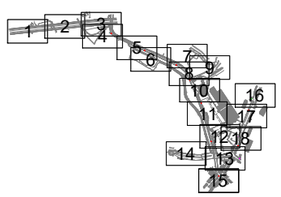
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



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PROJECT:

Dyke Road
Galway City

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	07/11/23	Original Drawing
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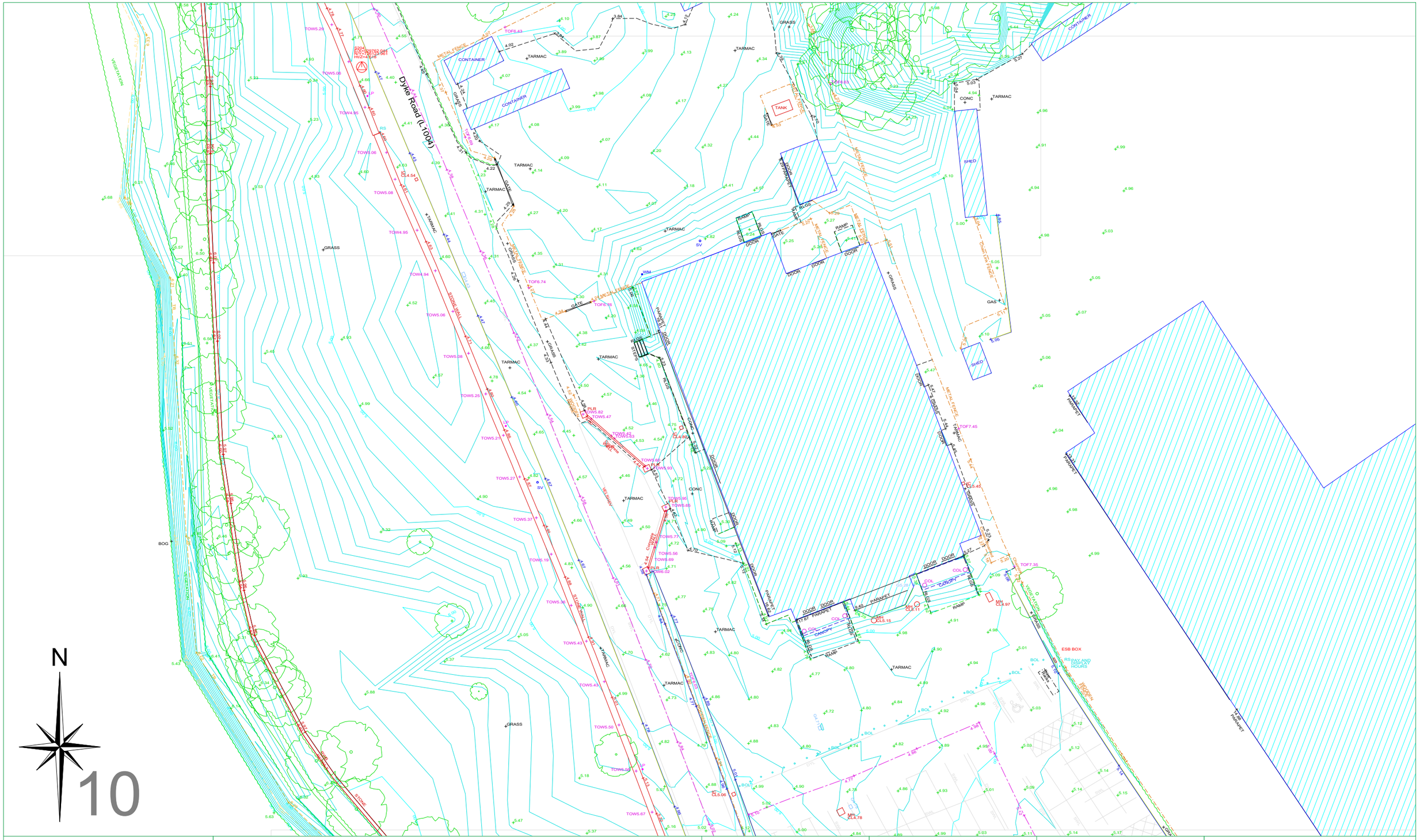
003	12/12/23	Additional TOW Levels Added
004	21/12/23	Contours Updated and Stations Added

SCALE :	1/200 A1	DATE :	15/11/2023
DRG No:	5999	DESCRIPTION :	2D Topographical
		SURVEYED BY :	C.F. & R.D.
SHEET:	9 of 18	PROCESSED BY :	Jason Pringle
		CHECKED BY :	Alan Brady



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RURAL/NATURAL FEATURES :

BUSH
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CATTLE GRID

LINEWORK:

EMBANKEMENT TOP	101.50
DRAIN	101.50
BREAKLINE	101.50
BUILDING	101.50
KERB BOTTOM	101.50
WALL	101.50
PATH/CHANGE SURFACE	101.50
O/HEAD ELECTRICITY	OE
O/HEAD TELECOM	OT

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH +
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER +
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR +
POST	POST
POST BOX	POST BOX +
ROADSIGN	RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT +

SERVICES :

AIR VALVE	AV +
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
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GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

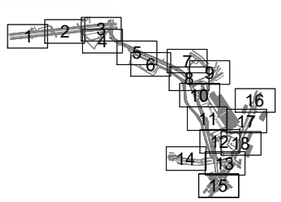
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM +
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



PLAN PRODUCED BY:

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CONTACT INFORMATION:

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Dunboyne, Co. Meath, Ireland
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info@apexsurveys.ie
00353 1 691 0156

CLIENT:

Client

PROJECT:

Dyke Road
Galway City

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	07/11/23	Original Drawing
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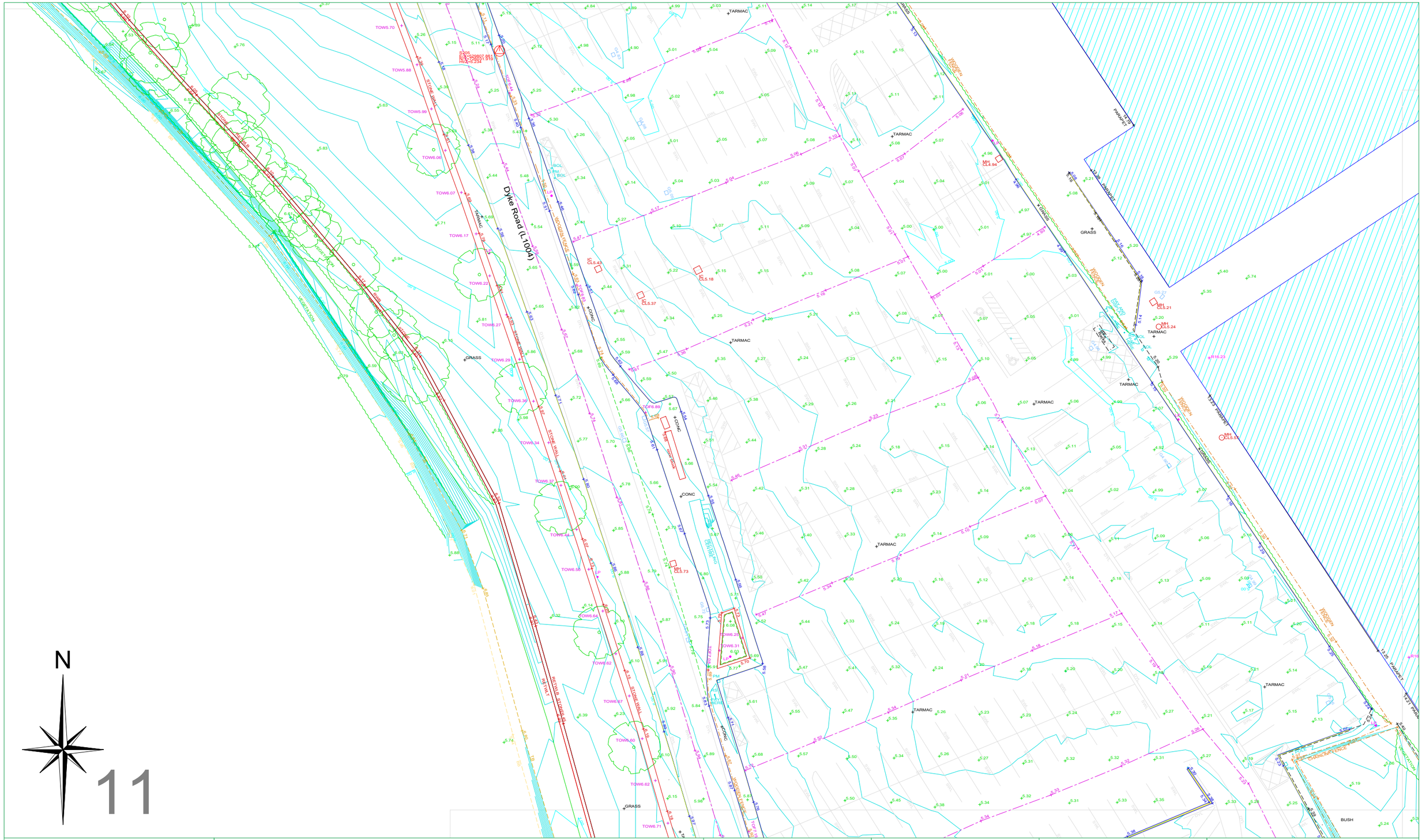
003	12/12/23	Additional TOW Levels Added
004	21/12/23	Contours Updated and Stations Added

SCALE :	1/200 A1	DATE :	15/11/2023
DRG No:	5999	DESCRIPTION :	2D Topographical
		SURVEYED BY :	C.F. & R.D.
SHEET:	10 of 18	PROCESSED BY :	Jason Pringle
		CHECKED BY :	Alan Brady



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00353 1 691 0156

RURAL/NATURAL FEATURES :

BUSH
SAPLING
TREE
HEDGE
TROUGH
CATTLE GRID

LINEWORK:

EMBANKEMENT TOP 101.50
DRAIN 101.50
BREAKLINE 101.50
BUILDING 101.50
KERB BOTTOM 101.50
WALL 101.50
PATH/CHANGE SURFACE 101.50
O/HEAD ELECTRICITY
O/HEAD TELECOM

STREET FURNITURE :

BOLLARDS	BD *
BORE HOLE	BH +
BUS STOP	BS *
CRASH BARRIER	CB
ELECTRICITY POLE	EP *
EARTHING ROD	ER +
GATE	
GROUND LIGHT	LT *
ILLUMINATED BOLLARD	BOL
LAMP POST	LP *
MARKER POST	MKR
POST	POST *
POST BOX	POST BOX +
ROADSIGN	RS *
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP *
TRAFFIC LIGHT	TL *
TRIAL PIT	TPIT +

SERVICES :

AIR VALVE	AV +
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH *
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV *
STOPCOCK	ST *

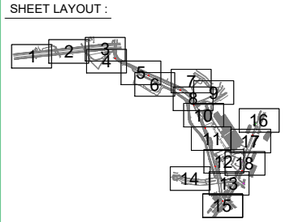
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT *
WATER METER	WM +
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



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CLIENT:

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PROJECT:

Dyke Road
Galway City

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
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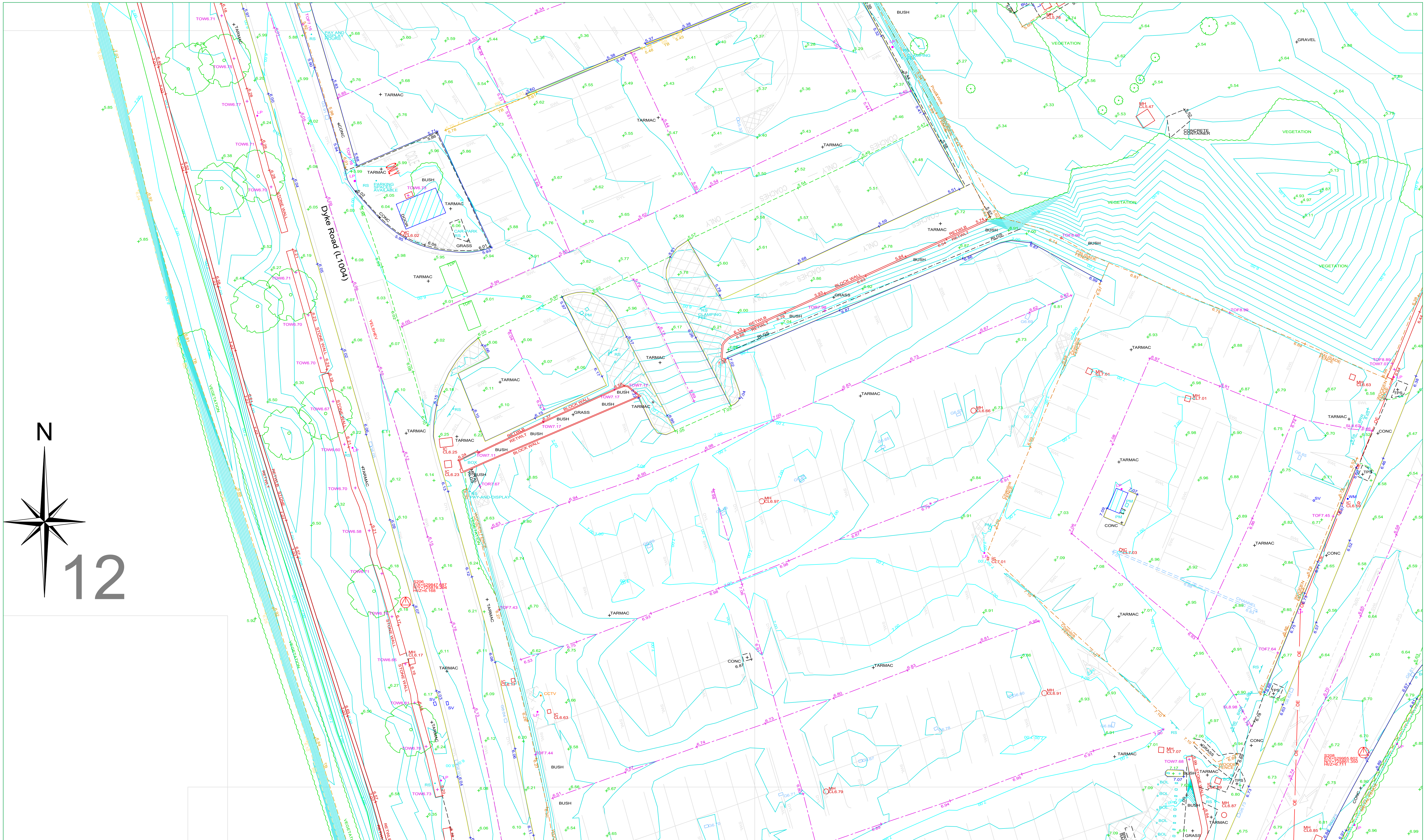
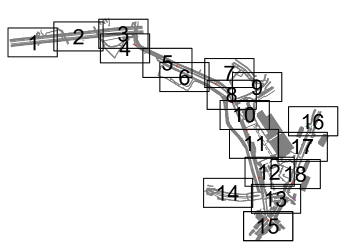
SCALE :	1/200 A1	DATE :	15/11/2023
DRG No:	5999	DESCRIPTION :	2D Topographical
		SURVEYED BY :	C.F. & R.D.
SHEET:	11 of 18	PROCESSED BY :	Jason Pringle
		CHECKED BY :	Alan Brady





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RURAL/NATURAL FEATURES :

BUSH	
SAPLING	
TREE	
HEDGE	
TROUGH	TR
CATTLE GRID	GRID

LINEWORK:

EMBANKEMENT TOP	101.50
DRAIN	101.50
BREAKLINE	101.50
BUILDING	101.50
KERB BOTTOM	101.50
WALL	101.50
PATH/CHANGE SURFACE	101.50
O/HEAD ELECTRICITY	OE
O/HEAD TELECOM	OT

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
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MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS RS
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SLUICE VALVE	SV
STOPCOCK	ST

SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	BED101.50
EAVE LEVEL	E101.50
FLOOR LEVEL	FL101.50
INVERT LEVEL	IL101.50
ROAD LEVEL	101.50
RIDGE LEVEL	R101.50
SOFFIT LEVEL	SL101.50
SPOT LEVEL	101.50
TOP OF FENCE LEVEL	TOF101.50
TOP OF WALL LEVEL	TOW101.50
WATER LEVEL	WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :

PLAN PRODUCED BY:

APEX SURVEYS

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CLIENT:

Client

PROJECT:

Dyke Road Galway City

GRID SYSTEM: Irish Transverse Mercator
DATUM: Malin Head (OSGM15)
NOTES: Drawing Contains Scale Factor

REVISIONS:

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SCALE : 1/200 A1

DATE : 15/11/2023

DRG No: 5999

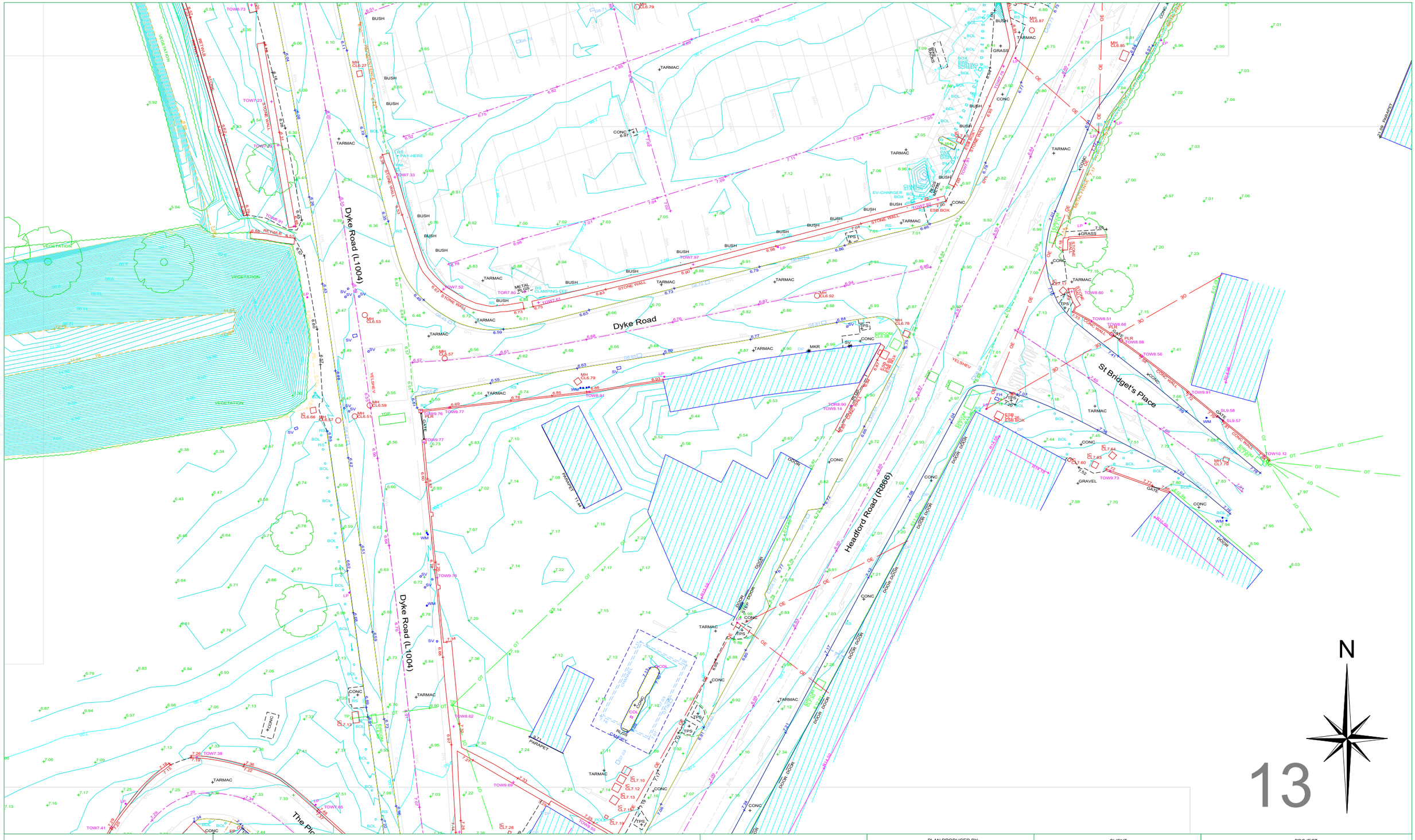
DESCRIPTION : 2D Topographical

SURVEYED BY : C.F. & R.D.

PROCESSED BY : Jason Pringle

CHECKED BY : Alan Brady

SHEET: 12 of 18



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BORE HOLE	BH
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS: RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT

SERVICES :

AIR VALVE	AV
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

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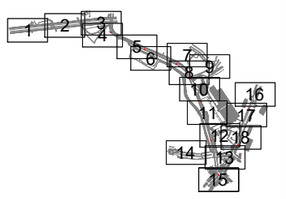

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00353 1 691 0156

CLIENT:

Client

PROJECT:

Dyke Road
Galway City

GRID SYSTEM: Irish Transverse Mercator
DATUM: Malin Head (OSGM15)
NOTES: Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	07/11/23	Original Drawing
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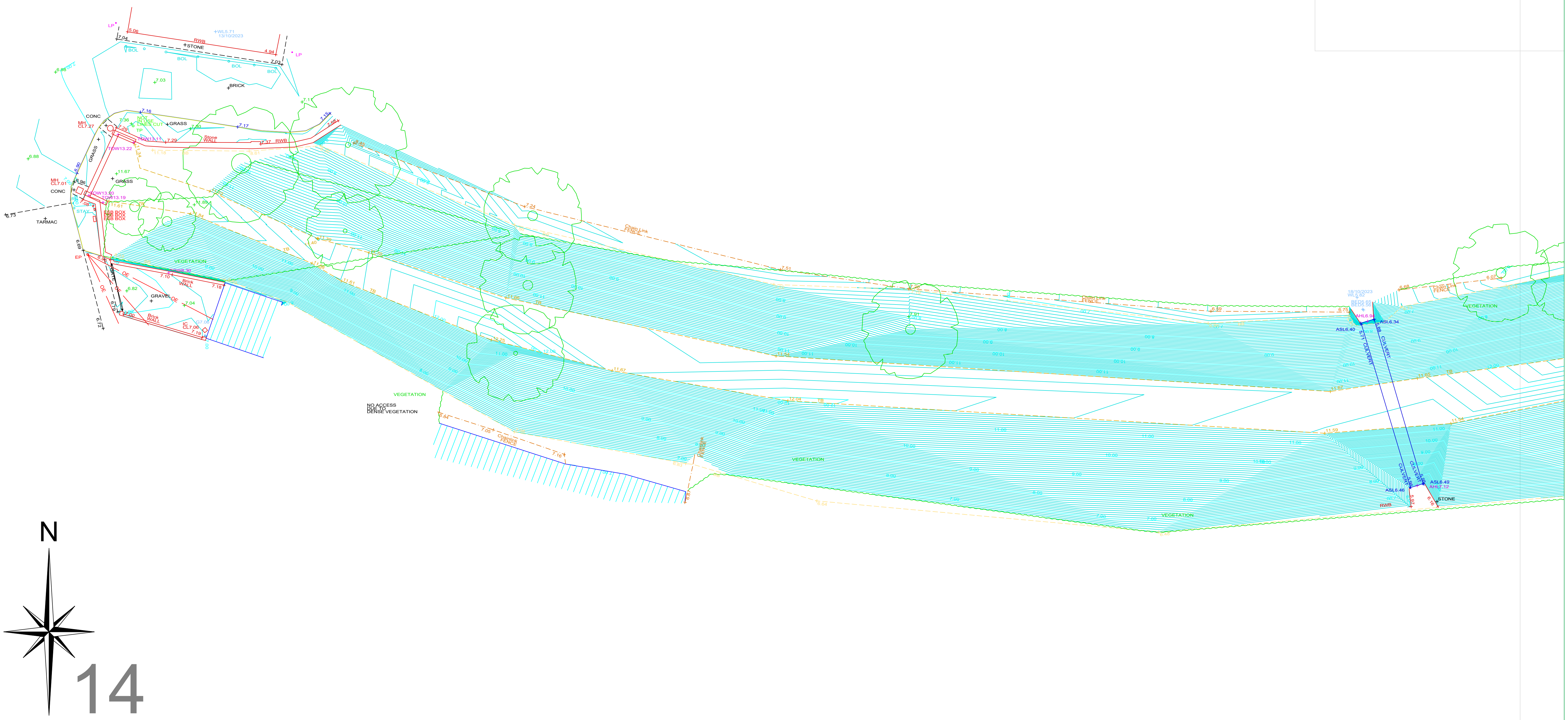
SCALE : 1/200 A1

DATE : 15/11/2023

DRG No: 5999

SHEET: 13 of 18

DESCRIPTION : 2D Topographical
SURVEYED BY : C.F. & R.D.
PROCESSED BY : Jason Pringle
CHECKED BY : Alan Brady



RURAL/NATURAL FEATURES :

BUSH
SAPLING
TREE
HEDGE
TROUGH — TR
CATTLE GRID — GRID

LINEWORK:

EMBANKEMENT TOP — 101.50
DRAIN — 101.50
BREAKLINE — 101.50
BUILDING — 101.50
KERB BOTTOM — 101.50
WALL — 101.50
PATH/CHANGE SURFACE — 101.50
O/HEAD ELECTRICITY — OE
O/HEAD TELECOM — OT

STREET FURNITURE :

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CRASH BARRIER — CB
ELECTRICITY POLE — EP
EARTHING ROD — ER
GATE
GROUND LIGHT — LT
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POST BOX — POST BOX
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EIRCOM JUNCTION BOX — EIRCOM BOX
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GAS VALVE — GV
GULLY — G
INSPECTION COVER — IC
MANHOLE — MH
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SLUICE VALVE — SV
STOPCOCK — ST

SERVICES :

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TRAFFIC COVER — TLIC
VENT — VENT
WATER METER — WM
UNABLE TO LIFT — UTO

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SPOT LEVEL — 101.50
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TOP OF WALL LEVEL — TOW101.50
WATER LEVEL — WL101.50
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

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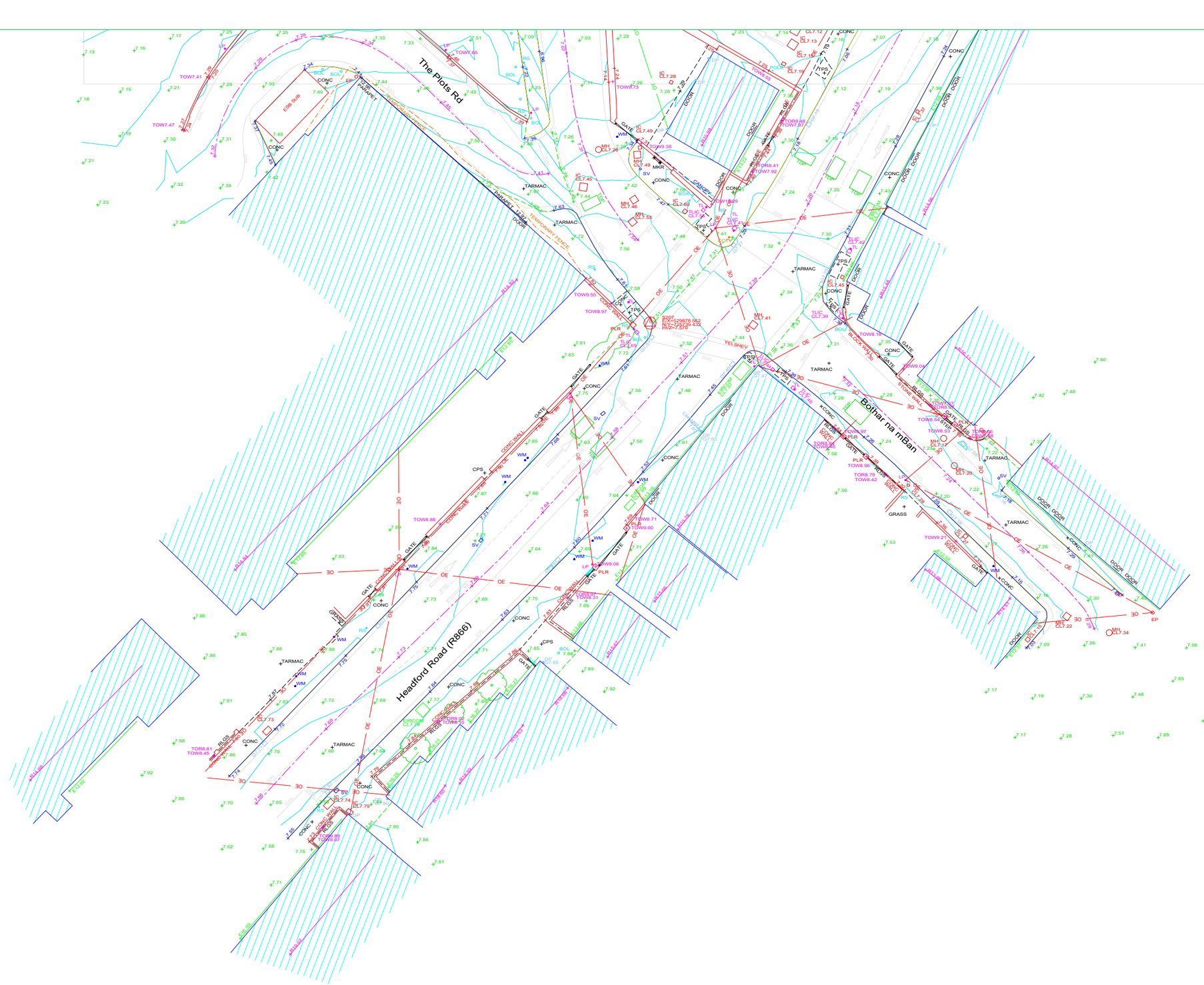
		CHECKED BY :	Alan Brady



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CATTLE GRID

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BUILDING +101.50
KERB BOTTOM +101.50
WALL +101.50
PATH/CHANGE SURFACE +101.50
O/HEAD ELECTRICITY oe
O/HEAD TELECOM ot

STREET FURNITURE :

BOLLARDS BD *
BORE HOLE BH +
BUS STOP BS *
CRASH BARRIER CB
ELECTRICITY POLE EP *
EARTHING ROD ER +
GATE
GROUND LIGHT LT *
ILLUMINATED BOLLARD BOL
LAMP POST LP *
MARKER POST MKR
POST POST *
POST BOX POST BOX +
ROADSIGN RS * RS
SIGN POST SIGN
TELEPHONE BOX TB
TELEPHONE POLE TP *
TRAFFIC LIGHT TL *
TRIAL PIT TPIT +

SERVICES :

AIR VALVE AV +
ARMSTRONG JUNCTION AJ
CABLE TV IC CATV
COVER LEVEL CL
EIRCOM COVER EIRCOM
EIRCOM JUNCTION BOX EIRCOM BOX
ELECTRICAL CABLE PIT ECP
ESAT COVER ESAT
ESB COVER ESB
ESB JUNCTION BOX ESB BOX
FIRE HYDRANT FH *
GAS VALVE GV
GULLY G
INSPECTION COVER IC
MANHOLE MH
SEPTIC TANK SEPTIC
SLUICE VALVE SV *
STOPCOCK ST *

SERVICES :

SERVICE BOX (UNKNOWN) BOX
TRAFFIC COVER TLIC
VENT VENT *
WATER METER WM +
UNABLE TO LIFT UTO

LEVELS :

BED LEVEL + BED101.50
EAVE LEVEL + E101.50
FLOOR LEVEL + FL101.50
INVERT LEVEL + IL101.50
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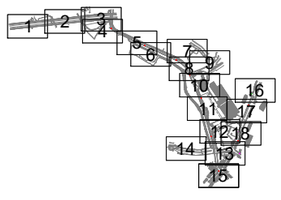
WATER LEVEL + WL101.50
SURVEY CONTROL STATION

SHEET LAYOUT :



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Dyke Road
Galway City

SCALE :	1/200 A1	DATE :	15/11/2023
DRG No:	5999	DESCRIPTION :	2D Topographical
		SURVEYED BY :	C.F. & R.D.
SHEET:	15 of 18	PROCESSED BY :	Jason Pringle
		CHECKED BY :	Alan Brady

16

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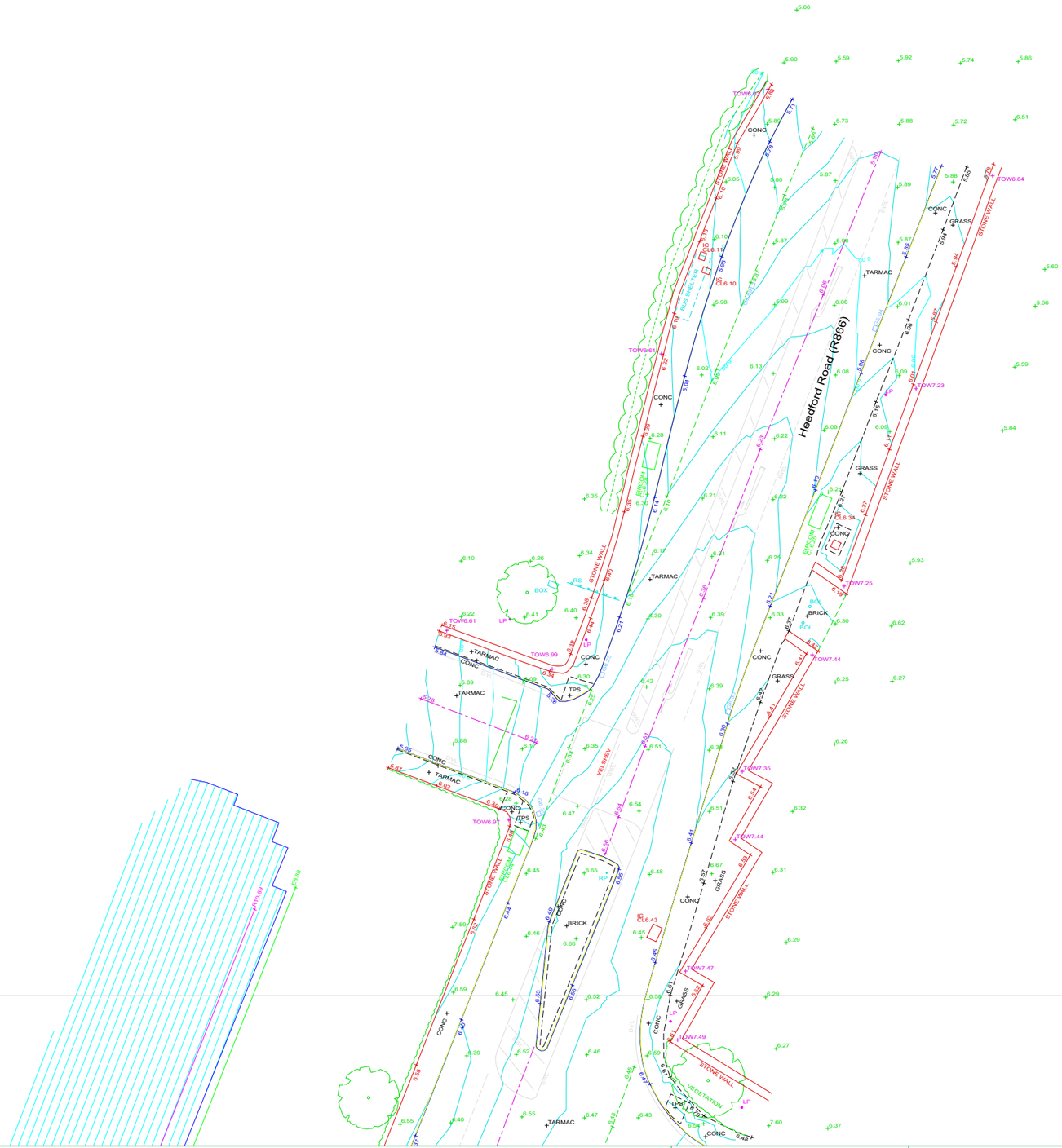

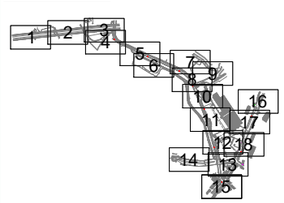

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WALL
PATH/CHANGE SURFACE
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O/HEAD TELECOM

STREET FURNITURE :

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BUS STOP
CRASH BARRIER
ELECTRICITY POLE
EARTHING ROD
GATE
GROUND LIGHT
ILLUMINATED BOLLARD
LAMP POST
MARKER POST
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POST BOX
ROADSIGN
SIGN POST
TELEPHONE BOX
TELEPHONE POLE
TRAFFIC LIGHT
TRIAL PIT

SERVICES :

AIR VALVE
ARMSTRONG JUNCTION
CABLE TV IC
COVER LEVEL
EIRCOM COVER
EIRCOM JUNCTION BOX
ELECTRICAL CABLE PIT
ESAT COVER
ESB COVER
ESB JUNCTION BOX
FIRE HYDRANT
GAS VALVE
GULLY
INSPECTION COVER
MANHOLE
SEPTIC TANK
SLUICE VALVE
STOPCOCK

SERVICES :

SERVICE BOX (UNKNOWN)
TRAFFIC COVER
VENT
WATER METER
UNABLE TO LIFT

LEVELS :

BED LEVEL
EAVE LEVEL
FLOOR LEVEL
INVERT LEVEL
ROAD LEVEL
RIDGE LEVEL
SOFFIT LEVEL
SPOT LEVEL
TOP OF FENCE LEVEL
TOP OF WALL LEVEL
WATER LEVEL
SURVEY CONTROL STATION

SHEET LAYOUT :

PLAN PRODUCED BY:

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Dunboyne, Co. Meath, Ireland
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info@apexsurveys.ie
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CLIENT:

Client

PROJECT:

Dyke Road
Galway City

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

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DATE : 15/11/2023

DRG No: 5999

SHEET: 16 of 18

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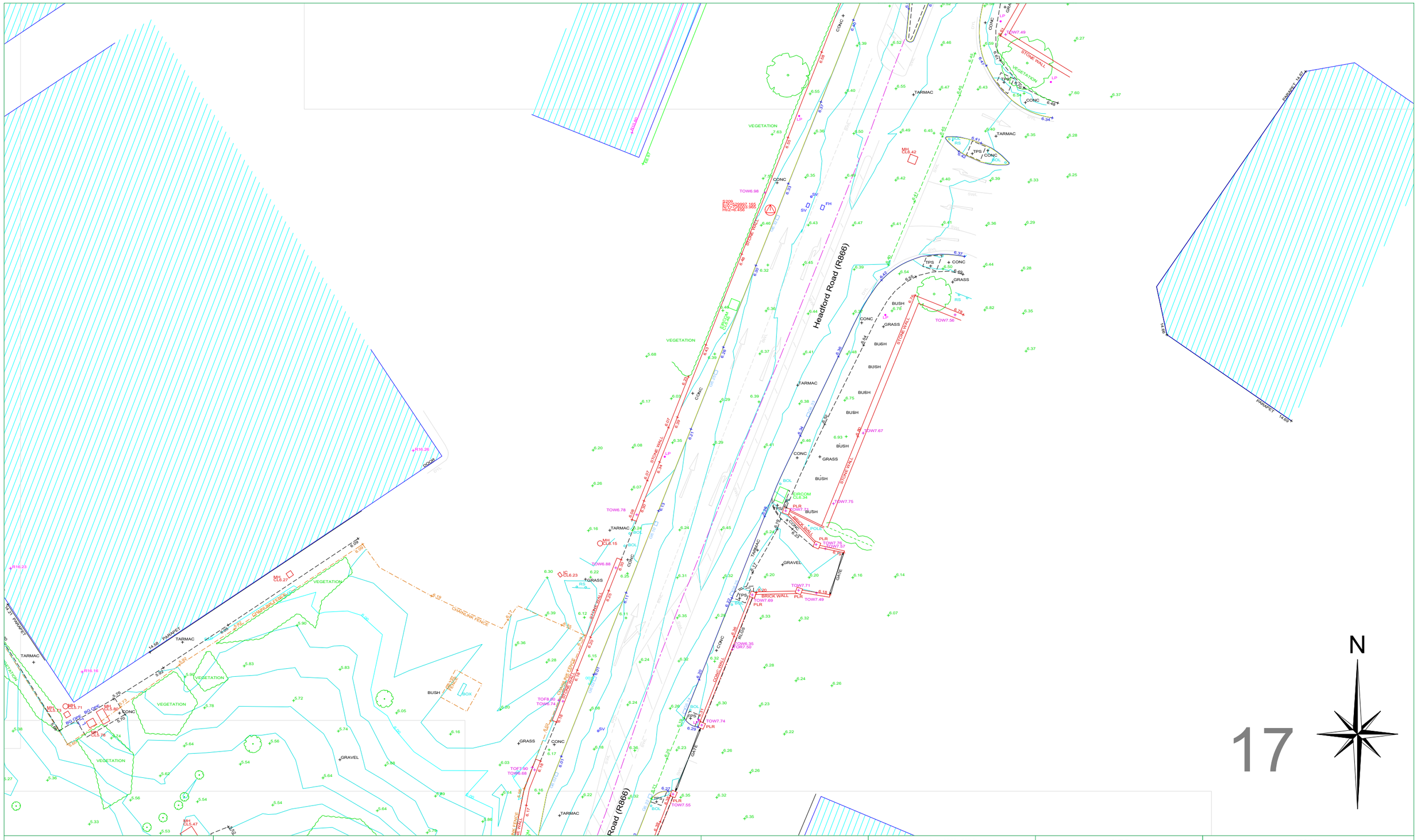
SURVEYED BY : C.F. & R.D.

PROCESSED BY : Jason Pringle

CHECKED BY : Alan Brady



RURAL/NATURAL FEATURES :

BUSH
SAPLING
TREE
HEDGE
TROUGH
CATTLE GRID

LINEWORK:

EMBANKEMENT TOP	101.50
DRAIN	101.50
BREAKLINE	101.50
BUILDING	101.50
KERB BOTTOM	101.50
WALL	101.50
PATH/CHANGE SURFACE	101.50
O/HEAD ELECTRICITY	OE
O/HEAD TELECOM	OT

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS: RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT

SERVICES :

AIR VALVE	AV
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

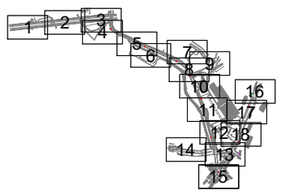
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



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Galway City

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DRG No: 5999

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SHEET: 17 of 18

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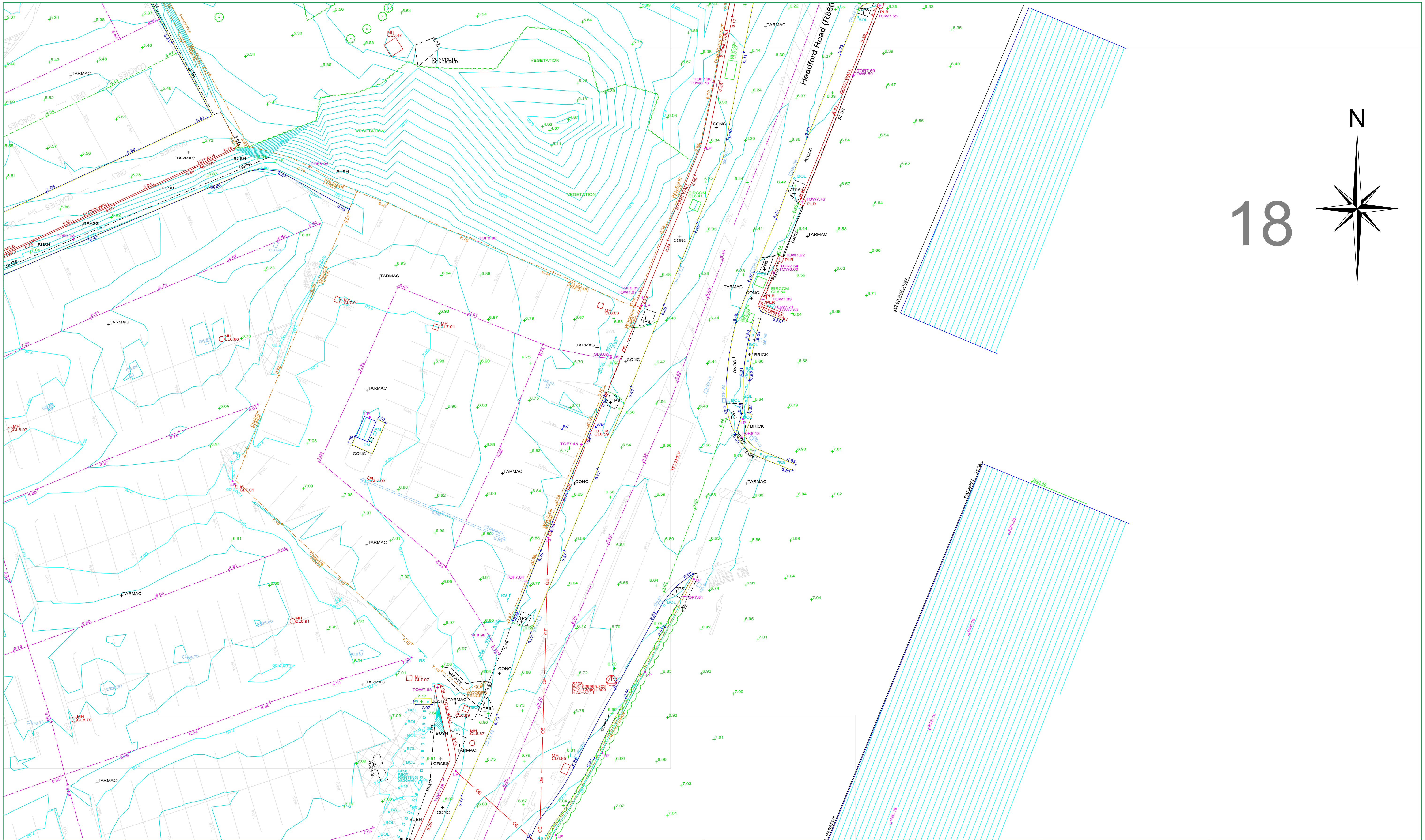

RURAL/NATURAL FEATURES :

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TREE
HEDGE
TROUGH — TR
CATTLE GRID — GRID

LINEWORK:

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BUILDING — 101.50
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STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
BUS STOP	BS
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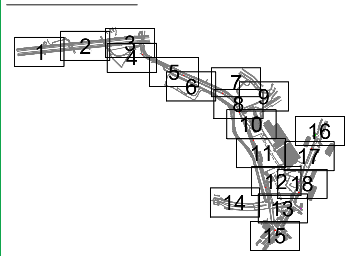

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Appendix D Hydraulic Flood Modelling

ARUP

Aecom

Corrib Causeway Phase 1, Dyke Road

Hydraulic Model Assessment of Proposed Development

Reference:

Final Issue | March 18 2025

Job number 304010-00

Ove Arup & Partners Ireland Limited
One Albert Quay
Cork
T12 X8N6
Ireland
arup.com

ARUP

Document Verification

Project title	Corrib Causeway Phase 1
Document title	Hydraulic Model Assessment of Proposed Development
Job number	304010-00
Document ref	
File reference	

Revision	Date				
		Filename	304010_LDA_DykeRoad_Develeopment_HydraulicsChapter		
Issue 1	08 January 2025	**Description**	Issue for planning		
			Prepared by	**Checked by**	**Approved by**
		Name	Livia Almeida	Cian Buckley	Rodoula Gregoriou
		Signature			
Final Draft	13 March 2025	**Filename**	304010_GCC_DykeRoad_Develeopment_HydraulicsChapter		
		Description	AGL and Aecom comments addressed		
			Prepared by	**Checked by**	**Approved by**
		Name	Livia Almeida	Cian Buckley	Bairbre O'Breasail
		Signature			
Final Issue	18 March 2025	**Filename**	304010_GCC_DykeRoad_Develeopment_HydraulicsChapter		
		Description	Final issue for planning		
			Prepared by	**Checked by**	**Approved by**
		Name	Livia Almeida	Cian Buckley	Bairbre O'Breasail
		Signature		Cian Buckley	Bairbre O'Breasail

Issue Document Verification with Document ✓

Contents

Tables

Figures

Appendices

1. Introduction

1.1 Context

Arup has been commissioned by Aecom to undertake hydraulic modelling to support the planning application for the Corrib Causeway Phase 1 Project on behalf of Galway City Council (GCC). The proposed site is on Phase 1 lands on an existing carpark along the Dyke Road in Galway. The location of the proposed development is shown in Figure 1.

Figure 1 Site Location Map (Google Satellite)

The Dyke Road site forms part of a strategic brownfield landbank located on the edge of Galway City Centre which has been identified for comprehensive redevelopment by GCC. Phase 1 lands, presented in Figure 2, with approximately 1.144 ha, designated for residential development (Highly Vulnerable Development), are going to be the lands concerned in this statement.

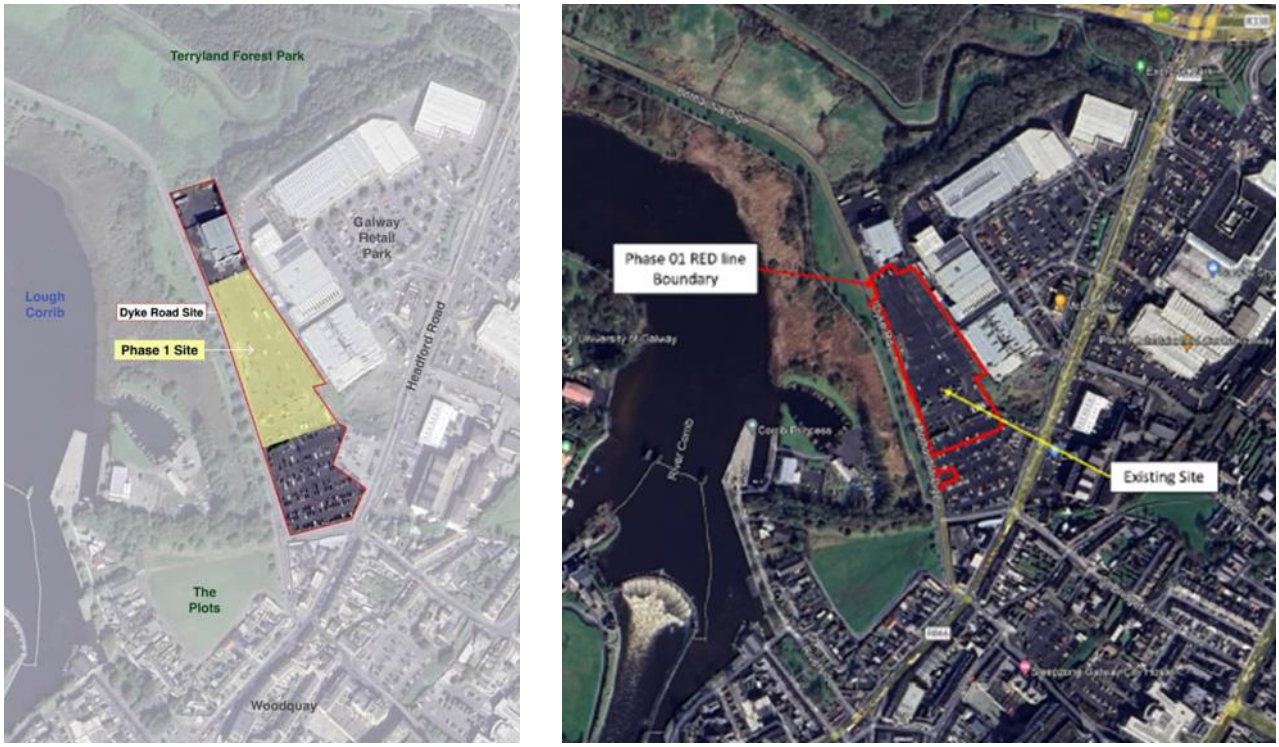


Figure 2 Phase 1, Tóchar na Coiribe Vision (MOLA Architecture 2023)

The topography of the entire site naturally falls from south to north, with a gradient of approximately 1:100. A topographic survey undertaken by Apex Surveys in October 2023 of the overall landholding indicates that the ground levels on the lands typically range from 4.8mOD to 5.9mOD, with the level in the centre of the site typically being around 5.3mOD. There is a small retaining wall in the southern portion of the site where the car park levels step up from about 6.0mOD to around 7.0mOD. It should be noted that the entire site is hardstanding.

The proposed development will consist of the construction of a new residential development of 219 no. apartment units and a childcare facility (approx. 241 sq. m) in the form of 1 no. new residential block (5 - 9 storeys over lower ground floor level) with associated car parking, bicycle parking, public and communal open spaces, and all ancillary works on a site area of 1.144 ha.

1.2 Scope

The scope of the hydraulic modelling for the purposes of the Site Specific Flood Risk Assessment (SSFRA) is outlined below:

- Reconfigure the Coirib go Cósta (Galway City Flood Relief Scheme) existing scenario model (i.e. no Flood Relief Scheme in place) to represent the pre-development scenario at the site (Scenario 1);
- Reconfigure the Coirib go Cósta existing scenario model to represent the post-development scenario at the site;
  - Scenario 2 – proposed development ground regrading
  - Scenario 3 - proposed development ground regrading and inclusion of walls/ louvres and building footprint
- Set up and run the Q100 (1 in 100 year flood event/1% Annual Exceedance Probability) and Q1000 (1 in 1000 year flood event/ 0.1% Annual Exceedance Probability) models for the various scenarios/climate epochs as per Table 1. The climate epochs include the Current Scenario (i.e. no climate change), the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS).
- Undertake a sensitivity analysis (one) on the set up of the model by removing the Terryland Waterworks penstock to assess flood risk at the site should there be a change to existing arrangements at the

Waterworks. The sensitivity analysis will be undertaken for the Q100 MRFS event post development scenario (Scenario 3);

- Extract results from the model and issue to Aecom;
- Produce a Hydraulics chapter to be appended to the SSFRA prepared by AECOM, describing the work undertaken and outcomes of modelling exercise.

The scenarios assessed for each flood event and epoch are shown in Table 1 below.

Table 1 Scenarios assessed as part of the hydraulic modelling

Scenario	Current	Mid-Range Future Scenario (MRFS)	High-End Future Scenario (HEFS)
Scenario 1	Q100, Q1000	Q100, Q1000	Q100, Q1000
Scenario 2		Q1000	
Scenario 3	Q100, Q1000	Q100, Q1000	Q100, Q1000
Scenario 3 – Terryland sensitivity analysis		Q100	

2. Model Setup

2.1 Baseline Model

The existing Coirib go Cósta project model has been used as a baseline model for the GCC Corrib Causeway Project assessment. This is a 1D/2D model (Flood Modeller Pro/ Tuflow) which has been used to assess the existing flood risk and proposed FRS for the River Corrib and its main tributaries for the reaches in the Galway Area. The model set up including calibration and validation of the baseline model has been approved by the OPW and is detailed in the Hydraulics Report. The report is also approved now but it is not currently publicly available. The 1D/2D model in OpenStreetMap and Flood Modeller are respectively presented in Figure 3 and Figure 4.

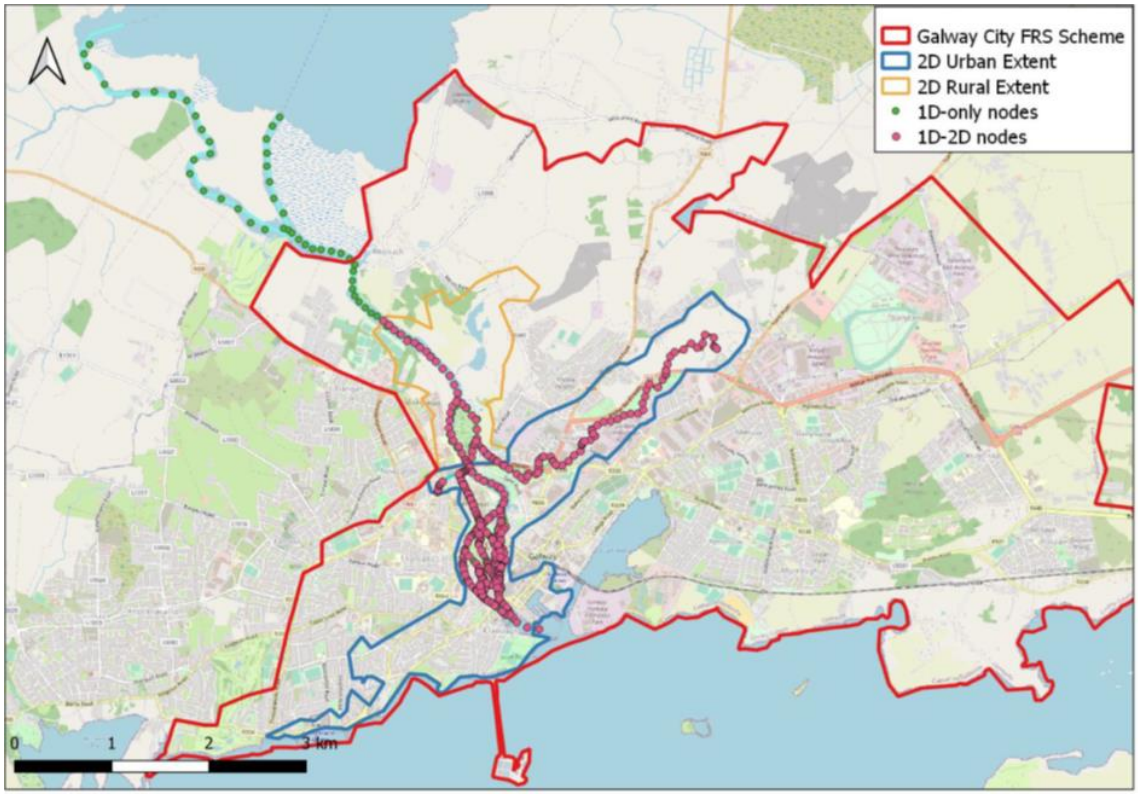


Figure 3 Fluvial/tidal model - 2D model domains (rural and urban) and 1D model cross sections (background mapping ©OpenStreetMap contributors) (Arup)

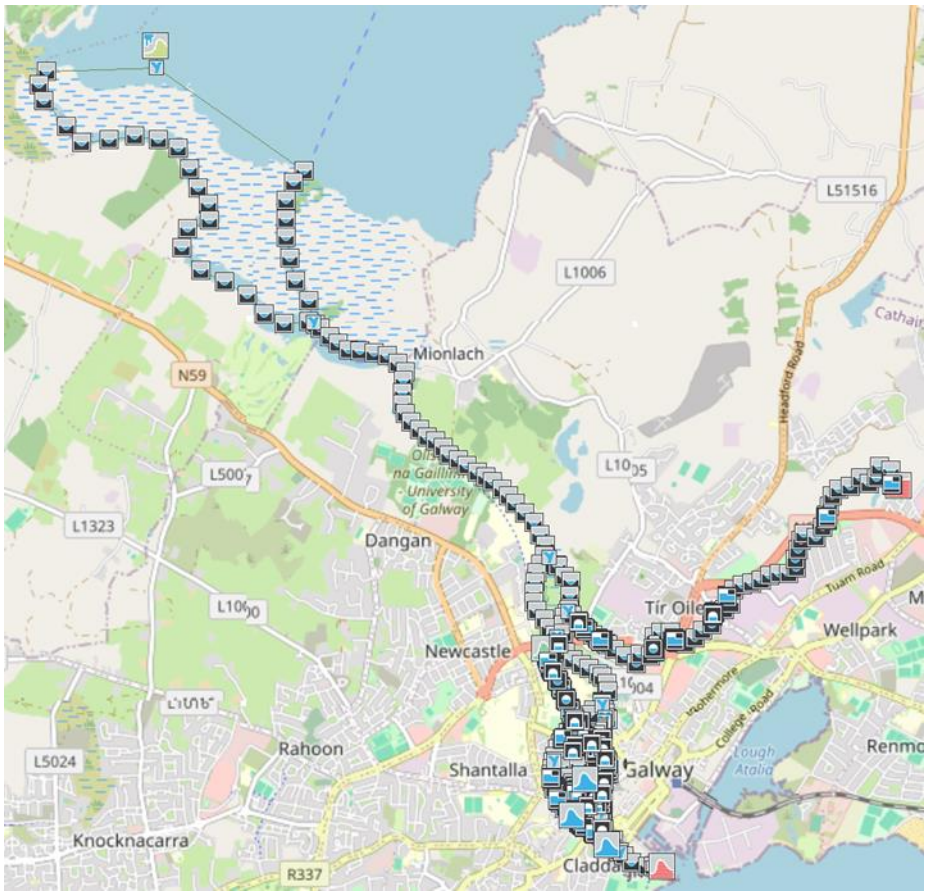


Figure 4 Fluvial/tidal model - Galway 1D baseline model (Arup)

This report will focus on the modifications required to the baseline model in order to assess the potential hydraulic impact caused by the proposed development.

2.1.1 Hydrology

It was considered appropriate to adopt the design flows derived as part of the Coirib go Cósta project for this assessment. The approved Coirib go Cósta Hydrology Report details the derivation of the design flows. A summary of the model boundaries used as part of this assessment is provided in Table 2 and Table 3. There is one inflow point in the model upstream of the proposed site location: the River Corrib, which is applied at Lough Corrib. There is also a point inflow on the Terryland to represent urban flow. The model inflow and outflow locations are presented in Figure 5.

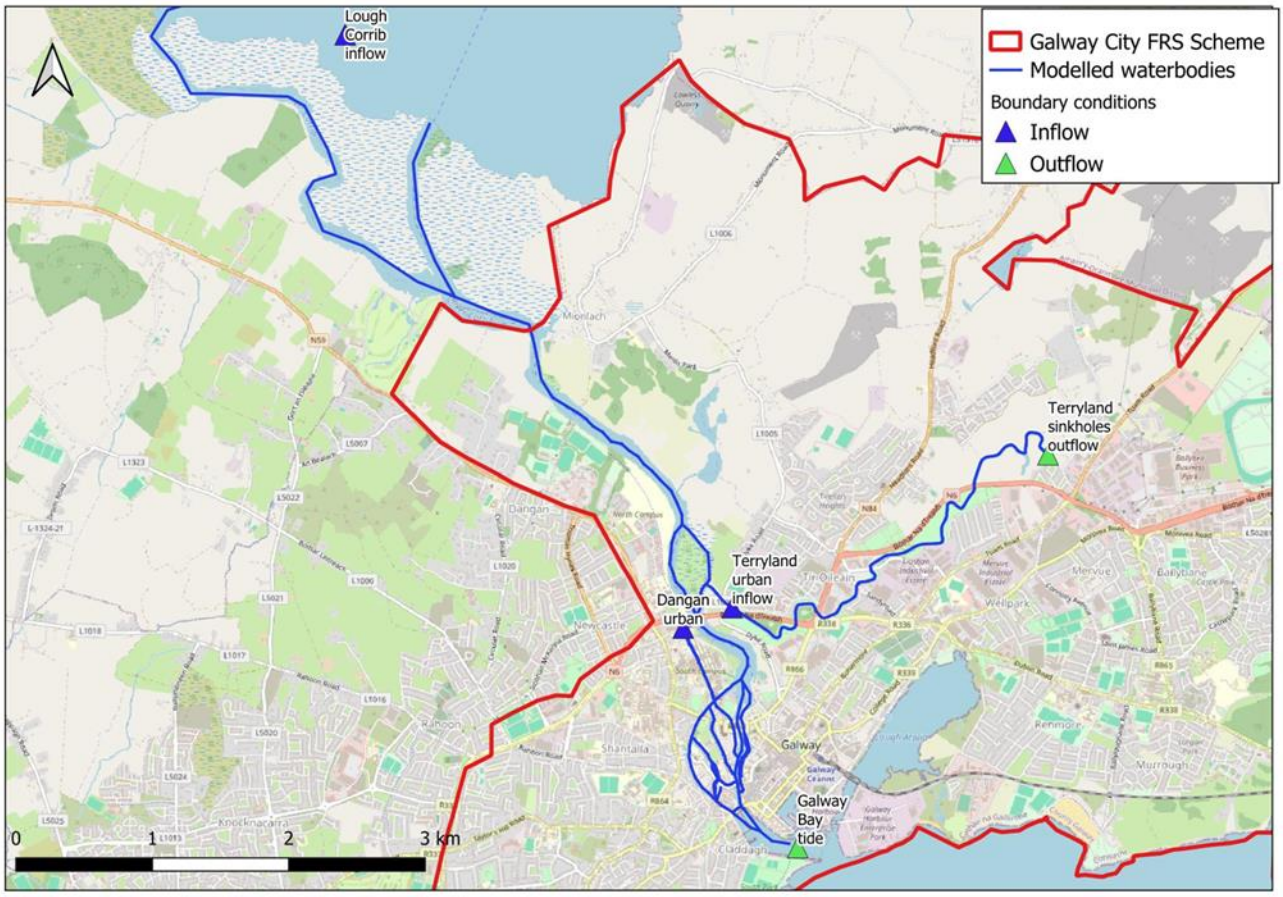


Figure 5 Fluvial/tidal model – model boundaries

The area of interest is upstream of the Salmon Weir and within the fluvial dominated area. As such, the design events considered were the Q100 fluvial flow, paired with a less than 1 in 1 year tidal boundary (<T1) and the Q1000 fluvial flow, paired with a 1 in 4 year tidal boundary (T4). The joint probability analysis was taken directly from the Coirib go Cósta model and it's described in the Hydrology report for the scheme.

In order to assess the impacts climate change, the peak flows were increased by 20% and 30% to represent the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS) respectively, the tidal level was also increased by 0.5m and 1.0m respectively at the downstream boundary of the model. These boundary updates are in keeping with Office of Public Works guidance on climate change for flood risk management.

Table 2 Fluvial Boundaries

Return Period	Current (m^3/s)	MRFS (m^3/s)	HEFS (m^3/s)
Q100	435.7	522.84	566.41
Q1000	533.8	640.56	593.94

Table 3 Tidal Boundaries

Return Period	Current (mOD)	MRFS (mOD)	HEFS (mOD)
<T1 (combined with Q100)	2.87	3.37	4.37

Return Period	Current (mOD)	MRFS (mOD)	HEFS (mOD)
T4 (combined with Q1000)	3.33	3.83	4.83

The Design hydrographs were developed using the UPO Gamma Curve shape with a shape parameter n = 1.9 and a shift parameter Tr = 460hours, commencing at a flow rate of 40% of the design flow (i.e. F = 0.4) and the standardized ordinates multiplied by the required design flood peak magnitude to produce the design flood hydrographs. Refer to Figure 6 for the return period flood hydrographs on the Corrib upstream of the Salmon Weir.

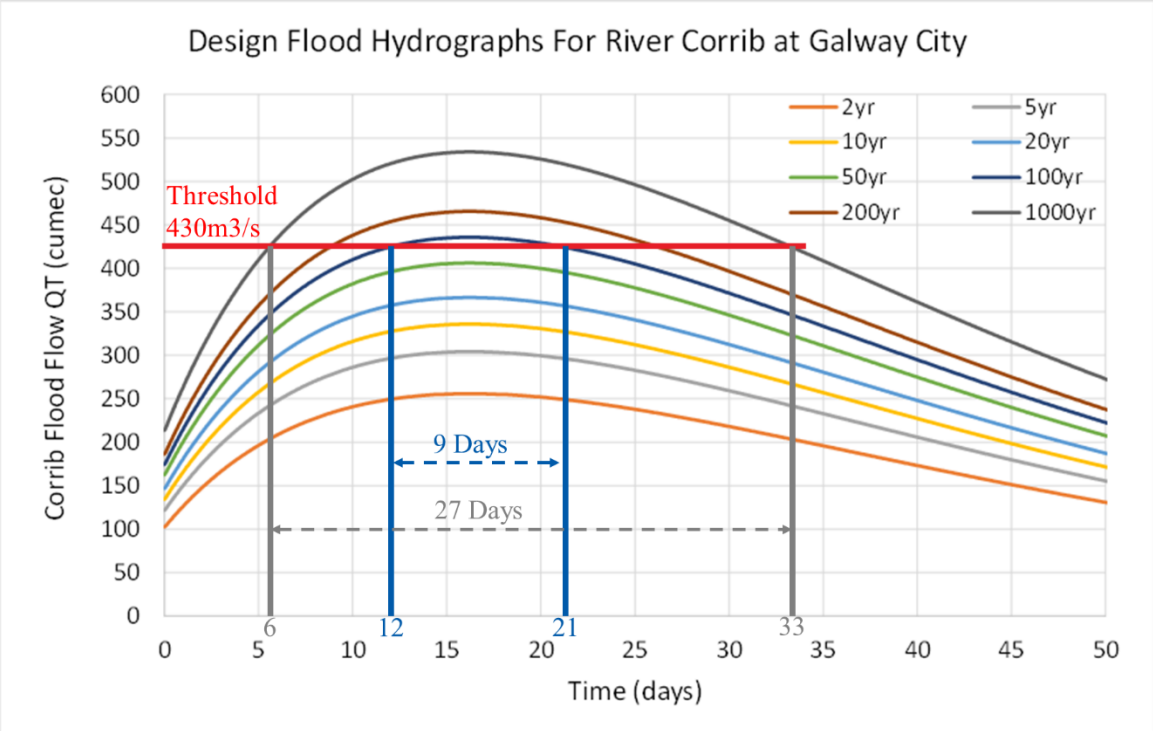


Figure 6 Return Period Design Flow Hydrographs for River Corrib at Galway City (Hydro Environmental)

It is estimated that the threshold of out of bank flooding from the River Corrib at the proposed site location is circa 430m^3/s. Based on inspection of the design flood hydrographs it has been estimated that this threshold will be exceeded for circa 9 and 27 days during the Q100 and Q1000 events respectively. This estimation is presented in Figure 6. These durations will likely increase further due to climate change.

For the purpose of the GCC assessment, the model was run for 90 hours, as the model achieved the maximum depth/ extents before the 90-hour period this approach was considered appropriate.

Figure 7 shows the fluvial hydrographs used as input for the main channel for the Q100 and Q1000 return periods. Figure 8 shows the fluvial hydrographs used as input for the Terryland Reach for the Q100 and Q1000 return periods. These hydrographs were derived by ramping up to the peak flow and then applying the peak flow as a constant for the duration of the model run.

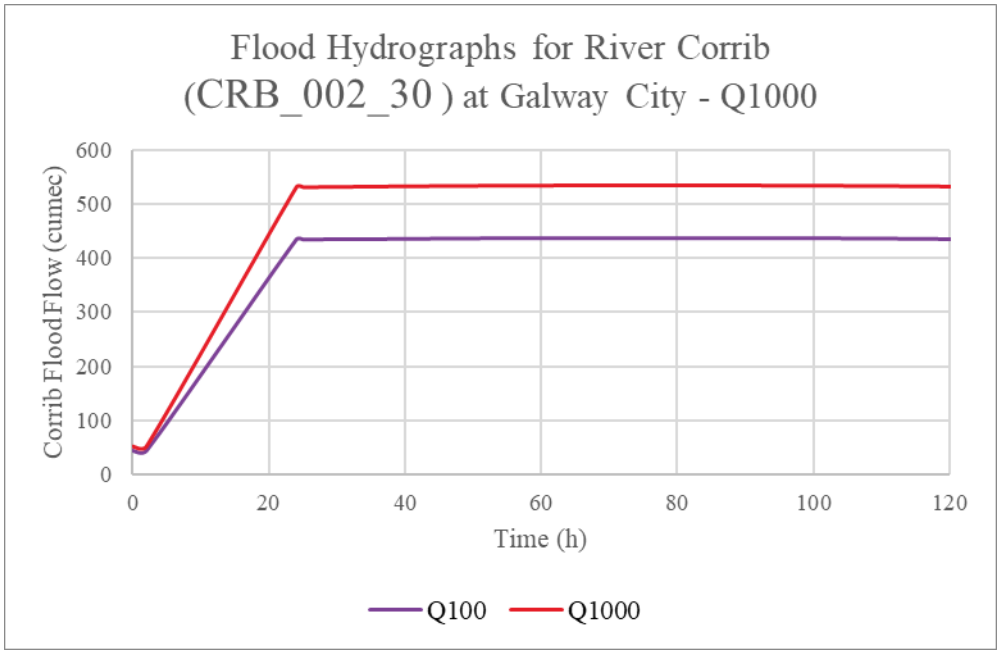


Figure 7 Flood Hydrographs for River Corrib (CRB_002_30) at Galway City - Q100 and Q1000 (Arup)

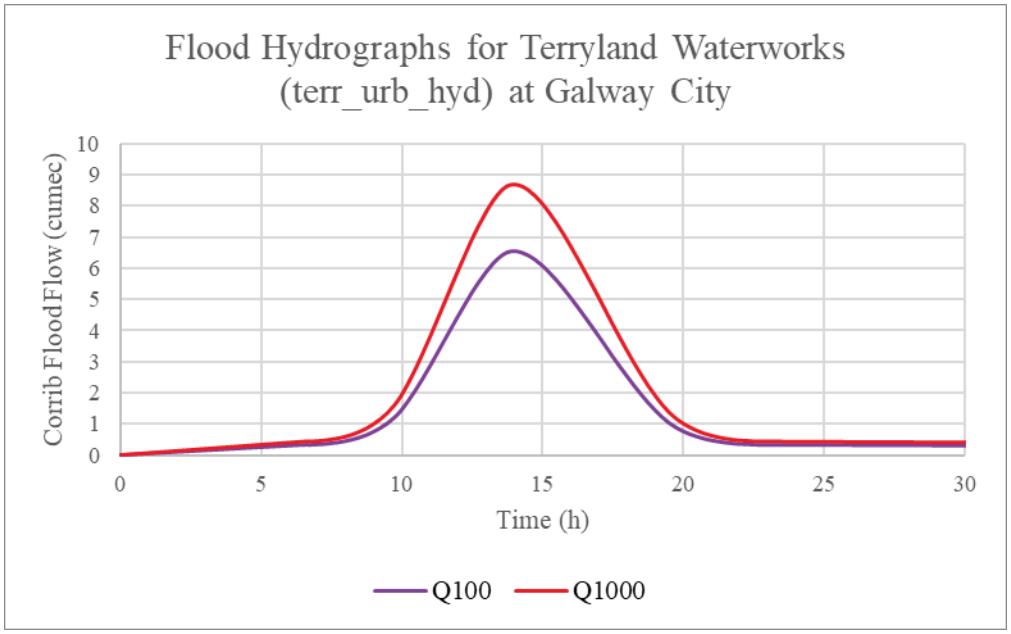


Figure 8 Flood Hydrographs for Terryland Reach (terr_urb_hyd) at Galway City - Q100 and Q1000 (Arup)

The Terryland drainage system is a karst catchment. Two sinkholes at the eastern part of the catchment act as outflows for the Terryland stream. A flow-stage boundary has been applied at the downstream end of the Terryland stream in order to represent the influence of groundwater and tide locking that occurs at the sinkholes as observed by recently installed gauges.

2.1.2 Relevant Infrastructure

2.1.2.1 Galway Corporation Waterworks/ Old Terryland Waterworks

The Terryland Waterworks is located upstream of the proposed site as shown in Figure 9.

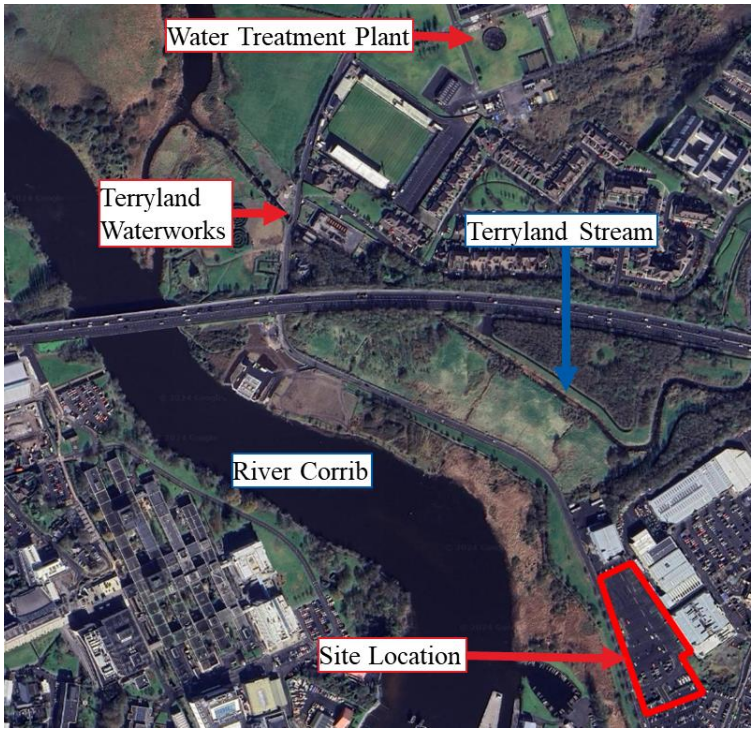


Figure 9 Terrylands Waterworks Location in relation to site

The Old Terryland Waterworks, shown in Figure 10, is a three-bay single-storey waterworks building built on double-arch bridge-like structure spanning artificial waterway with a pumping station associated with it. This structure contains two penstock locks that control flows on the Terryland Stream from the River Corrib. The Waterworks are located upstream of the site of interest. Future removal or failure of the penstocks could increase flood risk to the site.

Figure 10 Old Terryland Waterworks (Galway Corporation Waterworks, Bóthar na Díge [Dyke Road], TERRYLAND, Gaillimh [Galway], GALWAY - Buildings of Ireland)

Currently the Waterworks are represented as two orifice units. The throat invert level, throat soffit level and downstream sill level have been established from the geometry of the opening in the downstream section, as shown in Table 4:

Table 4 Details of the two orifices units that represent the Old Terryland Waterworks

	Throat Invert level	Throat Soffit Level	Up Sill Level	Down Sill Level	Bore Area
Left Orifice	4.680	5.350	4.680	2.990	3.648
Right Orifice	4.670	5.350	4.670	2.700	2.998

2.1.2.2 Dyke Road Embankment

The Dyke Road embankment, which can be seen in Figure 11, consists of a stone wall and embankment of 600m length and runs in a northwest to southeast direction between the River Corrib and the Terryland/Castlegar area (see Figure 10 for context). The wall consists of a large stone crest, which also forms part of a local footpath. The embankment ties into the Clifden Rail embankment at the south.

Figure 11 Dyke Road wall (Arup)

With respect to the existing wall, the topographic survey undertaken by Apex Surveys in October 2023, the lowest level of the wall adjacent to the site is approximately 6.6mOD. The elevation of the crest of the wall varies from 6.6mOD to 7.73mOD.

The wall has history of seepage problems and experienced some damage from a flood event around 2007 which was subsequently repaired by the OPW.

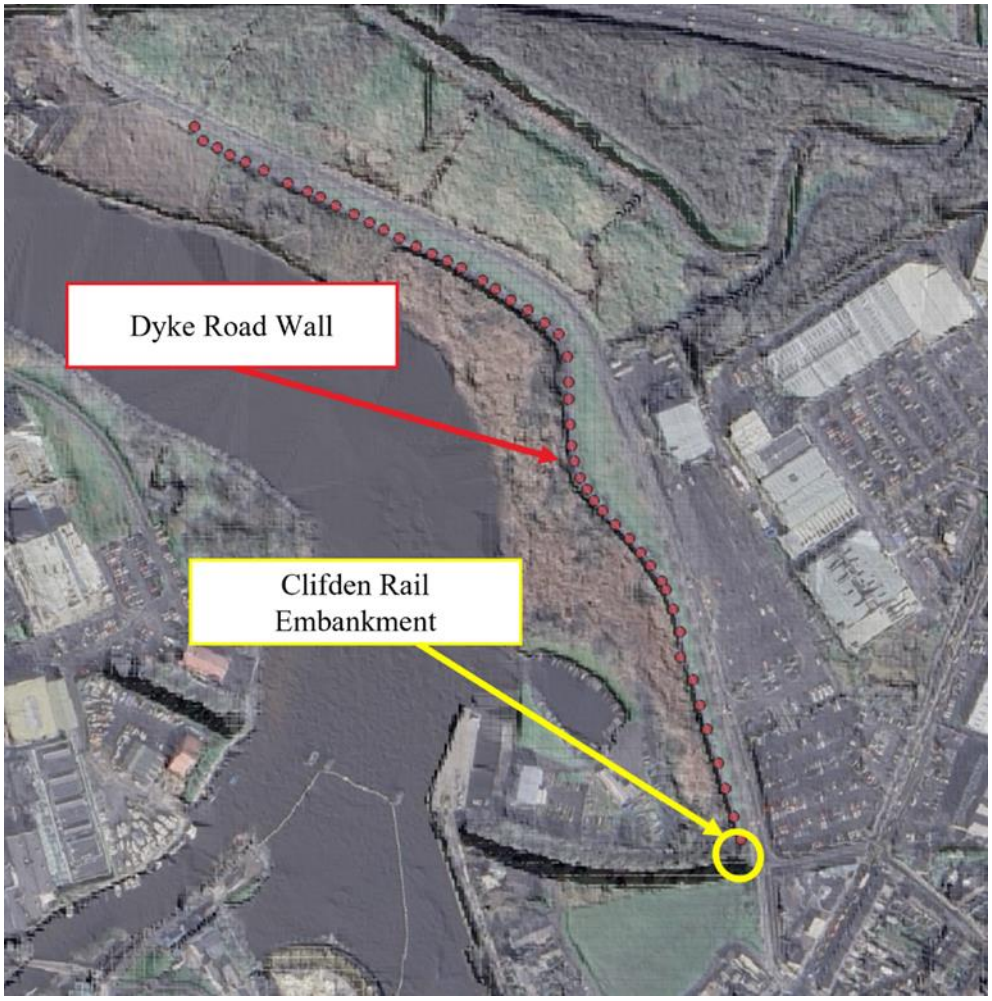


Figure 12 Dyke Road Wall (Arup)

It was requested by Aecom (on behalf of GCC) to revise the baseline model by excluding the wall in order to represent a conservative baseline condition for the site. This decision is a result of the recognition of the fragile and damaged nature of the wall that could result in its incapacity to retain floods. Aecom provided Arup with a surface of the existing topography (informed by a survey completed in August 2021) in the vicinity of the site which did not include the wall. An inspection of this surface was carried out against the raw survey data to confirm the levels were accurate and did not include the existing wall. This surface was read into the 2D hydraulic model.

2.1.2.3 Clifden Rail Embankment

The Dyke Road embankment ties into a second earth embankment known as the Clifden Rail embankment which is running east to west (Figure 13(a)). The Clifden Rail embankment is also represented in the surface provided by Aecom. The embankment has a base level set at approximately 6-7mAOD and crest levels varying between 11.5-12.5mAOD.

A small culvert penetrates the base of the Clifden Rail embankment (Figure 13(b)). Modelling of the culvert was undertaken as part of the Coirib Go Costa project, which concluded insignificant impact in terms of flooding due to the culvert. It has therefore been excluded from the model.

Figure 13 (a) Clifden Rail embankment (direction west from Dyke Road) and (b) culvert in the Clifden Rail embankment (Arup)

2.2 Proposed Design

Four scenarios were assessed by Arup based on drawings/ surfaces supplied by Aecom. A summary is provided in the table below in Table 5. For simplicity the naming conventions have been shortened.

Table 5 Scenarios assessed

Aecom Naming	Arup Naming	Description
Scenario 1	S1	Existing scenario – Dyke Road embankment wall removed from surface.
Scenario 2	S2	Proposed development ground regrading with no superstructure
Scenario 3	S3	Proposed development ground regrading, with the inclusion of walls/ louvres and building footprint

Each of the scenarios were run for the undefended (i.e. no flood relief scheme in place) case.

2.2.1 Ground Elevations

Aecom provided Arup with 2 No. 3D ground models using the latest topographical survey prior to commencement of works, one for predevelopment (Scenario 1), represented in Figure 14 and one for post development (Scenario 2 and Scenario 3), represented in Figure 15. This data was used to inform the geometry of the proposed development in the model.

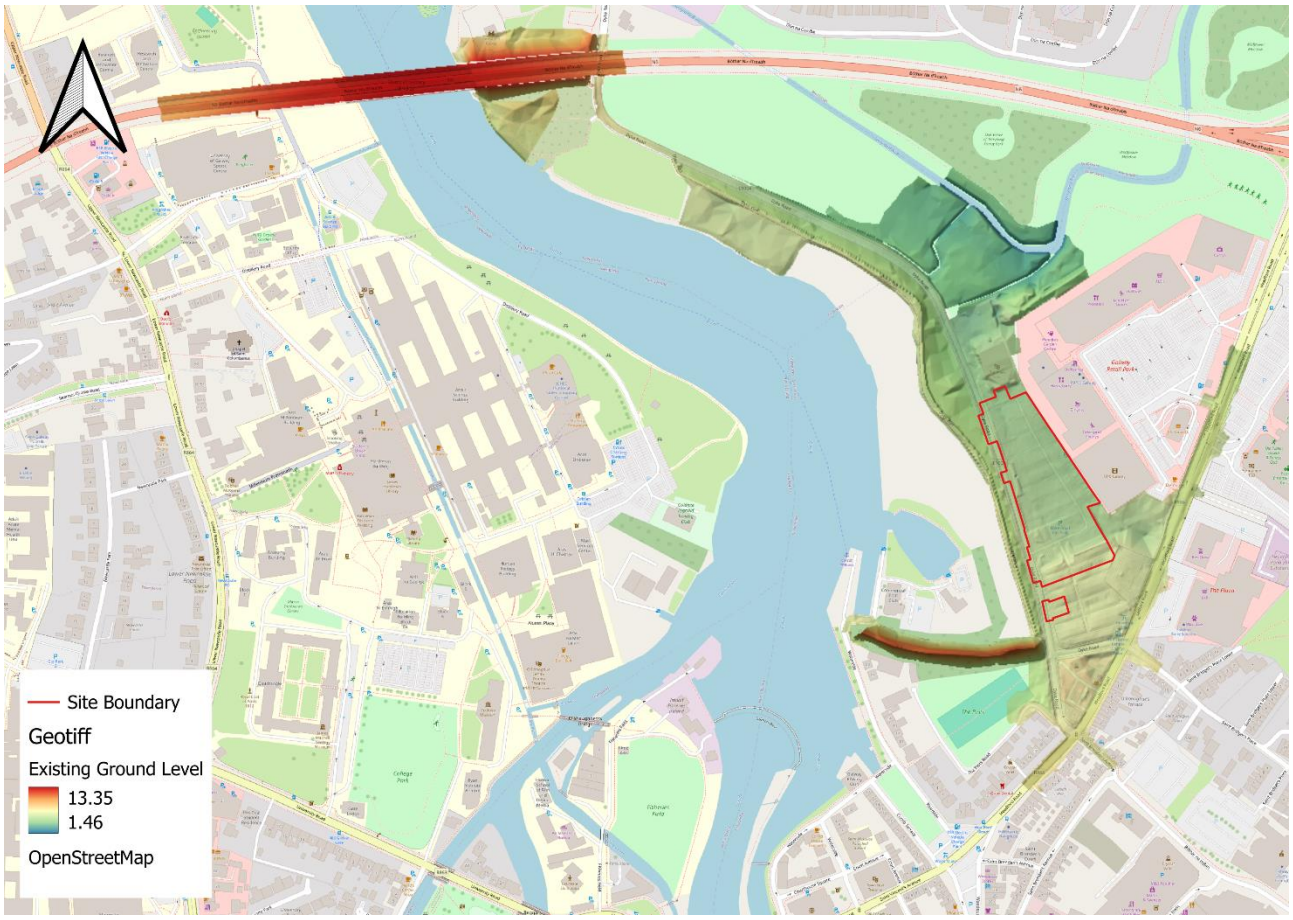


Figure 14 Aecom Surface – Scenario 1

Figure 15 Aecom Surface – Scenarios 2 and 3

2.2.2 Proposed Ground Floor

A ground floor plan of the proposed development (Scenario 3) is presented in Figure 16. The solid block sections of the design are marked in red and the permeable facades that allow flood water to run through, to minimise the volumetric loss of flood storage, are marked in green. The solid block sections of the design were represented by z-shape impermeable blocks with infinite height. The permeable facades that allow flood water to run through were designed with fc-shape blocks with infinite height and a blockage of 25% (allowing 75% of free air space, as required by Aecom and presented in Figure 17).

Figure 16 Scenario 3 ground floor with fcsh lines (louvers) and zsh lines (walls)

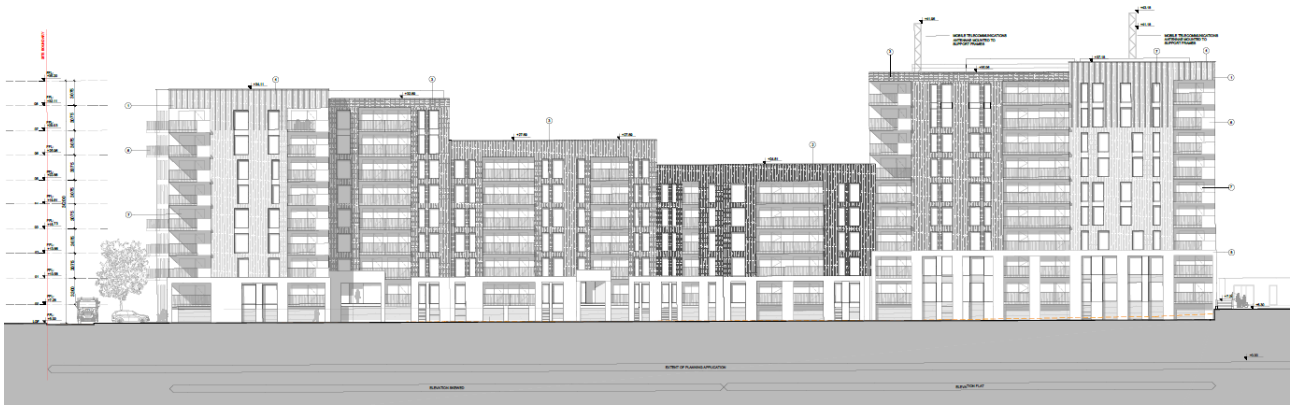


Figure 17 West elevation of the proposed development (Aecom)

3. Model Results

3.1 Overview of the design runs

A total of 14 model runs were simulated as part of this assessment. The 14 simulations and a description of each are outlined in Table 6. With regards to the flow scenario, “Curr” refers to the current scenario (i.e. no Climate Change Allowance), “MRFS” refers to the Mid-Range future scenario (i.e. +20% increase in flow and +0.5m increase in peak tide) and “HEFS” refers to the High-End future scenario (i.e. +30% increase in flow and +1.0m increase in peak tide).

Table 6 Model simulation naming convention and description

Model Name	Scenario	Return Period	Climate Change Scenario
Q100_S1_Curr	**Scenario 1**	Q100	Current
Q100_S1_MRFS	**Scenario 1**	Q100	MRFS
Q100_S1_HEFS	**Scenario 1**	Q100	HEFS
Q1000_S1_Curr	**Scenario 1**	Q1000	Current
Q1000_S1_MRFS	**Scenario 1**	Q1000	MRFS
Q1000_S1_HEFS	**Scenario 1**	Q1000	HEFS
Q1000_S2_MRFS	**Scenario 2**	Q1000	MRFS
Q100_S3_Curr	**Scenario 3**	Q100	Current
Q100_S3_MRFS	**Scenario 3**	Q100	MRFS
Q100_S3_HEFS	**Scenario 3**	Q100	HEFS
Q1000_S3_Curr	**Scenario 3**	Q1000	Current
Q1000_S3_MRFS	**Scenario 3**	Q1000	MRFS
Q1000_S3_HEFS	**Scenario 3**	Q1000	HEFS
Q100_S3_TLS_MRFS	**Scenario 3_Terrylands Sensitivity**	Q100	MRFS

3.2 Assessment of Results

An appropriate assessment of the comparable simulations was carried out in order to evaluate the potential impact on flood levels/ risk caused by the proposed development. This was done by comparing Scenario 1 model runs against Scenario 3 model results.

For each comparison, the following were produced:

1. Longitudinal plots of maximum water levels through the Corrib for each model simulation (i.e. Scenario 1 and Scenario 3). The plots include model node labels which correspond to the nodes presented in Figure 18.
2. Water level hydrographs from the 1D model extracted at the below locations to assess the impact of the proposed development on flood risk.
3. Table of results detailing the maximum water levels of the modelled scenarios at these critical locations (i.e. upstream and downstream of the proposed development site) for each of the scenarios.
4. Maximum flood extent maps, including maximum water levels at a number of locations on the site of interest. A larger version of these flood extent maps is also included in Appendix A. Flood extent maps in isolation for the 6 Scenario 3 runs are included in Appendix B.
5. Difference in maximum water levels on the site and surrounding areas between existing and proposed scenarios.

Section 3.2.1 presents the Q100 analysis while Section 3.2.3 presents the Q1000 analysis.

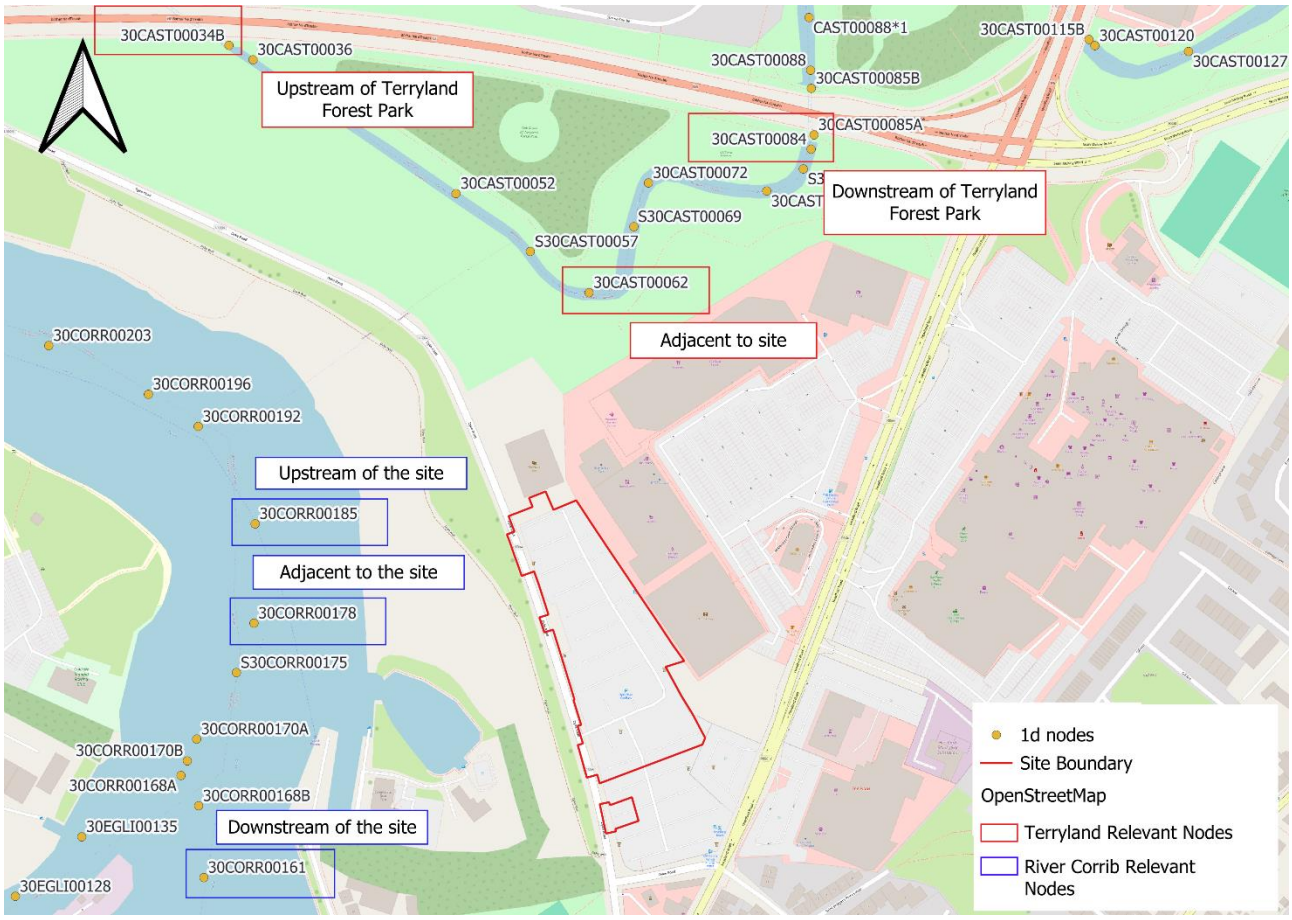


Figure 18 1d nodes in the vicinity of site location

3.2.1 Q100 design flows

A longitudinal plot of maximum water levels through the Corrib for the Scenario 1 and Scenario 3 scenarios for Q100 current, MRFS and HEFS flows is presented in Figure 19.

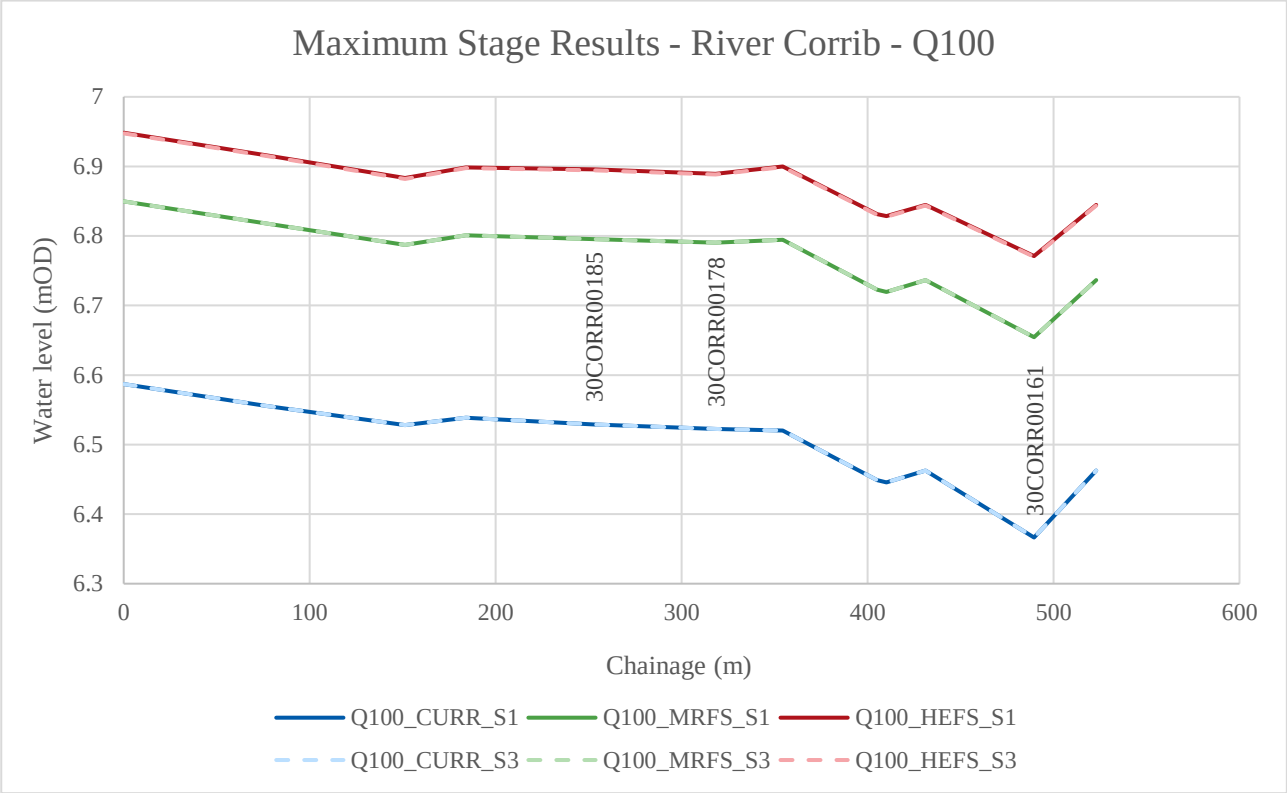


Figure 19 Maximum Stage Results on Corrib River - Q100

Table 7 presents the maximum stages at critical locations for the Q100 modelled scenarios in the River Corrib.

Table 7 Maximum stage at critical locations River Corrib - Q100

River Corrib							
Node	Location	Q100 _Curr Max Stage (mOD)		Q100_ MRFS Max Stage (mOD)		Q100 _HEFS Max Stage (mOD)	
		Scenario 1	Scenario 3	Scenario 1	Scenario 3	Scenario 1	Scenario 3
30CORR00185	Upstream of the site	6.53	6.53	6.79	6.79	6.89	6.89
30CORR00178	Adjacent to the site location	6.52	6.52	6.79	6.79	6.89	6.89
30CORR00161	Downstream of the site	6.37	6.37	6.65	6.65	6.77	6.77

The plot and table above demonstrate no impact to the maximum stage within the Corrib for the Q100 pre and post development scenarios, under any climate change epoch.

The hydrographs of the nodes upstream, adjacent and downstream of the site (30CORR00185, 30CORR00178 and 30CORR00161) on River Corrib for Q100 are shown respectively in Figure 20, Figure 21 and Figure 22. As with the maximum stage, the flows within the Corrib during the duration of the event are not impacted due to the proposed development for the Q100 current and climate change events.

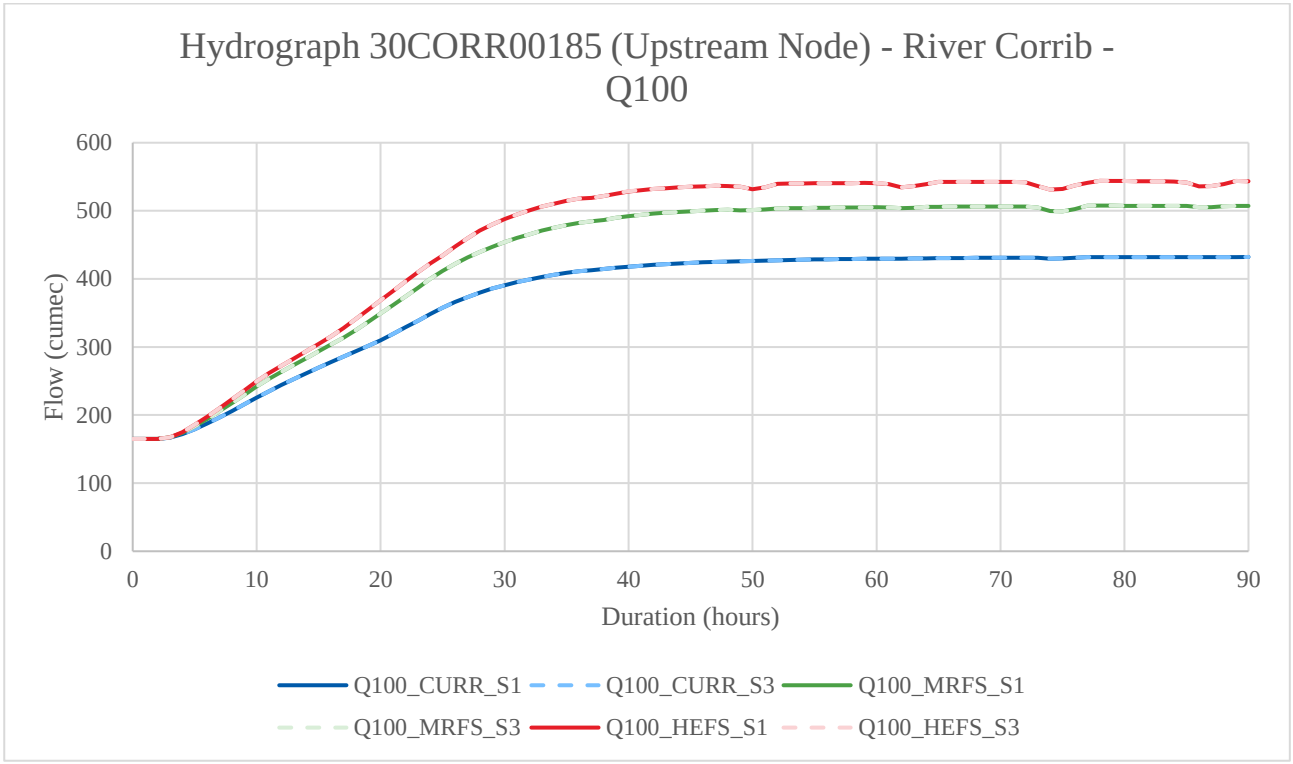


Figure 20 Hydrograph of node upstream of the site on River Corrib – Q100

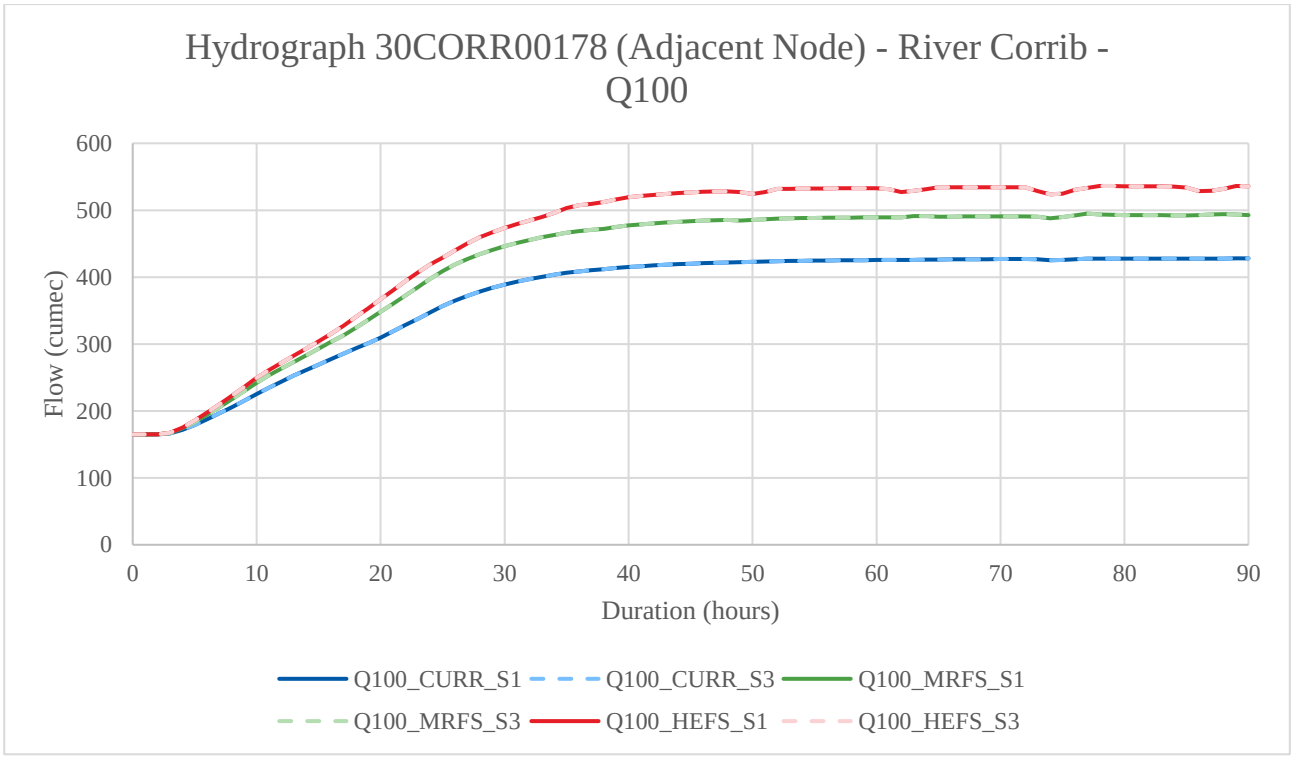


Figure 21 Hydrograph of node adjacent to the site on River Corrib – Q100

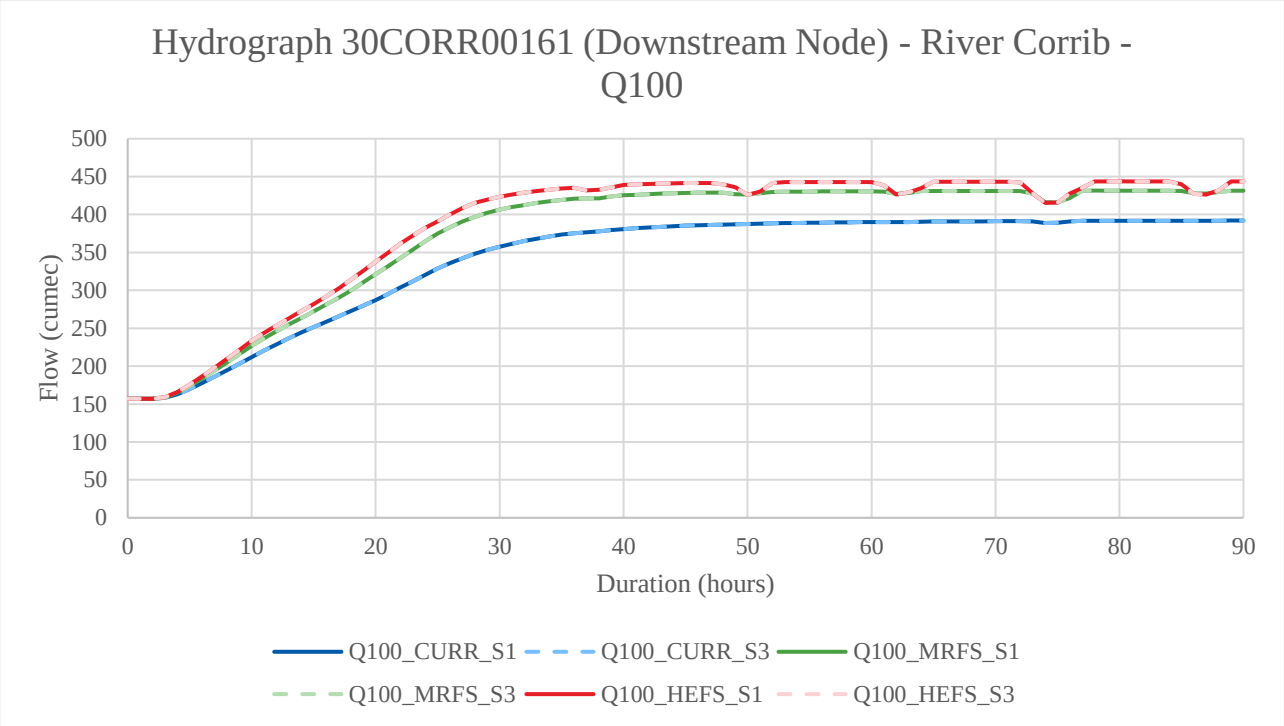


Figure 22 Hydrograph of node downstream of the site on River Corrib – Q100

The maximum flood extents for the Scenario 1 and Scenario 3 Q100 scenarios are presented in Figure 23 and Figure 24 respectively. As observed, with the Dyke Road embankment wall removed, the site is partially at risk of flooding. The Q100 flood extents increase significantly in the Terryland area and within the site when climate change is taken into account, with significant impacts to the site. The water depths at the site for each climate change scenario, as well as pre and post-development are shown in Table 8 below.

Table 8 Flood depths for the Q100 current and climate change events for Scenario 1 and 3 at site location

Locations within site	Q100 _Curr Max Depth (m)		Q100_ MRFS Max Depth (m)		Q100 _HEFS Max Depth (m)	
	Scenario 1	Scenario 3	Scenario 1	Scenario 3	Scenario 1	Scenario 3
1	0.03	0	1.26	1.02	1.54	1.31
2	0.04	0.02	1.15	0.77	1.43	0.95
3	0.02	0.03	1.13	1.16	1.41	1.44

There is a general decrease in flood depths between the pre-development and post-development scenarios within the site, with the exception of location 3, that shows a slight increase. The proposed development in Scenario 3 model impacts the flow paths on site. Flood water is confined between the proposed development and the raised ground to the east, resulting in a localised increase in water levels at Point 3.

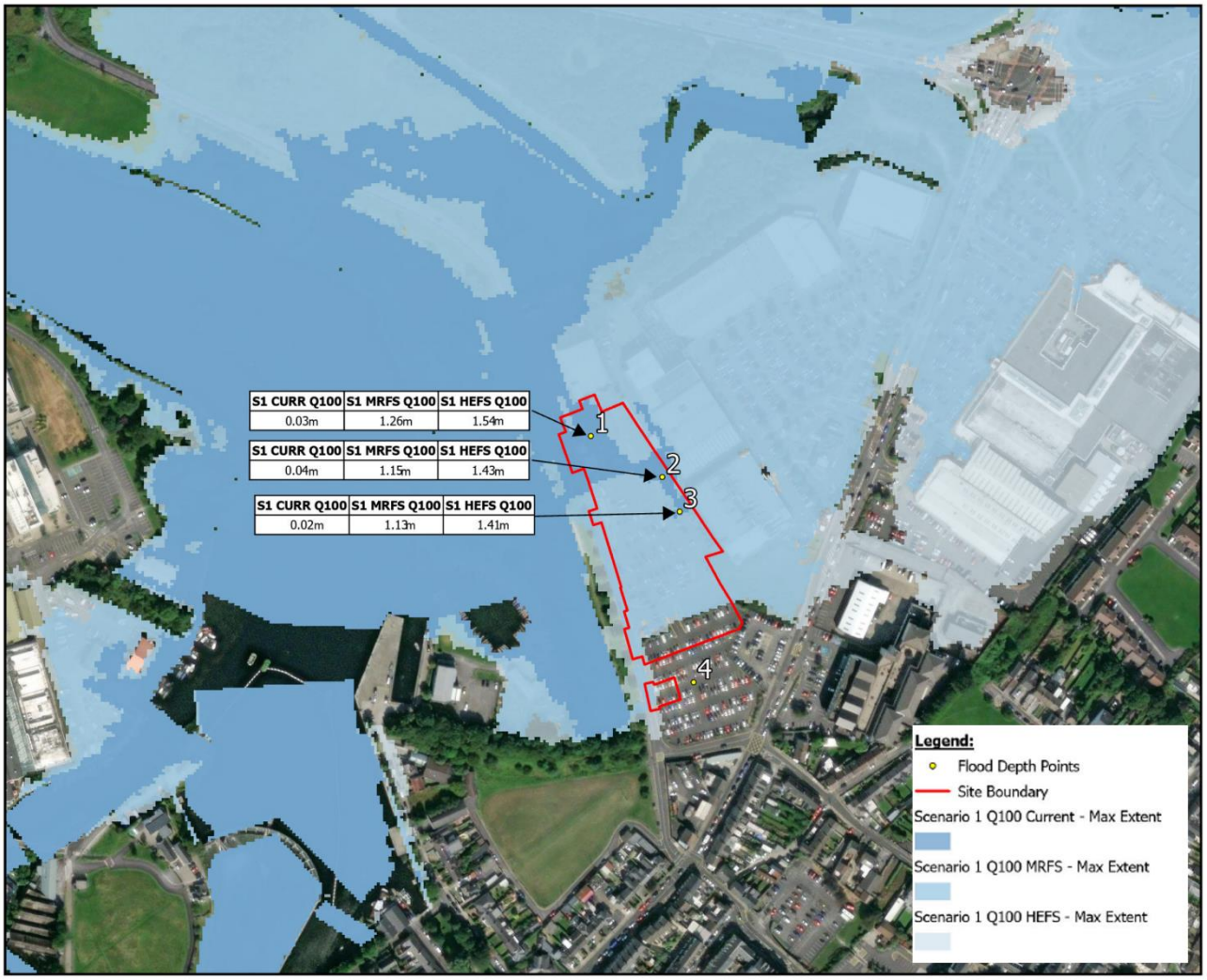


Figure 23 Maximum flood extents for the Q100 current and climate change events for Scenario 1

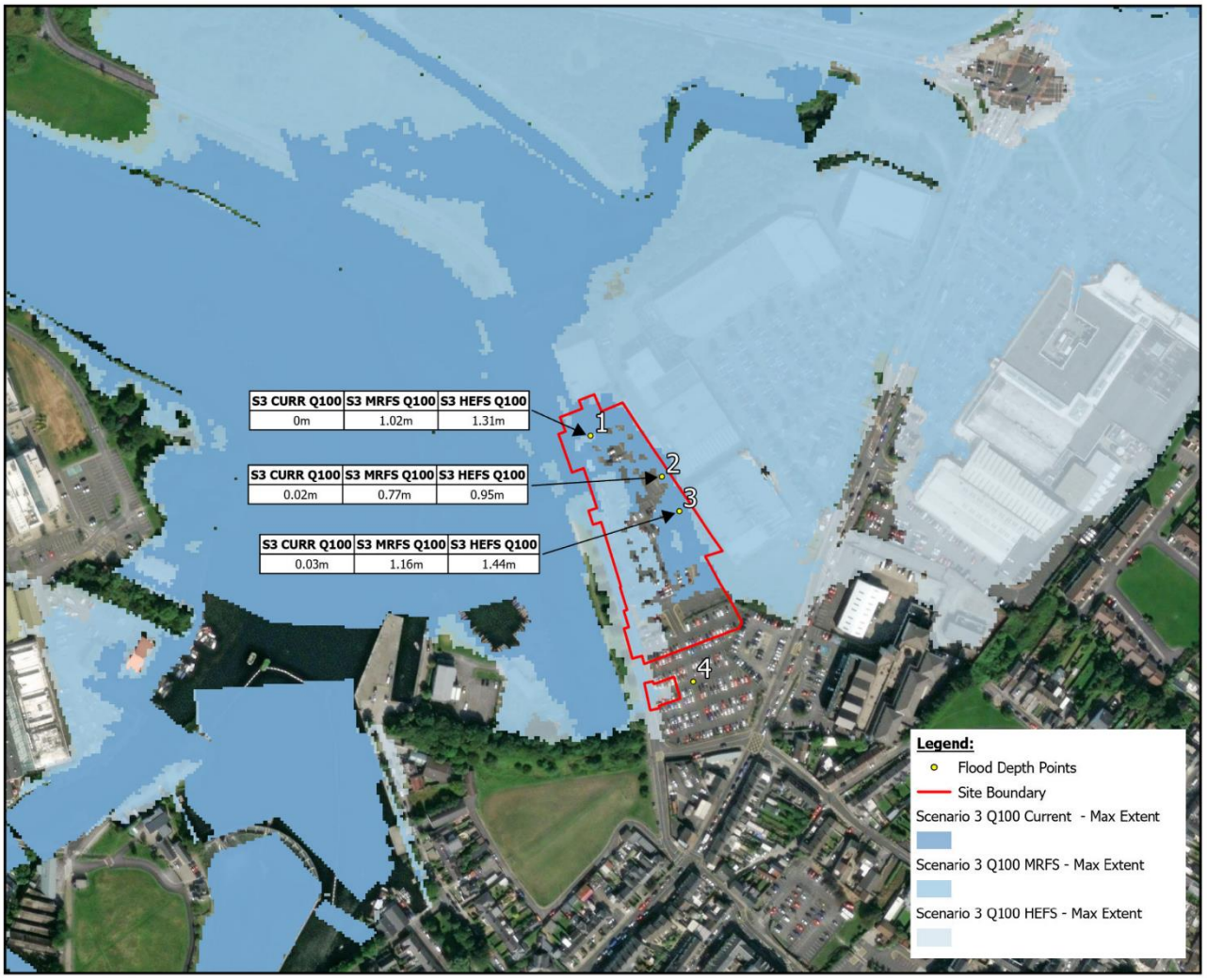


Figure 24 Maximum flood extents for the Q100 current and climate change events for Scenario 3

The difference in maximum flood extents between Scenarios 1 and 3 for the Q100 MRFS scenario is presented in Figure 25. There are no changes in offsite flood extents between the pre-development and post-development scenarios. There is however small changes in extents locally on the site due to the proposed development.

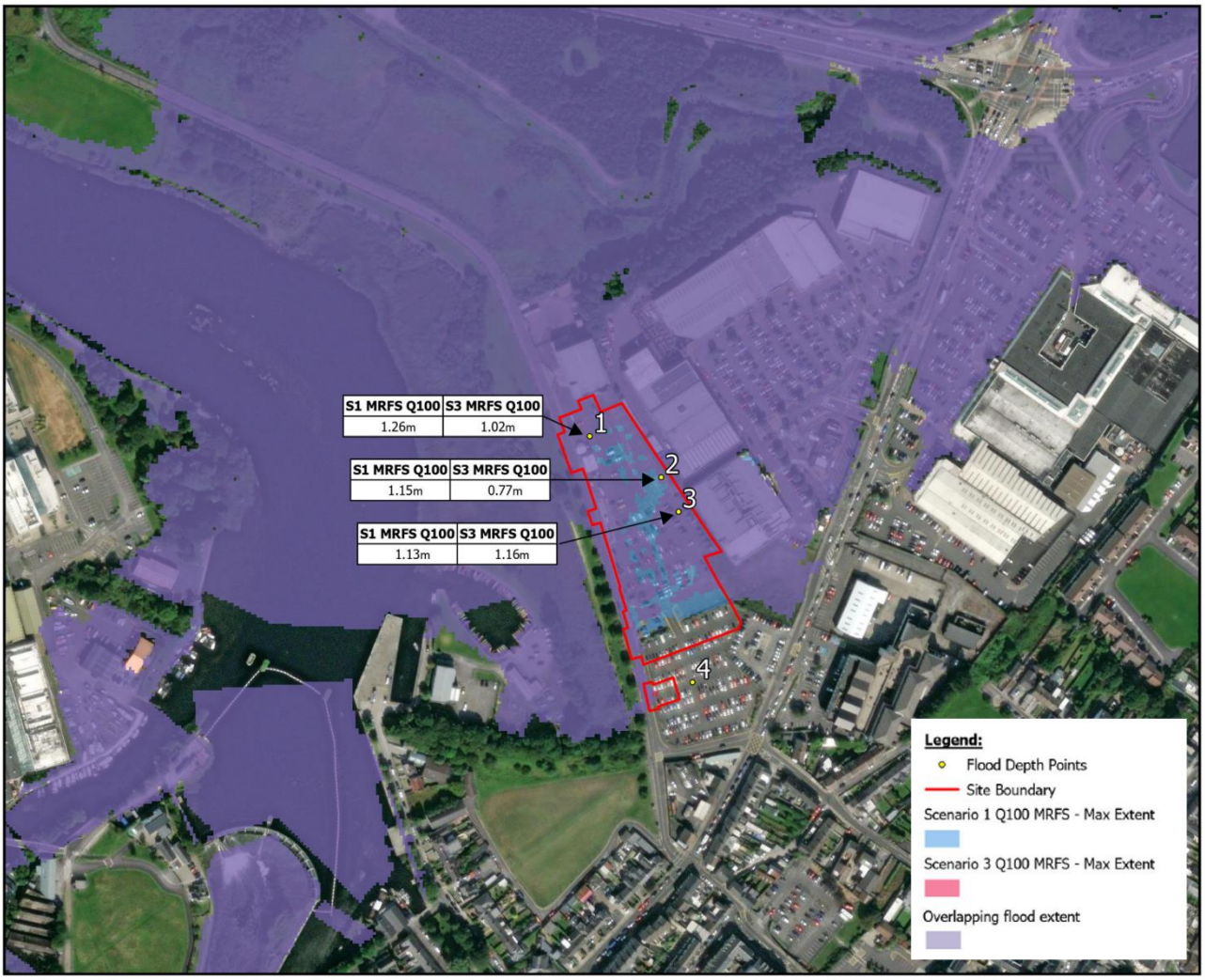


Figure 25 Maximum flood extents for the Q100 MRFS for Scenarios 1 and 3

The difference in maximum water levels between Scenarios 1 and 3 for the Q100 MRFS scenario is presented in Figure 26. In areas where the Scenario 3 levels area higher than Scenario 1 levels the delta is positive while in areas where Scenario 3 levels are lower than Scenario 1 levels the delta is negative. The maximum increase due to the proposed development is circa 30mm south of the site, on Dyke Road. It is noted that deltas between ±2mm have been filtered from the delta plot. Impact on adjacent properties (points a and b) is approximately 2mm and 3mm respectively.

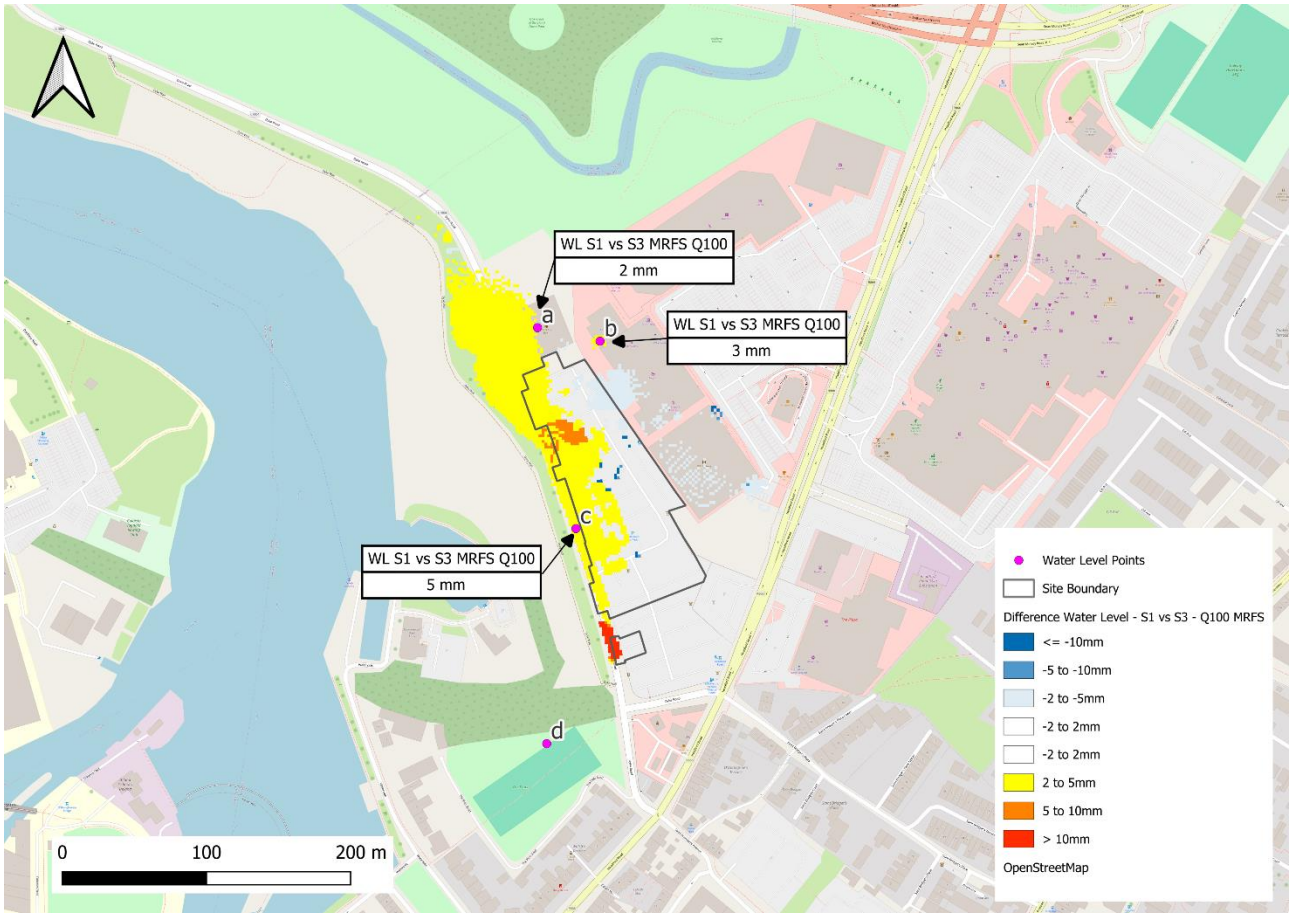


Figure 26 Difference in water levels between Scenario 1 and Scenario 3 – Q100 MRFS

3.2.2 Q1000 design flows

A longitudinal plot of maximum water levels through the Corrib for the Scenario 1 and Scenario 3 scenarios for Q1000 current, MRFS and HEFS flows is presented in Figure 27.

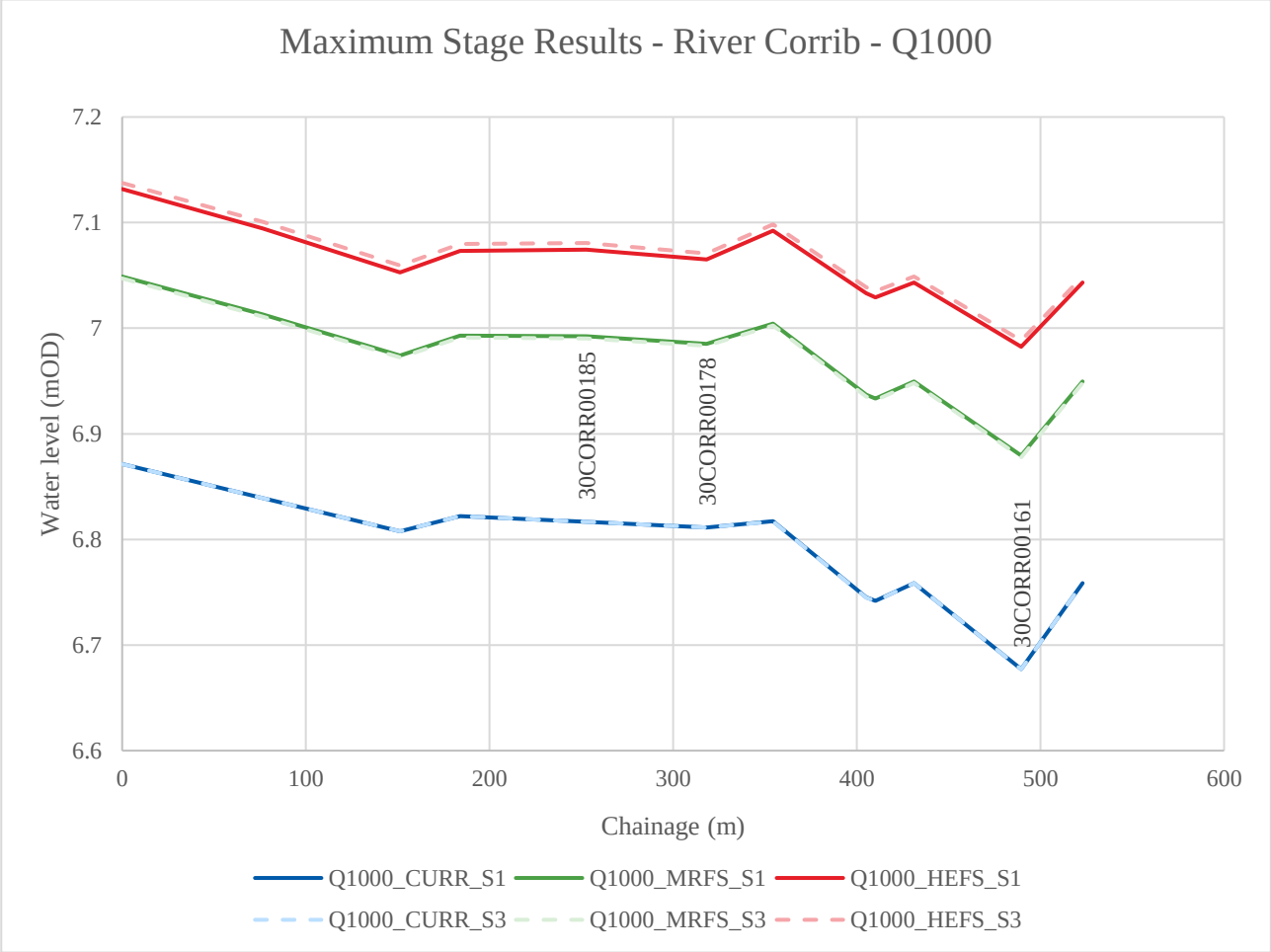


Figure 27 Maximum Stage Results on Corrib River - Q1000

Table 9 presents the maximum stages at critical locations for the Q1000 modelled scenarios.

Table 9 Maximum stage at critical locations River Corrib - Q1000

River Corrib							
Node	Location	Q1000 _Curr Max Stage (mOD)		Q1000_ MRFS Max Stage (mOD)		Q1000 _HEFS Max Stage (mOD)	
		Scenario 1	Scenario 3	Scenario 1	Scenario 3	Scenario 1	Scenario 3
30CORR00185	Upstream of the site	6.82	6.82	6.99	6.99	7.07	7.08
30CORR00178	Adjacent to the site location	6.81	6.81	6.98	6.98	7.07	7.07
30CORR00161	Downstream of the site	6.68	6.68	6.88	6.88	6.98	6.99

The plot and table above demonstrate no impact to the maximum stage within the Corrib for the Q1000 pre and post development scenarios, under the current and MRFS climate scenarios. There is a 10mm increase in levels during the Q1000 HEFS within the river Corrib due to the proposed development.

The hydrographs of the nodes upstream, adjacent and downstream of the site (30CORR00185, 30CORR00178 and 30CORR00161) on River Corrib for Q1000 are shown respectively in Figure 28, Figure 29 and Figure 30. The flows within the Corrib during the duration of the event are not impacted due to the proposed development for the Q1000 current and climate change events.

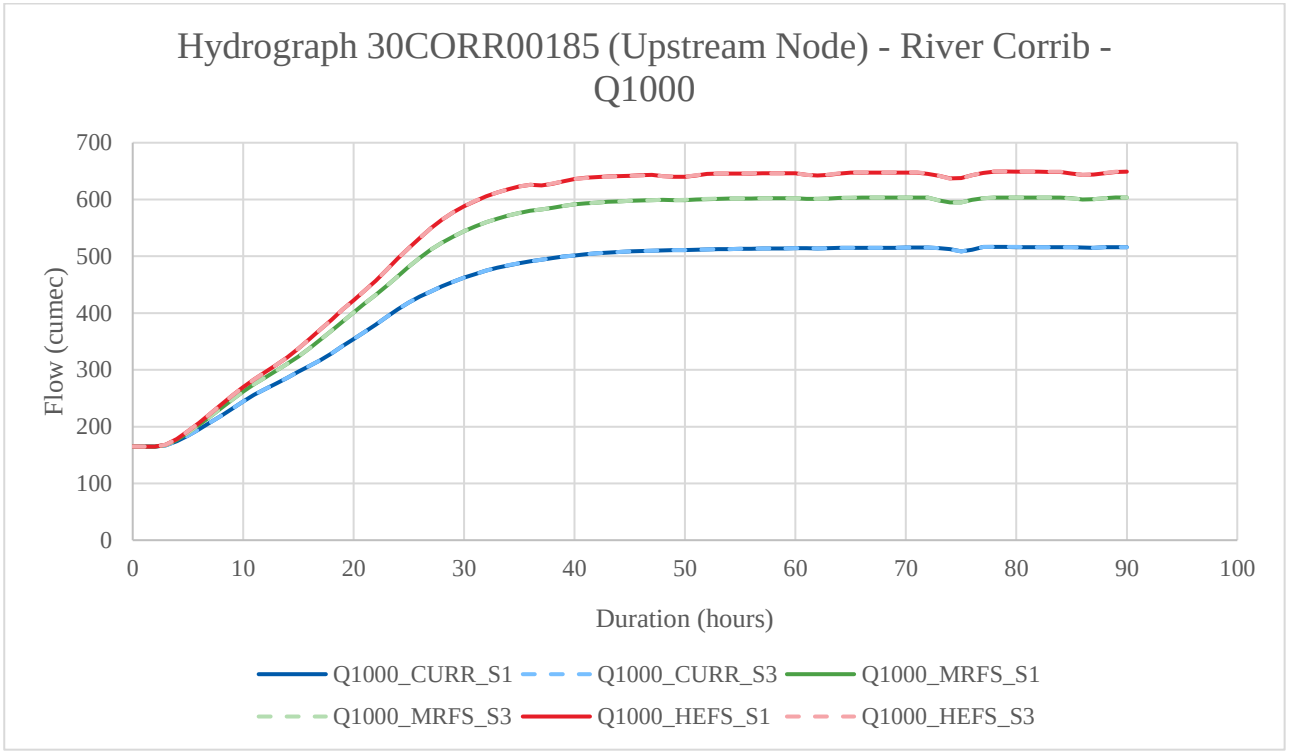


Figure 28 Hydrograph of node upstream of the site on River Corrib – Q1000

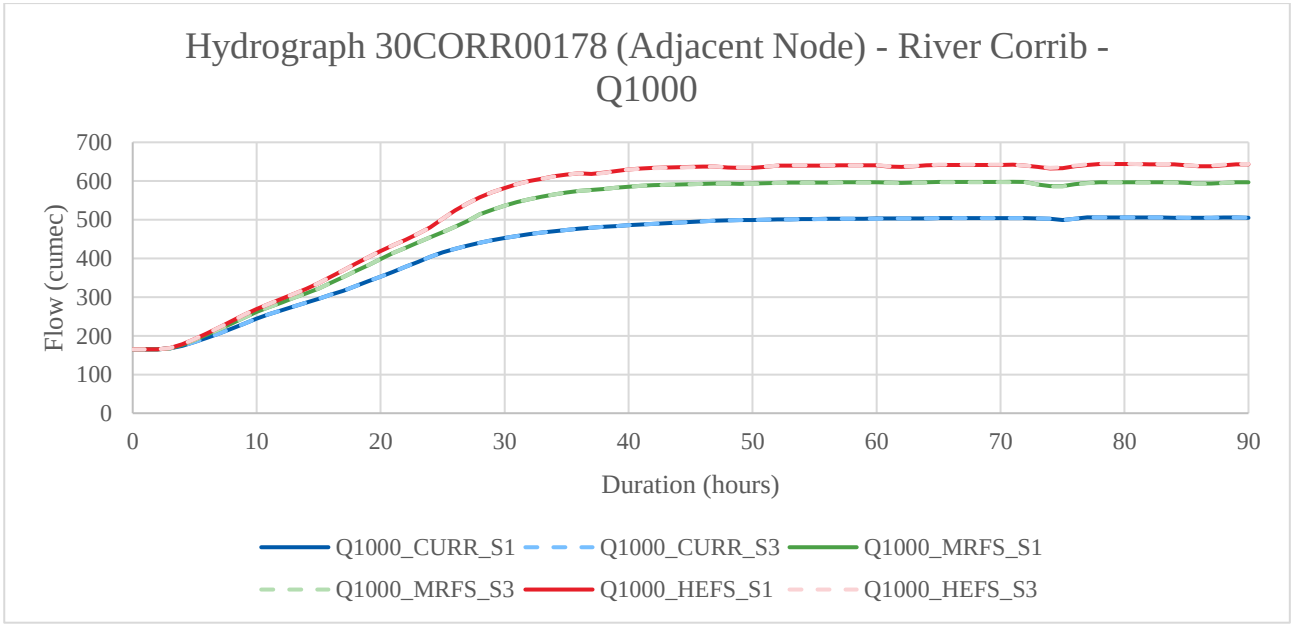


Figure 29 Hydrograph of node adjacent to the site on River Corrib – Q1000

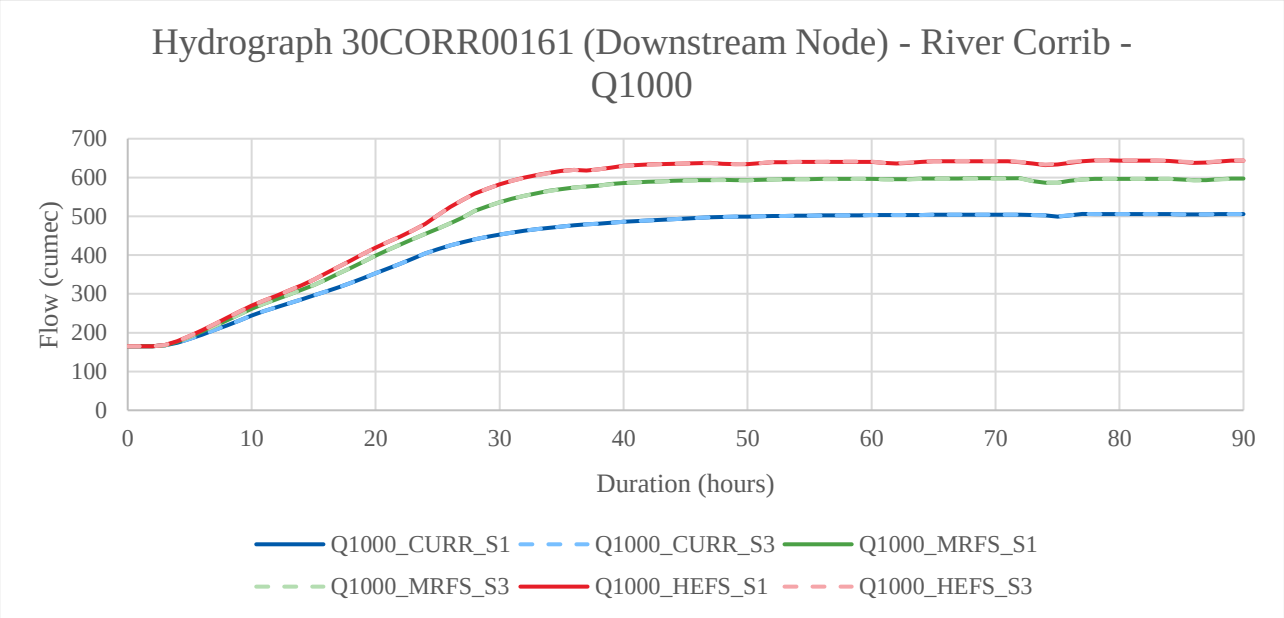


Figure 30 Hydrograph of node downstream of the site on River Corrib – Q1000

The maximum flood extents for the Scenario 1 and Scenario 3 Q1000 scenarios are presented in Figure 31 and Figure 32 respectively. The figures also include maximum water levels at 4 locations for the three modelled scenarios. As observed, with the Dyke Road embankment wall removed, the site is at risk of flooding. The site is inundated for all Q1000 scenarios modelled including the current scenario.

The water depths at the site for each climate change scenario, as well as pre and post-development are shown in Table 10 below.

Table 10 Flood depths for the Q1000 current and climate change events for Scenario 1 and 3 at site location

Locations within site	Q1000 _Curr Max Depth (m)		Q1000_ MRFS Max Depth (m)		Q1000 _HEFS Max Depth (m)	
	Scenario 1	Scenario 3	Scenario 1	Scenario 3	Scenario 1	Scenario 3
1	1.32	1.08	1.78	1.56	1.97	1.75
2	1.21	0.81	1.66	1.09	1.84	1.19
3	1.2	1.22	1.64	1.63	1.82	1.79
4	0	0	0	0	0.26	0.32

There is a general decrease in flood depths between the pre-development (Scenario 1) and post-development (Scenario 3) scenarios within the site. This is due to the impact the proposed development has on local flow paths. The carpark to the south of the site, where the proposed exit route passes through, only floods in the Q1000 HEFS. The proposed development increases water levels in the carpark by circa 60mm for the Q1000 HEFS.

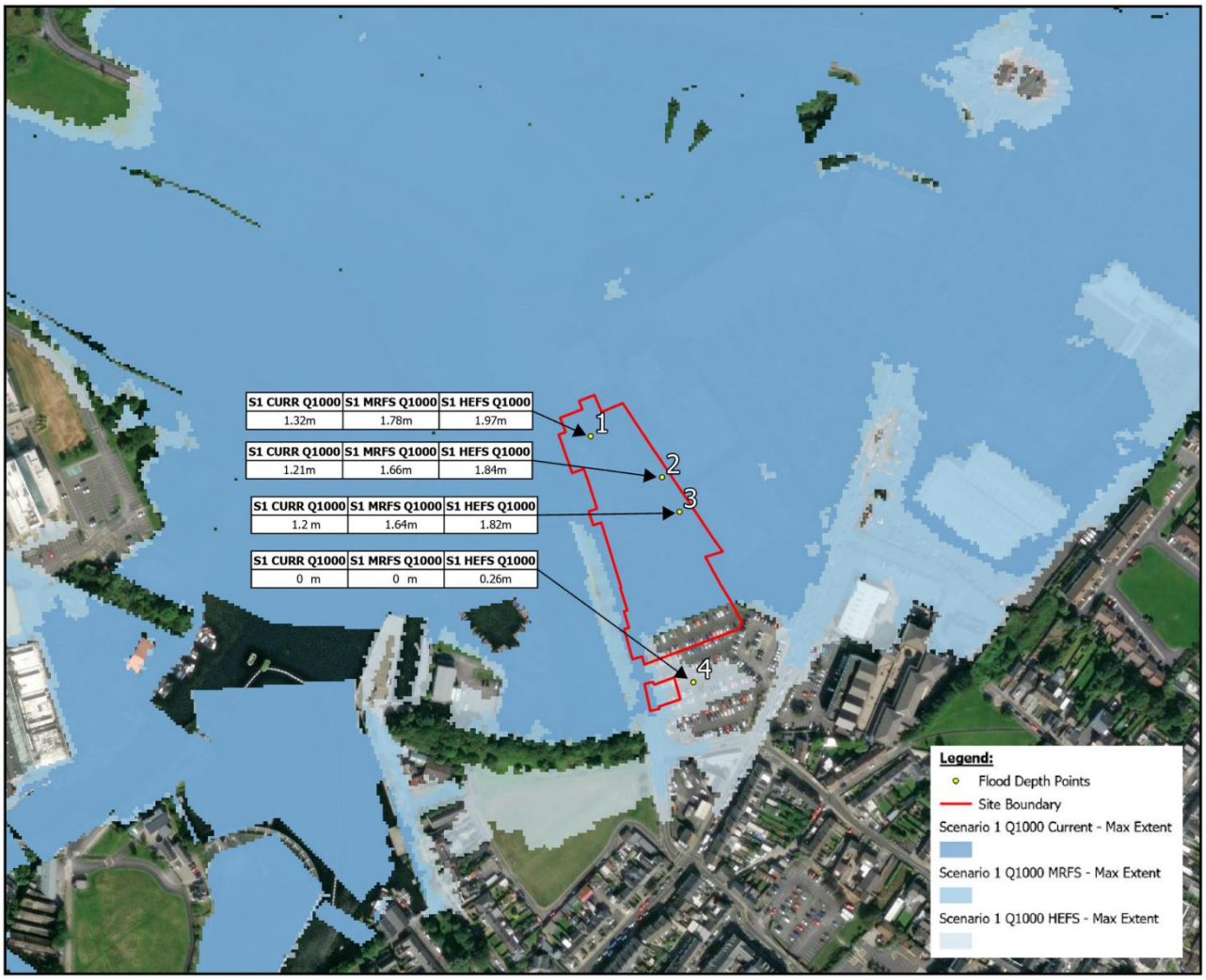


Figure 31 Maximum flood extents for the Q1000 current and climate change events for Scenario 1

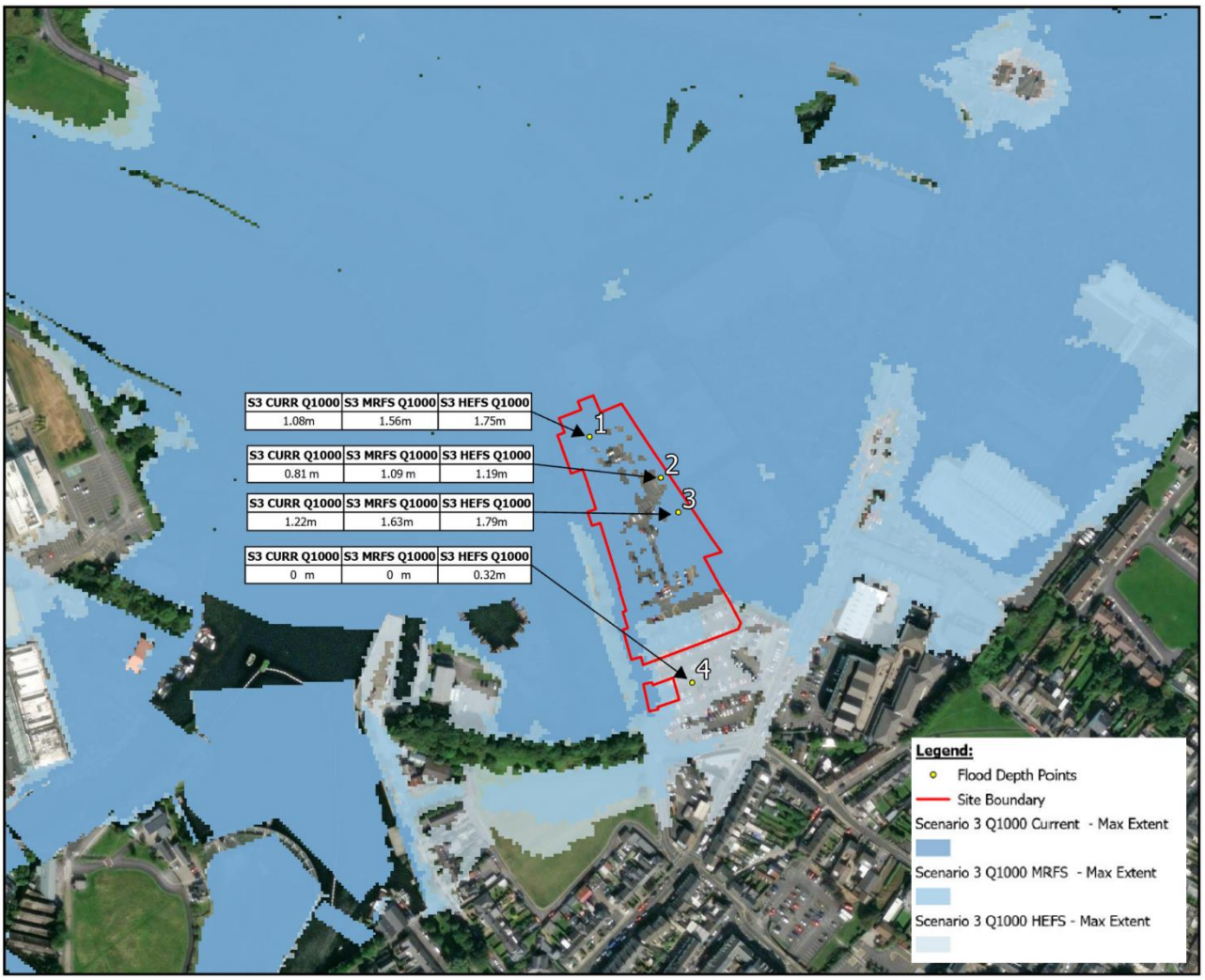


Figure 32 Maximum flood extents for the Q1000 current and climate change events for Scenario 3

The difference in maximum flood extents between Scenario 1 and Scenario 3 for the Q1000 MRFS scenario is presented in Figure 33. Increases in extents due to the proposed development during this event are noted behind the Clifden Rail embankment. The proposed superstructure has an impact on flood extent locally on the site.

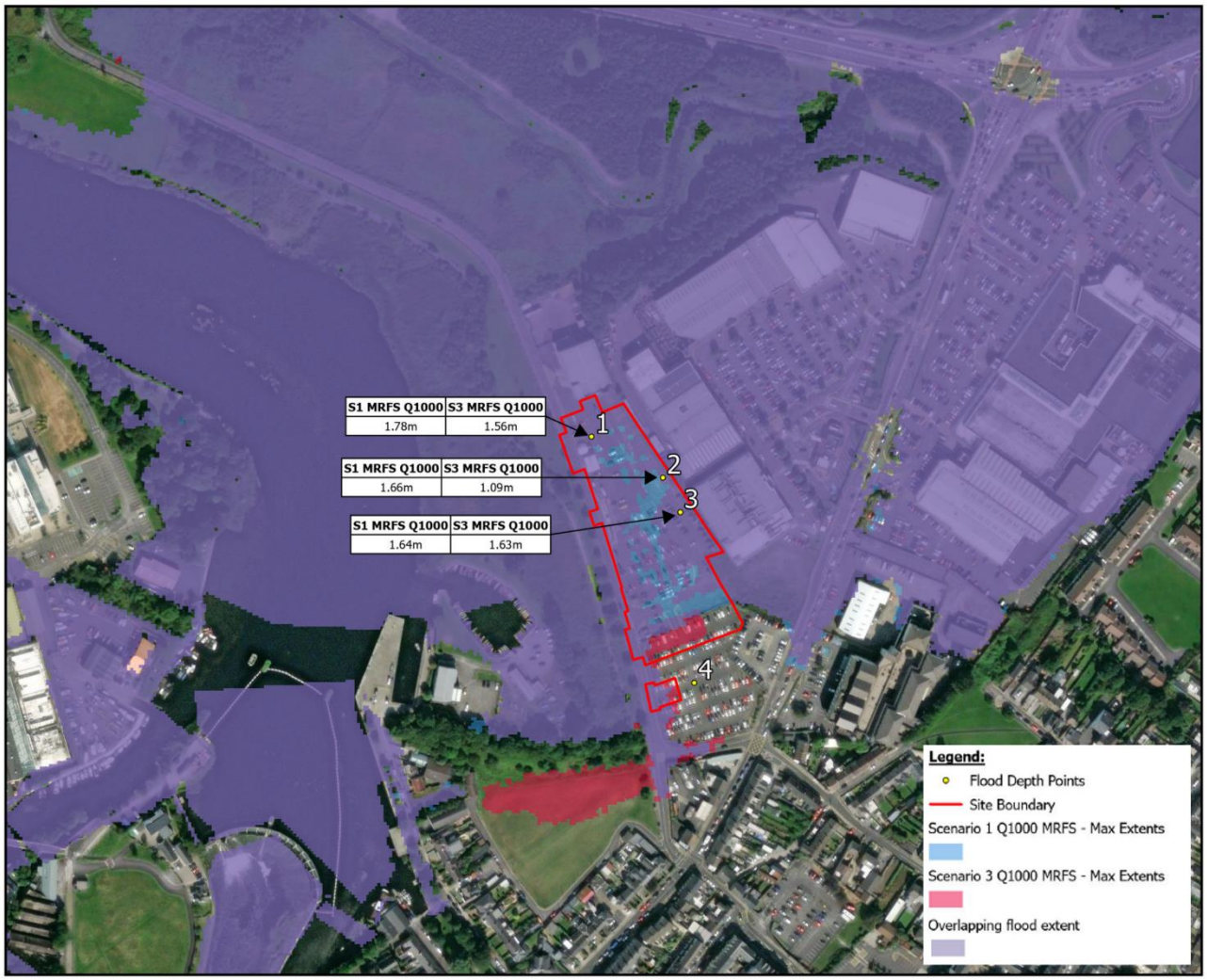


Figure 33 Maximum flood extents for the Q1000 MRFS for Scenarios 1 and 3

The difference in maximum water levels between Scenario 1 and Scenario 3 for the Q1000 MRFS scenario is presented in Figure 34. In areas where the Scenario 3 levels area higher than Scenario 1 levels the delta is positive while in areas where Scenario 3 levels are lower than Scenario 1 levels the delta is negative. The maximum difference in water levels is 100mm, at the southern part of the site, impacting Dyke Road. There is a reduction in water levels to the east of the site with the maximum reduction in the region of -40mm. It is noted that deltas between ±5mm have been filtered from the delta plot. Impact on adjacent properties (points a and b) is approximately 25mm.

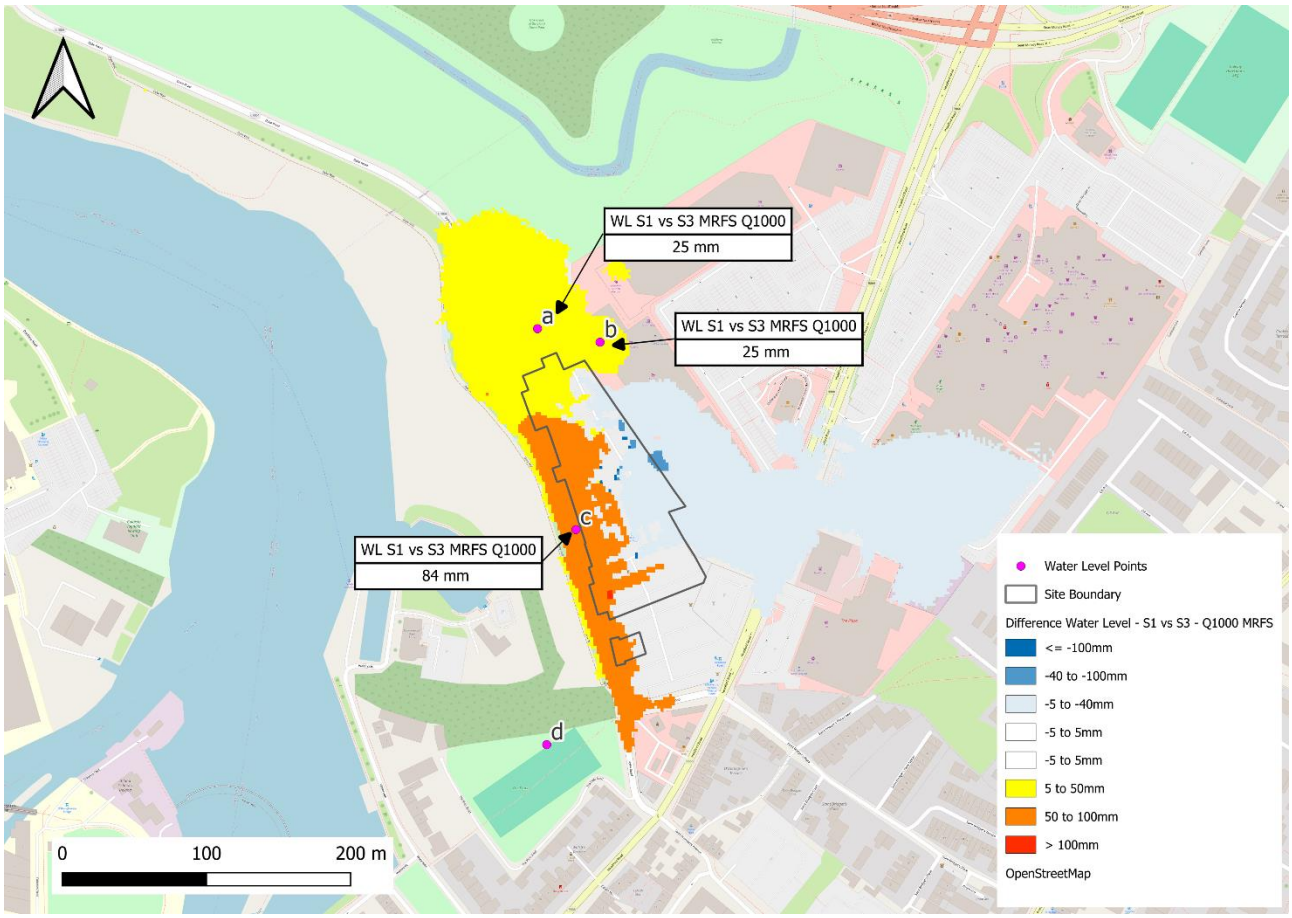


Figure 34 Difference in maximum water levels between Scenario 1 and Scenario 3 – Q1000 MRFS

3.2.3 Comparison of Scenario 2 vs Scenario 3

In order to assess the impact of the proposed developments ground regrading vs superstructure has on water levels., the Scenario 2 and Scenario 3 scenarios for Q1000 MRFS were compared against each other. As noted, Scenario 2 only includes the proposed development regrading while Scenario 3 includes the proposed development regrading and the proposed superstructure.

The difference in flood extent between Scenario 2 and Scenario 3 for the Q1000 MRFS scenario is presented in Figure 35. It can be seen that the extents are very similar, with increases in flood extents within the undeveloped area behind the Clifden Rail embankment southwest of the site. The loss of storage on the proposed site / impact on flow paths due to the inclusion of the superstructure results in increased water levels on the Dyke Road. This increase in water levels (<100mm) is enough to over top the existing high point between the road and the undeveloped area behind the Clifden Rail embankment resulting in flooding of the field.

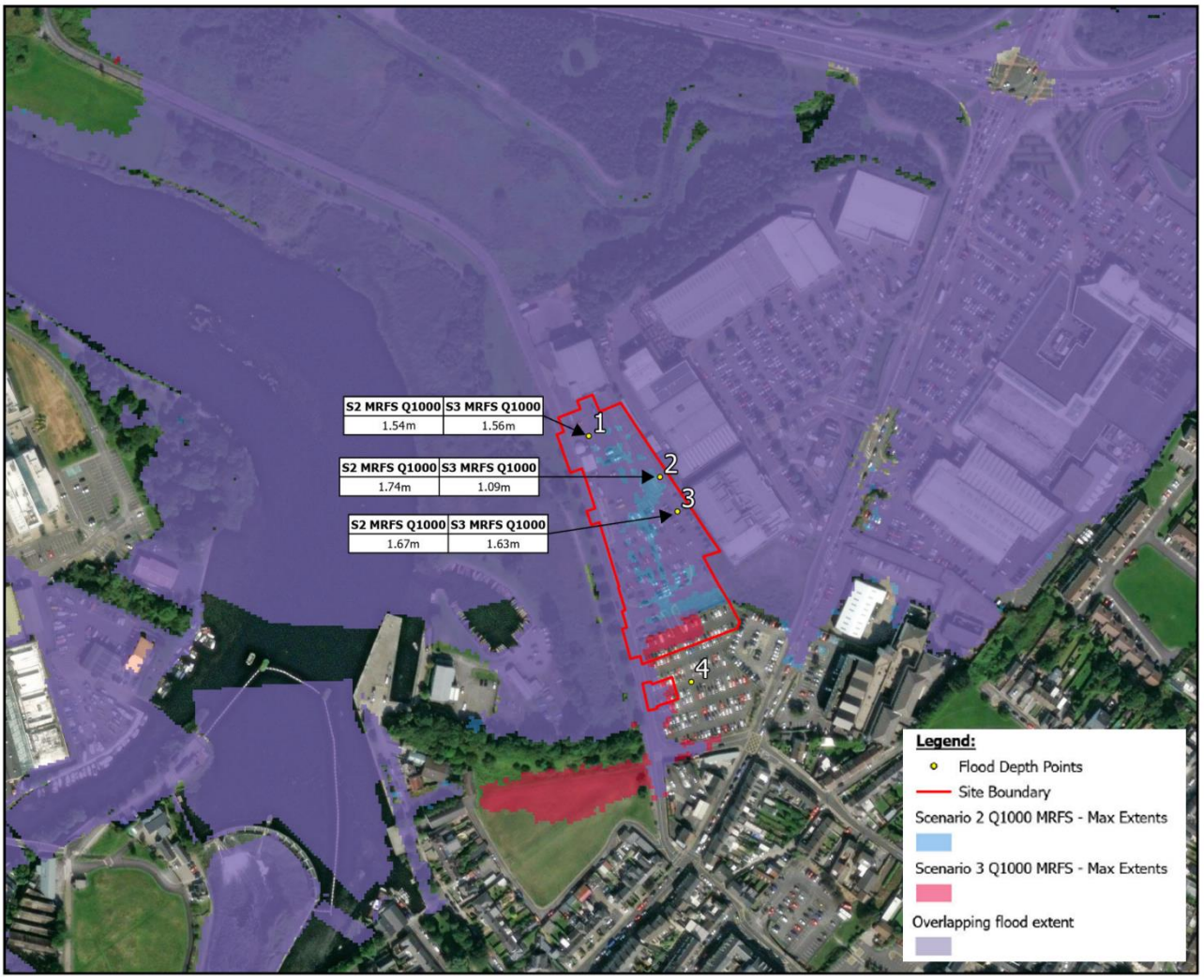


Figure 35 Maximum flood extents for the Q1000 MRFS for Scenarios 2 and 3

The difference in maximum water levels on the floodplain between Scenario 2 and Scenario 3 for the Q1000 MRFS scenario is presented in Figure 36. In areas where the Scenario 3 levels are higher than Scenario 2 levels the delta is positive while in areas where Scenario 3 levels are lower than Scenario 2 levels the delta is negative. It can be seen that the maximum water level difference between Scenario 3 and Scenario 2 levels is circa 80mm on the Dyke Road west of the site. There is a reduction in water levels to the east of the site. It is noted that deltas between ±5mm have been filtered from the delta plot. Impact on adjacent properties (points a and b) is approximately 25mm.

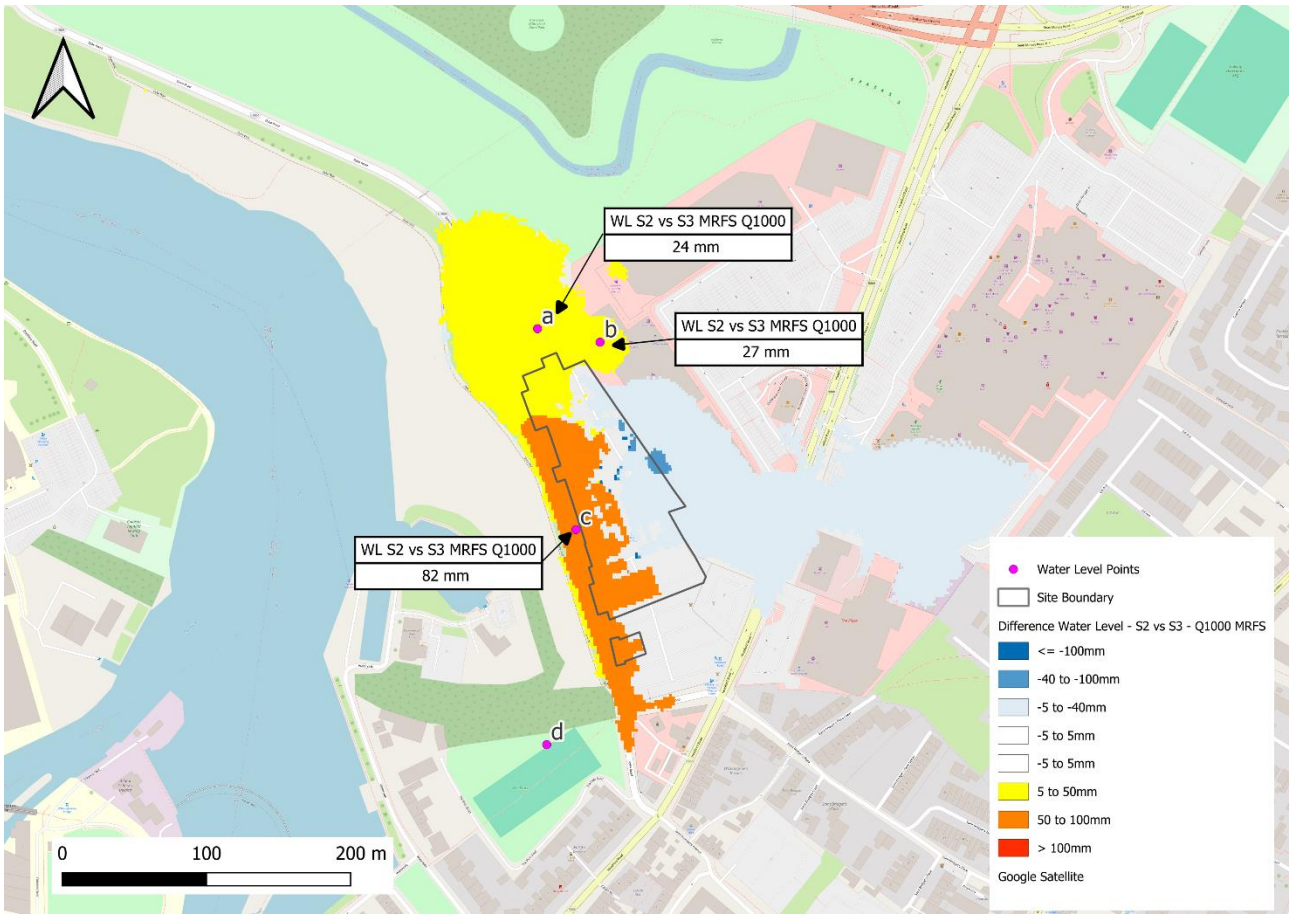


Figure 36 Difference in water levels between Scenario 2 and Scenario 3 – Q1000 MRFS

3.3 Terryland Sensitivity Analysis

In order to assess the impact of the removal/ failure of the Terryland Waterworks, the model was run for the Scenario 3 Q100 MRFS with the orifice units at the waterworks set to be open infinitely high.

Table 11 presents the maximum stages at critical locations for the Q100 MRFS modelled scenarios. Refer to Figure 18 for the location of the nodes.

Table 11 Maximum stage at critical locations Terryland Reach - Q100 MRFS

River/Reach	Node	Location	Q100_ MRFS Max Stage (mOD)	
			Scenario 3	Scenario 3_TL
Terryland Reach	30CAST00018A	Upstream of Terryland Waterworks	7.39	7.39
	30CAST00062	Adjacent to the site	6.00	6.00
	30CAST00084	Downstream of Terryland Forest Park	6.01	6.00
River Corrib	30CORR00185	Upstream of the site	6.79	6.80
	30CORR00178	Adjacent to the site location	6.79	6.79
	30CORR00161	Downstream of the site	6.65	6.65

The maximum stage results for Scenario 3 Q100 MRFS are almost identical in the River Corrib and Terryland Reach with or without the Terryland Waterworks. This leads to the conclusion that there is no impact on flood risk to the site if the Waterworks were to fail or be removed. There are two reasons behind this:

a) the maximum water levels are driven by the overtopping of the Corrib rather than the Terryland stream downstream of the water works and

b) in an extreme event such as the baseline Q100 MRFS, water from Terryland stream gets out of bank upstream of the waterworks and bypasses the orifice units. As such, removal of the waterworks has no impact to levels within the stream.

The maximum flood extents for the Scenario 3 Q100 MRFS scenarios including and excluding the Terryland Waterworks were compared. The difference between the two scenarios can only be seen upstream of Terryland Forest Park, adjacent to Terryland Waterworks, on the right bank where water bypasses the structure with the Terryland works in place (Figure 37). There is no impact on water levels on the site.

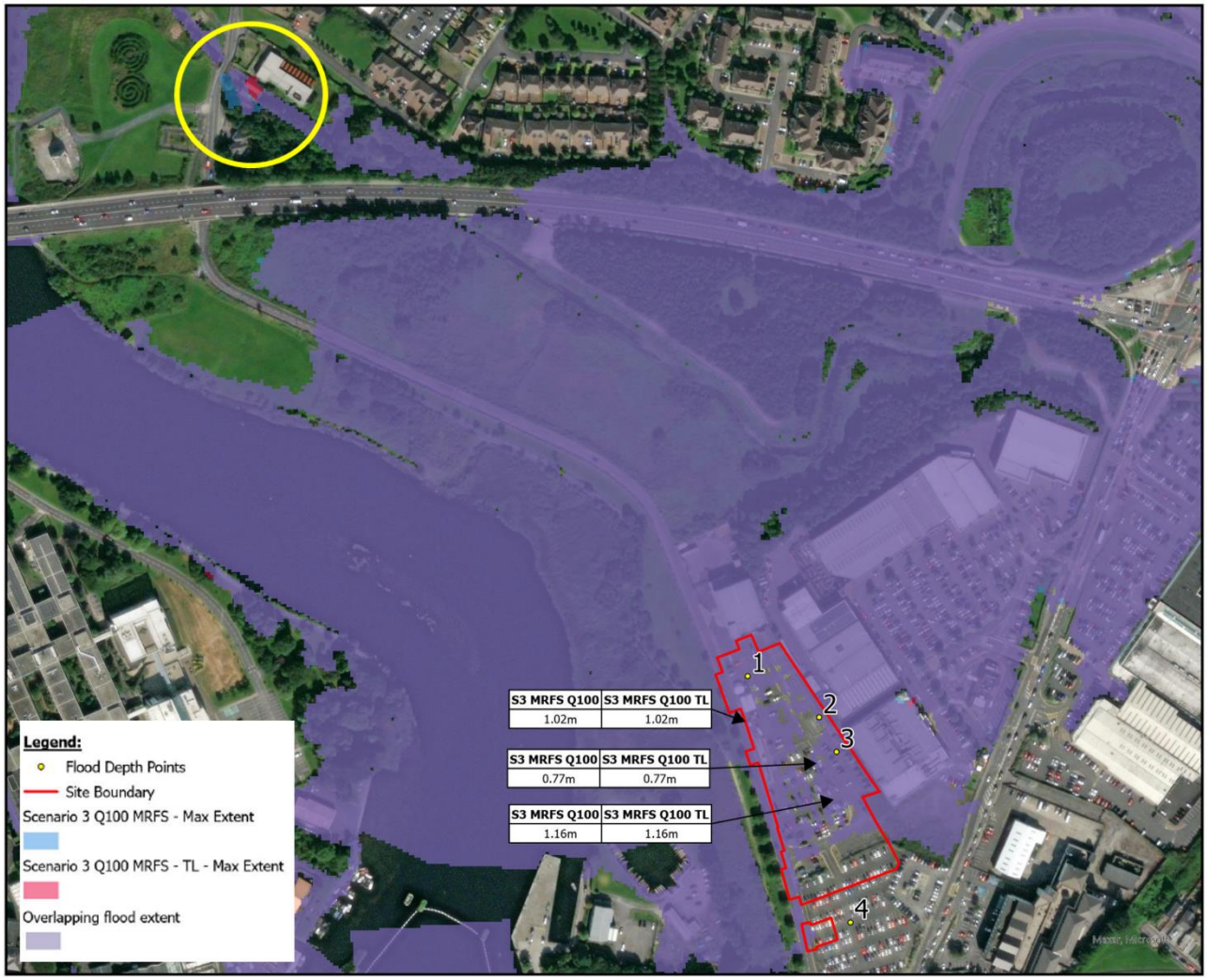


Figure 37 Maximum flood extents for the Q100 MRFS for Scenario 3 – Terryland Analysis

The difference in maximum water levels on the floodplain between Scenario 3 and Scenario 3 Terryland Sensitivity Analysis for the Q1000 MRFS scenario is presented in Figure 38. In areas where the Baseline levels are higher than Terryland Sensitivity levels the delta is positive while in areas Baseline levels are lower than Terryland Sensitivity levels than the Baseline levels the delta is negative. It is noted that the minimum/ maximum delta recorded on the site between the baseline and Terryland sensitivity run was in the range of ±2mm. This is considered negligible.

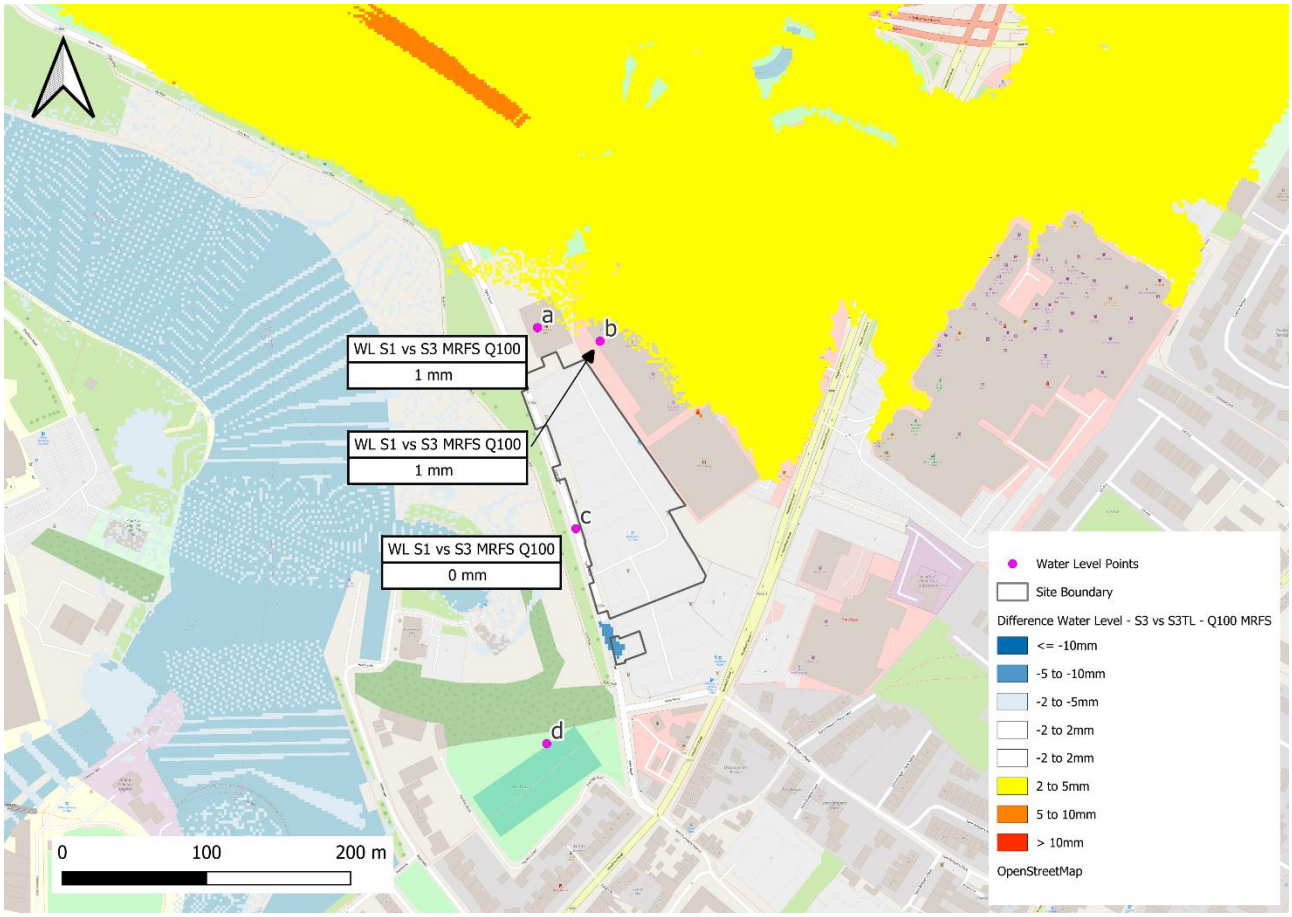


Figure 38 Difference in water levels between Scenario 3 and Scenario 3 Terryland sensitivity – Q100 MRFS

From the results it can be concluded that the inclusion/ removal of the Terryland water works will have no impact to the flood risk on the site.

Appendix A

Flood Extent Maps

1. Scenario 1 Q100 Curr, MRFS, HEFS max extent
2. Scenario 1 Q1000 Curr, MRFS, HEFS max extent
3. Scenario 3 Q100 Curr, MRFS, HEFS max extent
4. Scenario 3 Q1000 Curr, MRFS, HEFS max extent
5. Scenario 1 vs Scenario 3 Q100 MRFS max extent
6. Scenario 1 vs Scenario 3 Q1000 MRFS max extent

S1 CURR Q100	S1 MRFS Q100	S1 HEFS Q100
0.03m	1.26m	1.54m

S1 CURR Q100	S1 MRFS Q100	S1 HEFS Q100
0.04m	1.15m	1.43m

S1 CURR Q100	S1 MRFS Q100	S1 HEFS Q100
0.02m	1.13m	1.41m

1

2

3

4

Maxar, Microsoft

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary

Scenario 1 Q100 Current - Max Extent

Scenario 1 Q100 MRFS - Max Extent

Scenario 1 Q100 HEFS - Max Extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type: Maximum Flood Extent

Source:

Scenario: Scenario 1 Q100

Drawn By: LA Date: 14/02/2025

Checked By: CB Date: 14/02/2025

Approved By: RG Date: 14/02/2025

Drawing No: 1

Map Series:

Drawing Scale: 1:2,500 @ A3

S1 CURR Q1000	S1 MRFS Q1000	S1 HEFS Q1000
1.32m	1.78m	1.97m

S1 CURR Q1000	S1 MRFS Q1000	S1 HEFS Q1000
1.21m	1.66m	1.84m

S1 CURR Q1000	S1 MRFS Q1000	S1 HEFS Q1000
1.2 m	1.64m	1.82m

S1 CURR Q1000	S1 MRFS Q1000	S1 HEFS Q1000
0 m	0 m	0.26m

1

2

3

4

Maxar, Microsoft

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary

Scenario 1 Q1000 Current - Max Extent

Scenario 1 Q1000 MRFS - Max Extent

Scenario 1 Q1000 HEFS - Max Extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type: Maximum Flood Extent

Source:

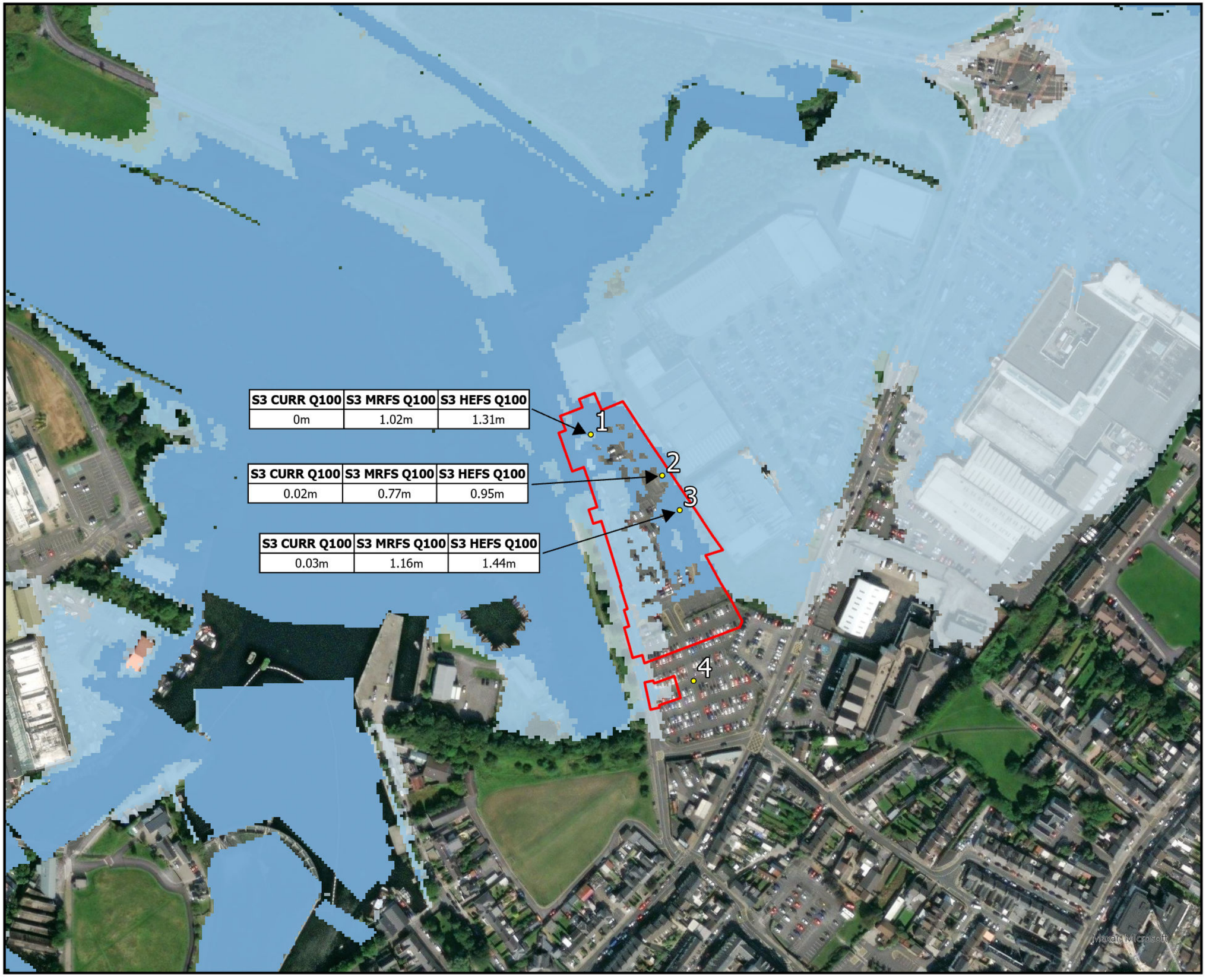
Scenario: Scenario 1 Q1000

Drawn By: LA	Date: 14/02/2025
Checked By: CB	Date: 14/02/2025
Approved By: RG	Date: 14/02/2025

Drawing No: 1

Map Series:

Drawing Scale: 1:2,500 @ A3



0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary
- Scenario 3 Q100 Current - Max Extent
- Scenario 3 Q100 MRFS - Max Extent
- Scenario 3 Q100 HEFS - Max Extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type: Maximum Flood Extent

Source:

Scenario: Scenario 3 Q100

Drawn By: LA Date: 14/02/2025

Checked By: CB Date: 14/02/2025

Approved By: RG Date: 14/02/2025

Drawing No: 1

Map Series: Page 1 of 1

Drawing Scale: 1:2,500 @ A3

S3 CURR Q1000	S3 MRFS Q1000	S3 HEFS Q1000
1.08m	1.56m	1.75m

S3 CURR Q1000	S3 MRFS Q1000	S3 HEFS Q1000
0.81 m	1.09 m	1.19m

S3 CURR Q1000	S3 MRFS Q1000	S3 HEFS Q1000
1.22m	1.63m	1.79m

S3 CURR Q1000	S3 MRFS Q1000	S3 HEFS Q1000
0 m	0 m	0.32m

1

2

3

4

Maxar, Microsoft

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary
- Scenario 3 Q1000 Current - Max Extent
- Scenario 3 Q1000 MRFS - Max Extent
- Scenario 3 Q1000 HEFS - Max Extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type: Maximum Flood Extent

Source:

Scenario: Scenario 3 Q1000

Drawn By: LA	Date: 14/02/2025
Checked By: CB	Date: 14/02/2025
Approved By: RG	Date: 14/02/2025

Drawing No: 1

Map Series: Page 1 of 1

Drawing Scale: 1:2,500 @ A3

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary
- Scenario 1 Q100 MRFS - Max Extent
- Scenario 3 Q100 MRFS - Max Extents
- Overlapping flood extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type: Maximum Flood Extent

Source:

Scenario: Scenario 1 vs Scenario 3 Q100 MRFS

Drawn By: LA Date: 14/02/2025

Checked By: CB Date: 14/02/2025

Approved By: RG Date: 14/02/2025

Drawing No: 1

Map Series: Page 1 of 1

Drawing Scale: 1:2,500 @ A3

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary
- Scenario 1 Q1000 MRFS - Max Extents
- Scenario 3 Q1000 MRFS - Max Extent
- Overlapping flood extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type: Maximum Flood Extent

Source:

Scenario: Scenario 1 vs Scenario 3 Q1000 MRFS

Drawn By: LA Date: 14/02/2025

Checked By: CB Date: 14/02/2025

Approved By: RG Date: 14/02/2025

Drawing No: 1

Map Series: Page 1 of 1

Drawing Scale: 1:2,500 @ A3

Appendix B

Flood Extent Maps in Isolation

1. Scenario 3 Q100 Curr max extent
2. Scenario 3 Q100 MRFS max extent
3. Scenario 3 Q100 HEFS max extent
4. Scenario 3 Q1000 Curr max extent
5. Scenario 3 Q1000 MRFS max extent
6. Scenario 3 Q1000 HEFS max extent

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary

Scenario 3 Q100 Current - Max Extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type:	Maximum Flood Extent
Source:	
Scenario:	Scenario 3 Q100 Current
Drawn By: LA	Date: 14/02/2025
Checked By: CB	Date: 14/02/2025
Approved By: RG	Date: 14/02/2025
Drawing No:	1
Map Series:	Page 1 of 1
Drawing Scale:	1:2,500 @ A3

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary

Scenario 3 Q100 MRFS - Max Extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type: Maximum Flood Extent

Source:

Scenario: Scenario 3 Q100 MRFS

Drawn By: LA Date: 14/02/2025

Checked By: CB Date: 14/02/2025

Approved By: RG Date: 14/02/2025

Drawing No: 1

Map Series: Page 1 of 1

Drawing Scale: 1:2,500 @ A3

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary

Scenario 3 Q100 HEFS - Max Extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type:	Maximum Flood Extent
Source:	
Scenario:	Scenario 3 Q100 HEFS
Drawn By: LA	Date: 14/02/2025
Checked By: CB	Date: 14/02/2025
Approved By: RG	Date: 14/02/2025
Drawing No:	1
Map Series:	Page 1 of 1
Drawing Scale:	1:2,500 @ A3

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary

Scenario 3 Q1000 Current - Max Extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type:	Maximum Flood Extent
Source:	
Scenario:	Scenario 3 Q1000 Current
Drawn By: LA	Date: 14/02/2025
Checked By: CB	Date: 14/02/2025
Approved By: RG	Date: 14/02/2025
Drawing No:	1
Map Series:	Page 1 of 1
Drawing Scale: 1:2,500 @ A3	

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary

Scenario 3 Q1000 MRFS - Max Extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type: Maximum Flood Extent

Source:

Scenario: Scenario 3 Q1000 MRFS

Drawn By: LA	Date: 14/02/2025
Checked By: CB	Date: 14/02/2025
Approved By: RG	Date: 14/02/2025

Drawing No: 1

Map Series: Page 1 of 1

Drawing Scale: 1:2,500 @ A3

0 25 50 100 150 200 250 Meters

Legend:

- Flood Depth Points
- Site Boundary

Scenario 3 Q1000 HEFS - Max Extent

Rev:	Note:	Date:
Rev. 1		14/02/2025

ARUP

Map:
Corrib Causeway Phase 1, Dyke Road
Estimated Flood Extents

Map type:	Maximum Flood Extent
Source:	
Scenario:	Scenario 3 Q1000 HEFS
Drawn By: LA	Date: 14/02/2025
Checked By: CB	Date: 14/02/2025
Approved By: RG	Date: 14/02/2025
Drawing No:	1
Map Series:	Page 1 of 1
Drawing Scale:	1:2,500 @ A3

Appendix E Emergency Plan and Evacuation Procedures

25 March 2025

Report

Flood Emergency Plan and Evacuation Procedure (rev 6)

Corrib Causeway, Dyke Road Development, Galway City

The Land Development Agency on behalf of Galway City Council

securing right **outcomes**

LOCATION	BLOCKS | PROPERTIES	LEVEL(S)	DISP.	REPORT | REV
DYKE ROAD, GALWAY CITY	ALL	ALL	PSDP	FE&EP-DCON-RPT-001-06

Diarmuid Condon
Managing Director

DCON Safety Consultants Limited
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Ireland

t: +353 1 611 1556
e: diarmuid.condon@dconsafety.com
w: www.dconsafety.com

Contents

The Land Development Agency on behalf of Galway City Council
Corrib Causeway, Dyke Road Development, Galway City

Rev	Originator	Approved	Date
0	John Kilkenny	Draft	30 September 2024
1	John Kilkenny	For Review	15th January 2025
2	Diarmuid Condon	Diarmuid Condon	31st January 2025
3	Diarmuid Condon	Diarmuid Condon	4th February 2025
4 (post LR)	Diarmuid Condon	Diarmuid Condon	27th February 2025
5 (updated project description)	Diarmuid Condon	Diarmuid Condon	14th March 2025
6 (post AECOM review)	Diarmuid Condon	Diarmuid Condon	25th March 2025

1 Introduction

This Flood Emergency Plan and Evacuation Procedure is designed to seek to ensure the safety of all residents in the event of a flood emergency. It outlines procedures for safe evacuation, emergency contacts, and key steps to minimise risks. This plan has been developed as part of the planning process and will remain a live document under constant revision for the life cycle of the building. This high-level plan is for distribution among the Client, Key Stakeholders and Facilities Management. Facilities Management will only be present on site when Met Éireann warnings suggest a flood is imminent. A user friendly and GDPR compliant version of this document will be made available to each building resident within their respective resident welcome packs as well as to operators of the proposed creche unit.

The subject planning application is submitted to An Bord Pleanála by the Land Development Agency for and on behalf of Galway City Council. It is intended that the Land Development Agency will develop the proposed phase 1 Corrib Causeway development and manage the completed building. This plan is written in respect of the entirety of the Dyke Road Development with an understanding that the area is subject to flood risk. Galway City Council and the Land Development Agency will ensure, as far as is reasonably practicable, that all parts of this plan are measured, achievable and demonstrable. The design team have ensured measures of flood mitigation and compensatory storage are provided on the site which will reduce the risk of many flood scenarios. Proposed upgrades to the existing flood defence embankment located on the Dyke Road is currently in design with the OPW and ARUP which Galway City Council, the Land Development Agency and the design team are engaging with. As part of the Coirib go Cósta Flood Relief Scheme (CgC GCFRS) the Dyke Road embankment is being considered. As noted in the Strategic Flood Risk Assessment within the Galway City Development Plan 2023-2029. the Coirib go Costa FRS reflects the outcomes of the CFRAM and should include for works to remediate the Dyke Road defences.

Detailed procedures are provided in this document to guide residents who may choose to evacuate in the event of a flood. Residents and visitors should always follow advice from emergency services and facilities management in the event of a severe weather event or flood.

1.1 Background and context

This document is submitted as an appendix to the Strategic Flood Risk Assessment. A summary of the background and context regarding flood risk and this Flood Emergency Plan and Evacuation Procedure is provided here. For full background regarding flood risk and mitigation, the Site-Specific Flood Risk Assessment should be referred to. As part of the Galway City Development Plan 2023-2029, JBA Consulting carried out a Strategic Flood Risk Assessment (SFRA). Within this SFRA, a review of the Dyke Road Car Park site was undertaken. The Phase 1 site subject of this application is located in Flood Zone A however is within a Defended Area due to the Dyke Road flood embankment. The SFRA shows the extent of defended areas benefiting from the Dyke Road flood defence embankment (which includes the subject site). The SFRA states this embankment is subject to assessment and possible remediation, under the Coirib go Cósta – Galway City Flood Relief Scheme. It notes, the *'embankment is shown to prevent the River Corrib entering the area in the defended 1% AEP fluvial event. This does not include sufficient freeboard however and does not meet the standard of protection required for a formal defence. The embankment is critical to preventing flood risk to the subject site. The embankment is modelled to overtop in the 0.1% AEP event*'.

Part 3 of the Justification Test was carried out as part of the JBA SFRA and included a detailed flood risk assessment and model runs. The model runs carried out show that the site is currently defended to the 1% AEP standard of protection (aka 1 in 100-year event), but that the embankment height is variable and does not include a freeboard allowance. There is a high

residual risk of flooding in both the 0.1% AEP event (aka 1 in 1000-year event) and when climate change is considered, when the embankment is overtopped and a high volume of water from the Corrib is allowed to fill the site and surrounding lands.

The SFRA states development proposals for the Dyke Road Car Park will need to consider appropriate finished floor levels and mechanisms for managing residual flood risks. Development of the regeneration site will require site specific assessment and plans for the area shall include the following additional flood management measures:

- Highly vulnerable development will be located above the 0.1% AEP level, with an appropriate freeboard. This may be achieved through setting the ground floor at a suitable height or by locating highly vulnerable uses (and particularly sleeping accommodation) at first floor level;
- An emergency plan and evacuation procedure in the event of an embankment failure will be prepared along with any planning proposal for the site; and
- Basements will be discouraged, and if included will be accessed from a level above the recommended finished floor level and fully sealed to ensure no water ingress.

This document is submitted to address the requirement for 'an emergency plan and evacuation procedure'. The main body of the SSFRA sets out the nature and extent of the flood risk design approach response and mitigation in detail.

In summary, the approach taken by the design team is to set the building FFL at 7.28m, with the ground level at circa 5.00m. The building will essentially be on stilts with only the cores extending down to ground level (with the exception of a façade treatment to include louvres to allow the free movement of water through and out of the site in the event of a flood). While only the cores and necessary structural elements will extend down to the ground the lower ground level façade will not be fully permeable as screens / louvres are proposed. The permeability of the lower ground level façade has been included in the hydraulic modelling undertaken by Arup.

Regarding the embankment, the Coirib go Costa team led by ARUP on behalf of Galway City Council (GCC) and OPW have confirmed that the Flood Relief Scheme will include works to remediate the Dyke Road defences. It is understood these defences will comprise an early phase of what is a complex and city-wide project (it is understood that site investigations works are to shortly commence on the embankment). As such, the flood mitigation works, and evacuation plan proposed as part of this development are only temporary in the case of the 1% AEP event (with climate change and freeboard considered). The design standard of protection for the embankment in the Flood Relief Scheme is still to be determined but it is understood it will likely be Q100+freeboard (likely 0.5m) +climate change (0.1m) (To be determined). As such in the event of a more severe flood, the measures outlined here will remain a requirement.

It is understood that since the construction of the embankment the Dyke Road area has remained free of flood events and the Corrib has not overtopped the embankment. Even though such events are rare, management and mitigation of flood risk and an evacuation response are nevertheless essential. For city wide flood context, Appendix 27, The Galway City Council Major Emergency Plan notes the following: '*For flood levels above 6.1metres Galway City fire station can flood. For severe flood warnings vehicles should be moved from the yard to the Fairhill side of the station. In Page 34 of 74 Galway City Council Major Emergency Plan the event of very severe flooding consideration should be given to closing the station temporarily and moving all vehicles and personnel to the Galway Technical Institute (091*

581342) on Fr Griffin Road where a room can be made available for the duration of high-water levels.'

For this development, the FFL of living spaces will be above this level, at 7.28m.

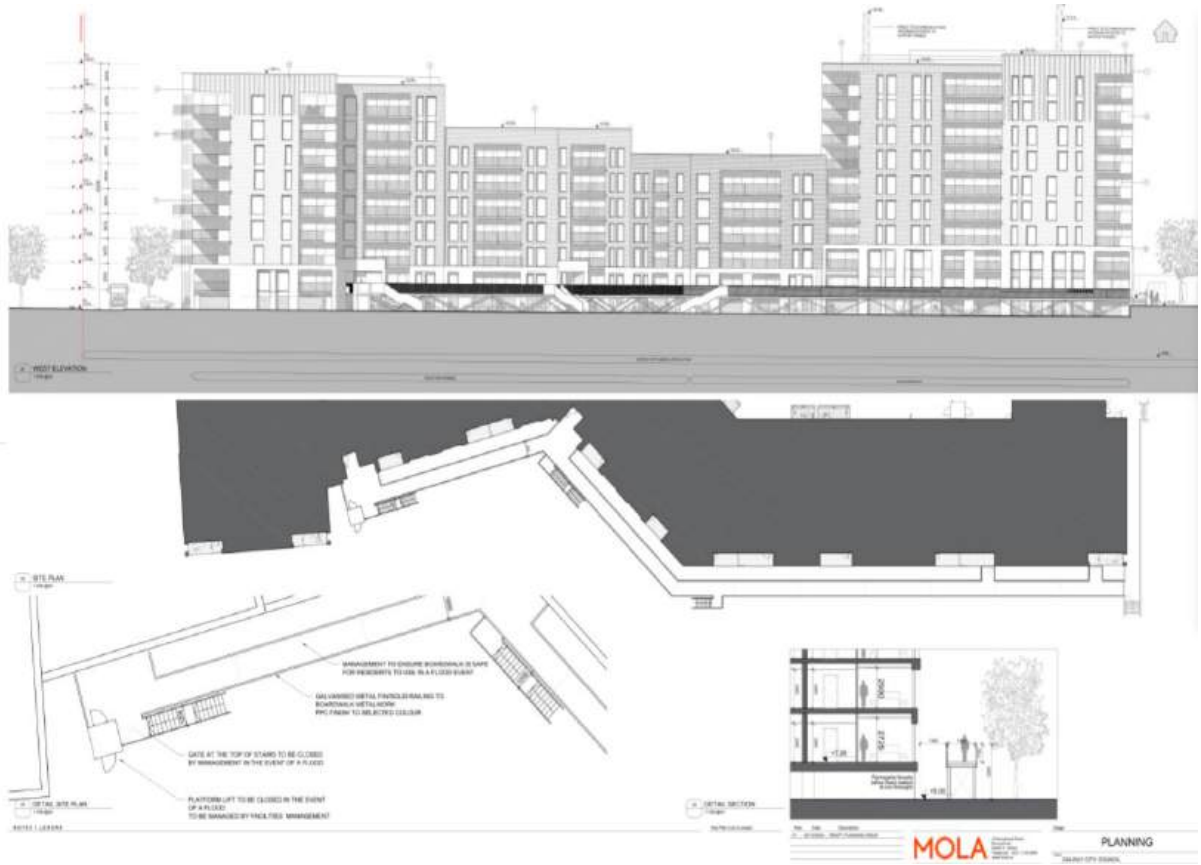


Figure 1: Section and Plan details illustrating primary flood mitigation comprising boardwalk & raised FFL

1.2 Site and development information

The Dyke Road site forms part of a strategic brownfield landbank located on the edge of Galway City Centre which has been identified for comprehensive redevelopment by GCC. The Phase 1 site subject to this planning application is located to the northeast of the city centre, within walking distance from Eyre Square and the Headford Road area.

The proposed development will consist of the construction of a new residential development of 219 no. apartment units and a childcare facility (approx. 241 sq. m) in the form of 1 no. new residential block (5 - 9 storeys over lower ground floor level) with associated car parking, bicycle parking, public and communal open spaces, and all ancillary works on a site area of 1.144 ha. The proposed development will provide for:

- 219 no. residential apartment units (109 no. 1-bedroom units, 100 no. 2-bedroom units and 10 no. 3-bedroom units) each with an associated private open space area in the form of a balcony/terrace;
- A raised pedestrian boardwalk along the western elevation of the proposed building;

- Open Space (approx. 2,778 sq. m) is proposed in the form of (a) public open space (approx. 1,183 sq. m) to the west of the proposed building fronting on to Dyke Road accommodating outdoor seating, planting, a sunken garden and pedestrian pathways and connections; and (b) communal open space (approx. 1,605 sq. m) to the east of the proposed building in the form of a courtyard including outdoor seating, planting, a children's play area and outdoor sports equipment;
- A childcare facility (approx. 241 sq. m) at ground floor level with dedicated external play area (approx. 61 sqm) at surface level;
- A total of 33 no. new car parking spaces at surface level to serve the proposed residential development (including 2 no. accessible spaces). In addition, 2 no. set down / drop off spaces are proposed to serve the childcare facility;
- A total of 465 no. bicycle parking spaces to include 330 no. standard residential spaces, 100 no. visitor spaces, 25 no. cargo bicycle spaces and 10 no. bicycle parking spaces dedicated for the childcare facility staff, all at surface / lower ground floor level;
- Vehicular access to serve the development is proposed via Dyke Road at 2 no. new locations along the western site boundary (to the north west and south west of the main development site). Pedestrian and Cyclist access is also proposed throughout the site via Dyke Road and a new pedestrian crossing is also delivered at Dyke Road. The proposed development will extinguish the existing pedestrian connection between Galway Retail Park and the subject site as part of wider proposals for local improvements to permeability;
- The removal of 389 no. existing car parking spaces (311 no. from Car Park 1 and 78 no. from Car Park 2) is proposed to provide for the new development. An overall total of 165 no. existing car parking spaces will be maintained in Car Park 2;
- The extinguishment of the main existing vehicular entrance serving Car Park 1 and Car Park 2 at Dyke Road with provision made for a new vehicular access point (to the south of the main development site) to facilitate continued access to existing Car Park 2 and the remaining car parking spaces (165 no.);
- The removal of existing bring bank facilities including 2 no. clothing banks and 8 no. bottle banks from Dyke Road; and
- 2 no. telecommunications lattice towers (overall height 6.45 m and 7.67 m) affixed to the rooftop supporting 9 no. 2m 2G/3G/4G antennas; 9 no. 0.8m 5G antennas; 6 no. 0.3m microwave transmission links; together with all associated telecommunications equipment and cabinets. The proposed overall building height including the telecommunications towers is approx. 38.18 m (+43.18 AOD).

The development will also provide for all associated site development works, infrastructure, excavation and clearance works including decommissioning the existing Black Box Theatre waste water pumping station, provision for a new pumping station complete with below ground emergency storage, all boundary treatment/retaining walls, public lighting, internal roads and pathways, ESB substations, switch rooms, water tank rooms, cleaner store and WC, meter rooms, facilities management office, parcel store, comms rooms, plant room, generator room / associated plant space, bin storage, bicycle stores, hard and soft landscaping, play equipment, below ground attenuation tanks, nature based SUDs features, green roofs, roof plant, new and replacement site services and connections for foul drainage, surface water drainage and water supply.

This planning application is accompanied by an Environmental Impact Assessment Report and Natura Impact Statement.

The Galway City Development Plan 2023 – 2029 identifies the site as a regeneration site with a unique opportunity to provide a residential led development with linkages to the established City Centre.

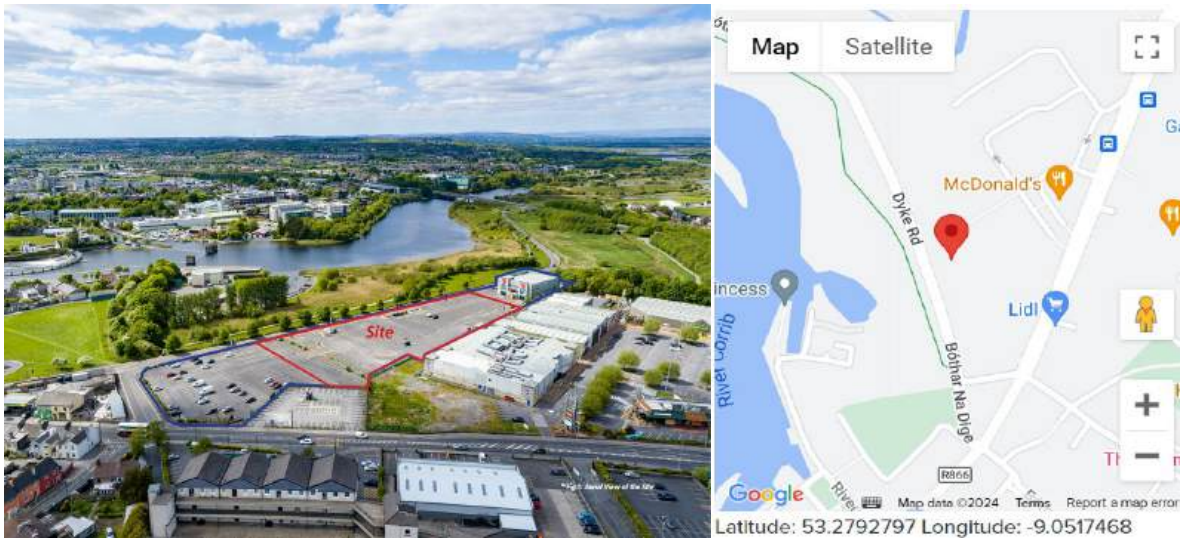


Figure 2: Site Location

The Site Development Framework submitted with this Application provides details on the planned delivery of 219 one, two and three-bedroom apartments, within a development ranging in height from 5 to 9 storeys, alongside a creche, communal open spaces, playgrounds and new landscaping along Dyke Road.

1.3 Flooding

Flooding in apartment buildings can cause severe damage, affecting multiple units and common areas. Water from broken pipes, heavy rainfall, or poor drainage systems can seep into walls, floors, and ceilings, leading to structural damage, mould growth, and electrical hazards. Tenants may face property damage, health risks, and temporary displacement. It is vital to the Dyke Road Development that appropriate mitigation measure, both pro-active and re-active, are well planned and communicated, along with swift emergency responses, to minimize the impact of flooding in this multi-unit development. Residents of the block will be made aware of the potential flood risk as part of the management plan/pack on move in.

The proposed flood defence scheme for Galway City is called Coirib Go Costa – Galway City Flood Relief Scheme, managed by the OPW. Work is ongoing with the hope to design and deliver a flood relief scheme for Galway City (https://www.floodinfo.ie/galwayfrs/#:~:text=The%20objective%20of%20Coirib%20go,relief%20scheme%20for%20Galway%20city)

2 Guidance and legislation

The project team were mindful and strive to demonstrate an awareness of the various legislative requirements and codes of practice/guidance documents consulted in the drafting of this document. These include but are not limited to:

- Building Control Amendment Regulations 2014;

- Guidelines for Planning Authorities – "The Planning System and Flood Risk Management", OPW, 2019;
- OPW Flooding Plans;
- Galway City Council, Major Emergency Plan, Appendix 27 – Flooding Emergencies;
- A Framework for Major Emergency Management – Working Draft – Guidance Document 11, A Guide to Flood Emergencies;
- Guidance Document 11 – A Guide to Flood Emergencies – Government of Ireland; and
- Proposed Corrib Go Cósta – Galway City Flood Relief Scheme.

In addition, the following reports and assessments led by the project design team have informed the Flood Emergency Plan and Evacuation Procedure:

- Corrib Causeway Phase 1, Dyke Road – Site Specific Flood Risk Assessment – Land Development Agency (Aecom); and
- Hydraulic Flood Modelling Report (ARUP).

2.1 Glossary of terms

Term	Meaning
LDA	The Land Development Agency
GCC	Galway City Council
HSA	The Health and Safety Authority
AGS	An Garda Siochana
CD	Galway Civil Defence
GFB	Galway Fire Brigade
HSE	The Health Service Executive
ICG	Irish Coast Guard
FM	LDA Dyke Road Facilities Management
IW	Uisce Eireann | Irish Water
ESB	Electricity Supply Board
GNI	Bord Gáis | Gas Networks Ireland
OPW	The Office of Public Works
MET	Met Éireann
NFFC	National Flood Forecast Centre

3 Hazard identification

3.1 Site specific flood risk assessment

3.1.1 QR link

The below is an illustration of a QR Code link which will be visible at various locations within the proposed building including all access points. The Flood Emergency Plan and Evacuation Procedure is intended as a live document to be updated as necessary by the Facilities Manager and with input of relevant authorities.

4 Mitigating pre-flood provision

Informed by the Flood Risk Assessment Process and Design Team Meetings, impacting on the design of the Dyke Road Development, a number of measures have been implemented in the building and future running of the development. These are listed below with further information to be made available in both the project designs and Operations and Maintenance Manuals to be provided on handover to the proposed Facilities Manager.

4.1 Designing for flood risk

Flood resilient design will be required. The measures proposed reflect the intended building uses at lower ground and ground floor levels. The following is an overview of the flood mitigation measures that have been proposed:

- The adoption of a residential Finished Floor Level (FFL) of 7.28m, which is above the 0.1% AEP or 1 in 1,000- year flood level and 1% AEP or 1 in 100-year flood plus freeboard plus MRFS climate-change allowance;
- External electrical, mechanical, or communication ducting and chambers below the 7.28m level will be watertight and flood-proof;
- All critical infrastructure (e.g. wastewater pumping station and substation) are above the 1 in 1,000-year flood level and the 1 in 100-year flood plus freeboard plus MRFS climate-change allowance;
- Anti-flood valves will be installed on foul and storm connections below the 7.28m level;

- Any infrastructure/ objects below the design flood level are at risk in a flood event. Mitigation measures form part of the evacuation / emergency strategy. These include residents being advised to remove bikes and cars prior to the flood event occurring and doors will be locked to prevent access to the areas during a flood event; and
- The provision of emergency evacuation routes above the 7.28m (1 in 1000 year) level.

4.1.1 Design stage

- The approach taken by the design team is to set the building FFL at 7.28m, with the ground level at circa 5.00m. The building will essentially be on stilts with only the cores extending down to ground level (with the exception of a façade treatment to include louvres to allow the free movement of water through and out of the site in the event of a flood). In doing so the flood storage volume currently available on site can be maintained;
- The building ground floor level is set at +7.28 AOD, placing all residential uses above the proposed flood levels;
- Access to the building is provided via the boardwalk at +7.28 AOD, ensuring access and evacuation above predicted flood levels;
- Additional boardwalk access stairs and platform lifts will be closed off in the event of a flood;
- The proposed block has a continuous corridor at Ground Level to ensure safe internal evacuation through the building in the event of an evacuation;
- Continuous corridors are provided at Levels 01, 02, 03 and 04 to facilitate alternative internal escape. Escape doors will be placed along the corridor for management purposes only and subject to detail design;
- Only non-essential uses are located at Lower Ground floor such as bin stores and bike stores. Access to the lower ground floor will be controlled in the event of a flood (Door closers etc.);
- Core A and C lifts terminate at Ground Floor Level;
- Core A, B and C stairs terminate at Ground Floor Level;
- An additional external stair to the Lower Ground Floor is proposed for access to the amenity space that can be closed in the event of a flood;
- A dual facing lift is utilised in Core B, with one side opening at the Lower Ground Floor level only. This can be restricted in the event of a flood;
- The creche is located at +7.28 AOD with direct access to the external area above predicted flood levels. The boardwalk will act as a defence to the building facade should any vehicle etc be found floating in the water;
- Additional bollards/barriers will be installed (where the boardwalk/fencing does not protect the building);
- The introduction of soft landscaping will offer a NET reduction surface water runoff;
- The development includes a 1799m^2 green roof which will yield a 131.2m^2 combined storage volume;
- The adoption of a residential Finished Floor Level of 7.28m which is above the 1:100 and 1:1000-year flood level; and
- A site-specific hydraulic flood modelling report was completed by ARUP utilising the Draft Corrib Go Cósta hydraulic modelling (via the OPW) to ensure up to date flooding information and modelling informed the SSFRA.

4.1.2 Building operational phase

- Flood warnings are managed and monitored by Met Éireann. Corrib water levels are monitored by the OPW. Severe weather advisory notices and relevant impacts management and actions are managed in Galway City by a multiagency team comprising between An Garda Siochana, the HSE, the Fire Service, the Civil Defence, Galway City Council, Galway County Council, and the Port of Galway. Each of these monitoring services will in turn be monitored by the Facilities Manager who will ensure residents and building users/tenants are notified once a flood risk from the River Corrib is known;
- Flood warning communication system with real-time water levels on the Corrib will be notified to all residents via an agreed communication means;
- The building flood evacuation route includes for signage and other flood awareness measures to inform residents and the public what to do (and what not to do) in the event of flooding;
- Provision of flood warnings, evacuation plans and ensuring public / residents are aware of the flood risk and evacuation plan. This information will be provided in a welcome pack to new occupants. This will be updated regularly to ensure information is up to date;
- Demountable flood barrier system to protect openings in the building façade below projected flood levels. Alternatively, where possible flood doors will be specified to ensure no ingress of flood waters;
- Door closers will be activated by management on notification of potential flood waters to ensure no resident can gain access to spaces below +7.28 AOD/potential flood waters;
- Residents/shared car operators will be informed at the earliest possible time to move any bikes or parked cars away from the property before any flood waters arrive on the site. Bike stores will be on a code-controlled access which will be restricted in the event of a flood. In the event any vehicle is not removed, Facilities Management will look to remove the vehicle if time permits, otherwise Facilities Management will review this to ensure no resident will be in any additional danger. The boardwalk will look to provide a defensible barrier to the building façade on the western side. Gates to the north (reducing access to the rear of the block) will form a line of defence to the eastern façade of the building. Additional bollards will be provided where to the northwest of the building to help protect the building from floating debris;
- A dedicated Facilities Management room is provided at Core C and residents & operators in the building will be advised by the management company when the personnel are due to be in the building. This is to ensure any resident can access resources when required. The Facilities Manager will ensure a presence is provided on site in the management room once a flood risk warning is received;
- Post development completion regular maintenance will be undertaken (regular drain clearing etc.);
- The QR code (refer to Section 3.1.1 above) will be located/shown at all access points to the building to help residents follow procedures correctly;
- Residents will be informed frequently of flood activity and advised if any additional precautions should be taken;
- Facilities Management will check in/visit residents during a flood to ensure all residents are comfortable with the management plan. Facilities Management will also assist any resident evacuate the building if they wish;
- The Facilities Management will advise when flood levels have recessed to safe levels to allow access to the full site;

- The Facilities Management will coordinate and manage associated clean-up of any flood debris on site;
- Facilities Management will review refuse storage and ensure refuse is collected (if required from the Headford Road) in the event of a severe 1:1000-year event;
- Residents will be able to evacuate the site internally (or via the external boardwalk) at any time. Management will ensure a safe route (above flood waters) is provided to the Headford Road Area;
- Vulnerable users will be identified by facilities management and needs assessed to ensure access to all essential services. Additional language skills will be made available as required; and
- Facilities Management will utilise designated site access routes for emergency services in the event of a medical emergency.

5 Planning and preparation (flood evacuation)

5.1 Roles and responsibilities

5.1.1 Local roles and responsibilities

5.1.1.1 Owners | client

The LDA, as proposed developers and operators of the building, will take all reasonably practicable measures to counter any adverse effects from flooding. Prior to construction handover, the LDA will tender for competent and suitably qualified agents and facilities management to manage and maintain this property. These specialists will also be responsible to ensure regular inspection, long and short-term maintenance, repairs are planned and executed to ensure health and safety and legal compliance.

5.1.1.2 Facilities management

Facilities Management, under the direction of the LDA, will establish upon Practical Completion of the development. a Flood Working Group consisting of key stakeholders including Facilities Management, Resident's Association, Local Authorities and external consultants as required. The Facilities Manager will ensure coordination of emergency plans with the relevant emergency services i.e. Local Authorities, Fire & Rescue, Civil Defence and An Garda Siochána. Facilities Management will be responsible for the ongoing flood prevention maintenance of the development, the roll out of flood defence systems, communication and controlling all evacuations from the site. Facilities Management will also ensure that an appropriate person is always available in the event of holiday leave or illness.

5.1.1.3 Contractors

The LDA will ensure that the appointed Main Contractor will maintain a register of all suppliers and contractors completing works on the development in the construction stage. Prior to construction handover, there will be maintenance contracts for inspections, repairs and maintenance for this building.

5.1.2 Statutory | other agencies

Building relationships with authorities will help the LDA to further understand the role of different agencies and organisations in responding to emergency events, building direct contacts with those involved and identify how our Flood Evacuation Plan can be integrated and 'tie-in' with the wider community emergency response plan currently in place. Key agencies and stakeholders relevant to flood management and the proposed Flood Emergency Plan and Evacuation Procedure are as follows:

- Interagency Flood Planning agencies;
- Galway Severe Weather Advisory Team including:
  - Galway City Council
  - Galway County Council;
  - An Garda Síochána;
  - Health Service Executive
  - Civil Defence
  - Port of Galway
  - Fire Service
- Transport Infrastructure Ireland
- Irish Coast Guard
- ESB
- Bord Gáis; and.
- Uisce Eireann

The following table sets out the Galway Fire Service and Galway Civil Defence Flood Response Assets as set out in the Galway City Council Major Emergency Plan (Appendix 27 - Flooding Emergencies):

Table 1 - GFRS / GCD Flood Response Assets			
Galway Fire Rescue Service			
Location	Teams (4 persons)	Team Type	Equipment
Galway City	2 - 3	B	3 No 4x4s (2 from County Stations) 1 Combi van & 1 Incident Command Unit 2 MFC rescue sleds (RS10 & RS5) 1 No Amphibio 1500 lpm floating pump
Athenry	1	B	1 No 4x4 and 1 No MFC RS10 rescue sled 1 No Amphibio 1000 lpm floating pump
Loughrea	1	B	1 No 4x4 and 1 No MFC RS10 rescue sled 1 No Amphibio 1000 lpm floating pump
Ballinasloe	1	B	1 No 4x4 and 1 No MFC RS10 rescue sled 1 No Amphibio 1000 lpm floating pump
Portumna	1	C	1 No 4x4 and 1 No 7.5m RIB (twin engine) 1 No Smartwave 3500 rigid rescue boat 1 No Amphibio 1000 lpm floating pump
Gort	1	B	1 No 4x4 and 1 No MFC RS10 rescue sled 1 No Amphibio 1000 lpm floating bump
Galway Civil Defence			
Galway City	2	C	1 No 4x4 and 1 No MFC RS10 rescue sled 1 No 6.4m RIB (single engine) & 1 No Zodiac 1 No Smartwave 3500 rigid rescue boat
Ballinasloe	1	C	1 No 4x4 and 1 No MFC rescue sled 1 No Zodiac

Table 1: Flood Response Assets GFRS / GCD

5.2 Flood monitoring and warning system

Facilities Management will be tasked to monitor Met Éireann and Corrib Flood Warning Systems consistently for any flood warnings.

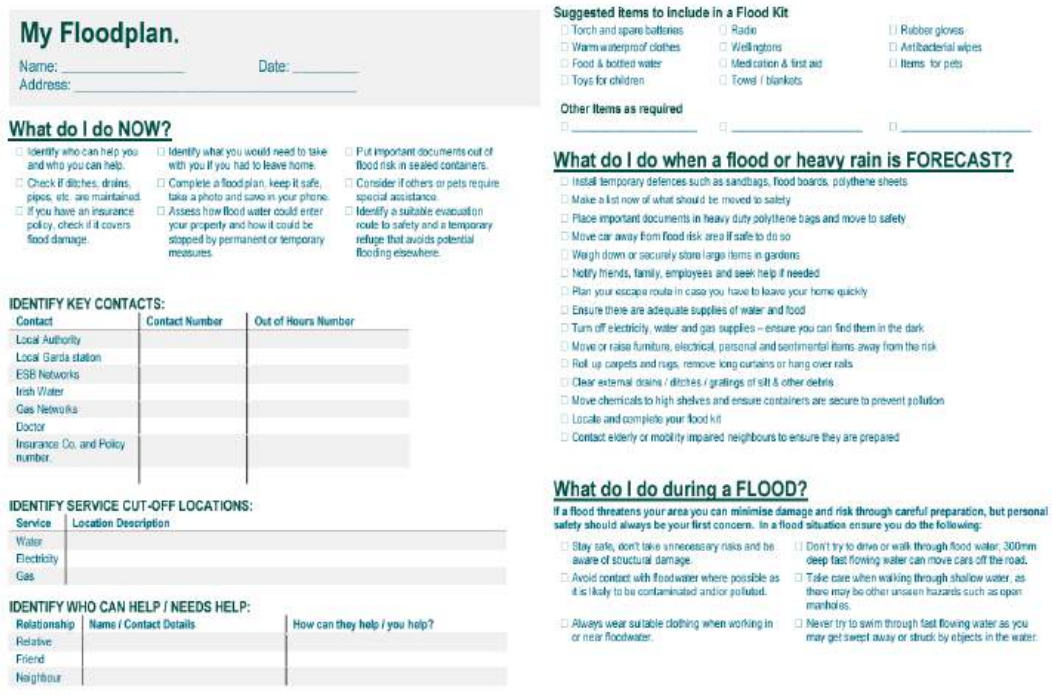
Warning type	Meaning	Actions to be taken
	Met Éireann Yellow Warning: Flooding is possible, be prepared.	• Check Forecasts • Check Flood Maps • Check River Levels (refer to links below:) • Real-time water levels of the River Corrib are available on www.waterlevels.ie. The Galway Barrage gauge (Ref 30099) and the Dangan gauge (Ref 30098) updates water levels every 15 minutes. • The River Corrib system is a slow-to-flood system, providing additional time to evaluate and prepare for flooding. • Engage with Galway City Council regarding the national centralised warning system. • Facilities Management will check with residents to ensure they are aware of the procedures in the event of a flood. • Have Flood Plan to hand. • Prepare to deploy development flood defences if required.
	Met Éireann Amber Warning: Flooding expected, immediate action required.	• Make sure residents are safe • Raise all mobile plant, equipment etc above the flood level. • Move vehicles and bicycles to safe location (short term limited permission to store bicycles in apartments) • Deploy property flood defence measures • Door closers to prohibit access to spaces below +7.28m.
	Met Éireann Severe Flood Warning: Risk to Property and Life	• Manage utilities • Prepare to evacuate if determined necessary by Met Eireann, Public Safety bodies or Emergency Services. • Facilities Management to review on site refuse collection and other service to ensure residents can continue to use the development internally.

		• Co-Operate with Emergency Services and Galway City Council and relevant agencies including the Galway Severe Weather Advisory Team • Monitor all warnings • Enlist additional resources as required

5.3 Communication and co-ordination

Each resident will receive a welcome pack when they enter their new home. The LDA will ensure that each pack contains a Flood Plan which will include:

- A Resident Friendly copy of this Evacuation Plan and Emergency Procedure document;
- A development specific version of the "My Flood Plan" from www.myfloodplan.ie (sample below);



My Floodplan.

Name: _____ Date: _____
Address: _____

What do I do NOW?

- Identify who can help you and who you can help.
- Check if ditches, drains, pipes, etc. are maintained.
- If you have an insurance policy, check if it covers flood damage.
- Identify what you would need to take with you if you had to leave home.
- Complete a flood plan, keep it safe, take a photo and save in your phone.
- Assess how flood water could enter your property and how it could be stopped by permanent or temporary measures.
- Put important documents out of flood risk in sealed containers.
- Consider if others or pets require special assistance.
- Identify a suitable evacuation route to safety and a temporary refuge that avoids potential flooding elsewhere.

IDENTIFY KEY CONTACTS:

Contact	Contact Number	Out of Hours Number
Local Authority		
Local Garda station		
ESB Networks		
Irish Water		
Gas Networks		
Doctor		
Insurance Co. and Policy number		

IDENTIFY SERVICE CUT-OFF LOCATIONS:

Service	Location Description
Water	
Electricity	
Gas	

IDENTIFY WHO CAN HELP / NEEDS HELP:

Relationship	Name / Contact Details	How can they help / you help?
Relative		
Friend		
Neighbour		

Suggested items to include in a Flood Kit

- Torch and spare batteries
- Warm waterproof clothes
- Food & bottled water
- Toys for children
- Radio
- Wellingtons
- Medication & first aid
- Towel / blankets
- Rubber gloves
- Antibacterial wipes
- Items for pets

Other items as required

- _____
- _____
- _____

What do I do when a flood or heavy rain is FORECAST?

- Install temporary defences such as sandbags, flood boards, polythene sheets
- Make a list now of what should be moved to safety
- Place important documents in heavy duty polythene bags and move to safety
- Move car away from flood risk area if safe to do so
- Weigh down or securely store large items in gardens
- Notify friends, family, employees and seek help if needed
- Plan your escape route in case you have to leave your home quickly
- Ensure there are adequate supplies of water and food
- Turn off electricity, water and gas supplies – ensure you can find them in the dark
- Move or raise furniture, electrical, personal and sentimental items away from the risk
- Roll up carpets and rugs, remove long curtains or hang over rails
- Clear external drains / ditches / gratings of silt & other debris
- Move chemicals to high shelves and ensure containers are secure to prevent pollution
- Locate and complete your flood kit
- Contact elderly or mobility impaired neighbours to ensure they are prepared

What do I do during a FLOOD?

If a flood threatens your area you can minimise damage and risk through careful preparation, but personal safety should always be your first concern. In a flood situation ensure you do the following:

- Stay safe, don't take unnecessary risks and be aware of structural damage.
- Avoid contact with floodwater where possible as it is likely to be contaminated and/or polluted.
- Always wear suitable clothing when working in or near floodwater.
- Don't try to drive or walk through flood water, 300mm deep fast flowing water can move cars off the road.
- Take care when walking through shallow water, as there may be other unseen hazards such as open manholes.
- Never try to swim through fast flowing water as you may get swept away or struck by objects in the water.

Figure 3: Sample of flood plan document that will be issued to building residents and operators

- Directions on what actions to take in the event of a flood event;
- Specific Flood Evacuation Routes;
- Location and travel advice for accessing the Galway Flood Reception Centres (if required);
- Emergency Contact Numbers;
- Details of how communication on floods will be disseminated to all persons;
- Ability to opt in to a property What's App notification Group; and
- Coordination and discussion with GCC/National Bodies to ensure appropriate notification and enforcement of flood warnings.

Facilities Management will be responsible for communicating all Flood Directions and will utilise the following methods:

- E-Mail to officially registered tenants;
- Text Message / What's App to those registered | Opted in;
- Notices at prominent points throughout the development;
- Use of (And regular drills involving) the Fire Alarm;
- Prominently designated Flood Evacuation Routes;
- Additional signage to be rolled out during MET Eireann amber warnings; and
- Door to door call outs for severe events.

6 Response actions

6.1 Met Éireann Yellow Warnings

- Residents will be advised to consult their apartment flood plan and be aware of its contents;
- Facilities Management will monitor all Met Éireann and Local Authority advice;
- Additional resources will be made available to Facilities Management;
- Flood defence equipment will be gathered and prepared by Facilities Management personnel;
- Vulnerable Persons Register will be printed and kept with the Facilities Building Manager; and
- Electrical and mechanical contractor emergency staff will be placed on standby.

6.2 Met Éireann Amber Warnings

- Residents will be advised to prepare their homes, gather essential belongings and medications, remove bicycles and move cars to a safe location. They will be advised to access and egress the development only when necessary, and, when doing so, to use the south entrance only, accessed via the internal contiguous corridor. Core B will restrict access from Ground Level to Lower Ground Floor Level;
- Cascading of plan to commercial operators including the creche operator to allow plant and equipment below the 1:100-year flood level to make systems safe. No equipment is currently proposed below +6.48;
- Facilities Management, in liaison with GCC, may deploy flood defence systems consisting of:
  - Flood barriers to lower levels and building openings;
  - Sand bags at key locations; and
  - Altering valves for rooftop storage and attenuation tanks.
- Movement of vulnerable items of plant, equipment and materials, offices, computers etc to a safe location. Lift will be turned off at this point; and
- Operating a sign-in | sign-out system for all persons within the development (access through South only) to allow for better accounting in the event of a severe flood.

6.3 Met Éireann Red Warning

- All residents will be advised to stay in their apartment unless travelling for specific reasons;

- Flood Marshals will carry out door-to-door notification service to prepare for an evacuation. Each residence will be asked for the number of persons present and details of any vulnerable persons that may need assistance;
- Facilities Manager will monitor warnings and liaise directly with emergency services and local authorities;
- Contractors may need to isolate some electrical and mechanical systems; and
- Interaction with City/County Management Plan.

6.4 Flood evacuation

The following arrangements will be activated in an evacuation event:

- Under direction of the local authority or emergency services, and, when provisions have been made for safe travel to the local receiving centre, the fire alarm will be activated;
- Flood Evacuation Marshalls will be located at key locations throughout the development to assist and advise resident on routes and exit points;
- Starting at the lowest point of residential apartments, Facilities Management Flood Marshalls will knock on each door and advise residents they need to depart;
- All power will be isolated and fire marshals will prepare for fire; a stand by generator or a battery back- up supply will be provided by the asset owner to support all firefighting and life safety systems in the development;
- Where Severe Flooding impedes safe evacuation, residents will be directed to a safe point on the upper floors of the building until rescue is available from Galway Fire Brigade (GFB) | ICG; and
- The Facilities Manager will call Emergency Services as required.

6.5 Emergency services

- The Facilities Manager should only call the Emergency Services to avoid duplication of calls;
- Liaise with the authority and make only those emergency calls deemed necessary;
- Be specific in the resources that are required, taking into consideration the knock-on strain for others in danger;
- Provide contact details for the Facilities Manager and ONE other point of contact;
- Keep Emergency Service access routes clear; and
- Only fight fire when safe to do so.

6.6 Secure everyone's safety

- Assembly Points are located in the appendices of this document, included in the Flood Evacuation Plan Drawing;
- Where notified of missing persons, Flood Marshalls will carry out a single sweep of the building (if safe to do so). If persons cannot be located, Emergency Services will be informed. Residents will not be permitted back into the development until the Emergency Services, supported as required by the Local Authority declare it safe to do so.

6.7 Recommended flood kit

For Residents to procure and have to hand in their homes

7 Recovery (post flood evacuation)

This section considers actions to be taken post flooding to alleviate resources on local authorities:

- If evacuation has been ordered, no persons will be allowed to return until it is safe to do so. Depending on damage, this may take days or weeks for some apartment owners. Using the same communications tools set out above, Facilities Management will engage with residents on an individual basis to arrange return or alternative accommodation;
- Actions related to insurance issues to be reviewed as necessary following a flood event.
- Residents will be advised to contact their own contents insurers;
- Facilities Management will arrange for engineers and assessors to report on damage;
- Emergency accommodation is provided by GCC at the following locations:
  - The Raheen Woods Hotel Athenry;
  - The Loughrea Hotel and Sap; and
  - The Shearwater Hotel, Ballinasloe.
- Emergency Works will be undertaken by retained contractors as soon as it is declared safe to do so. Works will be compliant with the Health, Safety and Welfare at Work (Construction) Regulations, 2013 – 2023. Consideration should be given to planning and procuring necessary health and safety provisions;
- Facilities Management will manage the associated clean up and repair of any external damages caused by flood waters;

- ½ inch submersible pumps will be used to clear standing water into attenuation tanks for later controlled pumping into the river in agreement with the Local Authority; and
- Waste disposal and accumulation of food waste can be a problem after a flood event. Facilities Management will make available a series of mixed waste roll on roll off skips for the use of residents and maintenance personnel following severe floods as per the Operational Waste Management Plan submitted with the Dyke Road Phase 1 Application, additional collections will be facilitated in the event of additional waste arising from flood events.

8 Emergency warnings

8.1 Emergency warning systems

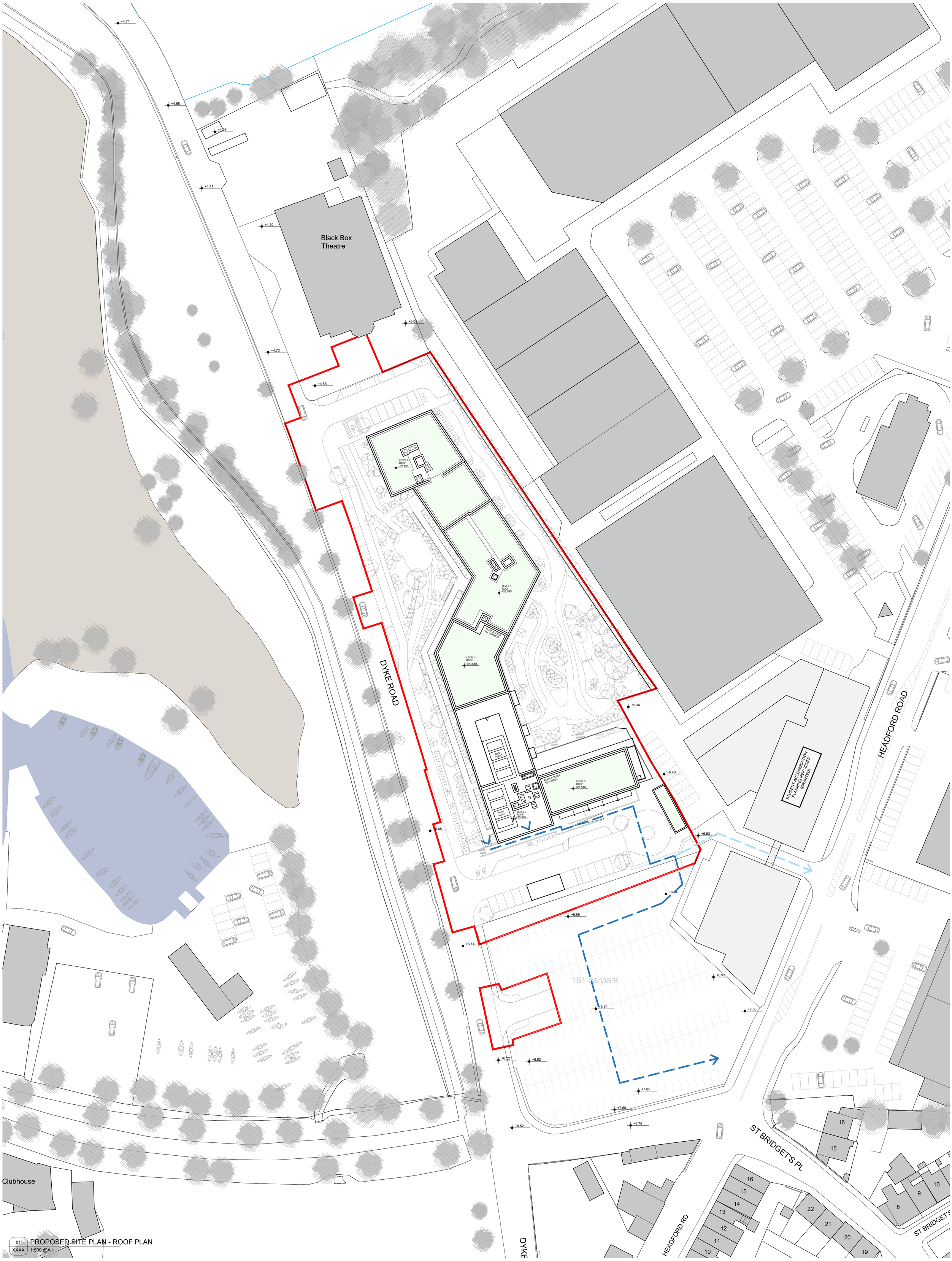
The following warning systems will inform the Evacuation Plan and Emergency Procedure. The Facilities Manager will ensure these are monitored and take the above relevant actions in the event of a weather or flood warning:

- Met Éireann Weather Warnings – www.met.ie
- OPW Storm Surge Warnings www.opw.ie
- Local Authority Website – www.galway.ie
- Corrib Monitoring – www.waterlevel.ie
- GCC Severe Weather Alerts – www.mapalerter.ie

Appendix A – Contact list

	Organisation	Position	Name	Mobile	Email
Galway County Council					
AGS					
HSE					
HSA					
ICG					
ESB					
Bord Gáis					
Irish Water					
Facilities Management					
Retail 1					
Retail 2					
Mechanical					
Electrical					
TMP					
Drains Cleaning					
Cleaners					

Appendix B – Flood evacuation plan drawings



01 PROPOSED SITE PLAN - ROOF PLAN

XXXX 1:500 @A1

NOTES / LEGEND

0 5m 25m 50m

PHASE 1 PLANNING APPLICATION BOUNDARY

Key Plan (not to scale):

Rev:	Date:	Description:
01	31/01/2025	ISSUED FOR INFORMATION

MOLA

2 Donnybrook Road,
Donnybrook,
Dublin 4, Ireland
Telephone +353 1 218 3900
www.mola.ie

Notes
Do not scale.
Use figured dimensions only.
This drawing is to be read in conjunction with all relevant specifications and drawings.
All dimensions to be checked on site.
In the event of any discrepancies between drawings, the contractor is to inform the Architect immediately.

Stage:

PLANNING

Client: GALWAY CITY COUNCIL

Project: CORRIB CAUSEWAY PHASE 1, DYKE ROAD

Drawing: PROPOSED SITE PLAN - EVACUATION ROUTE

Date: JAN 2025 Scale: 1:500 @ A1 Int. Job No: 23018

Drawing No.: DRG- MOLA - ZZ - RF - DR - A - 0110 Status: Revision: 1

Appendix C – Evacuation & vulnerability register*

***To be included when building becomes habitable post PC**