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Volume 3 EIAR Appendices

PRESENTED TO

Galway City Council

Corrib Causeway Phase 1, Dyke Road

DATE

March 2025

Environmental Consultancy Services

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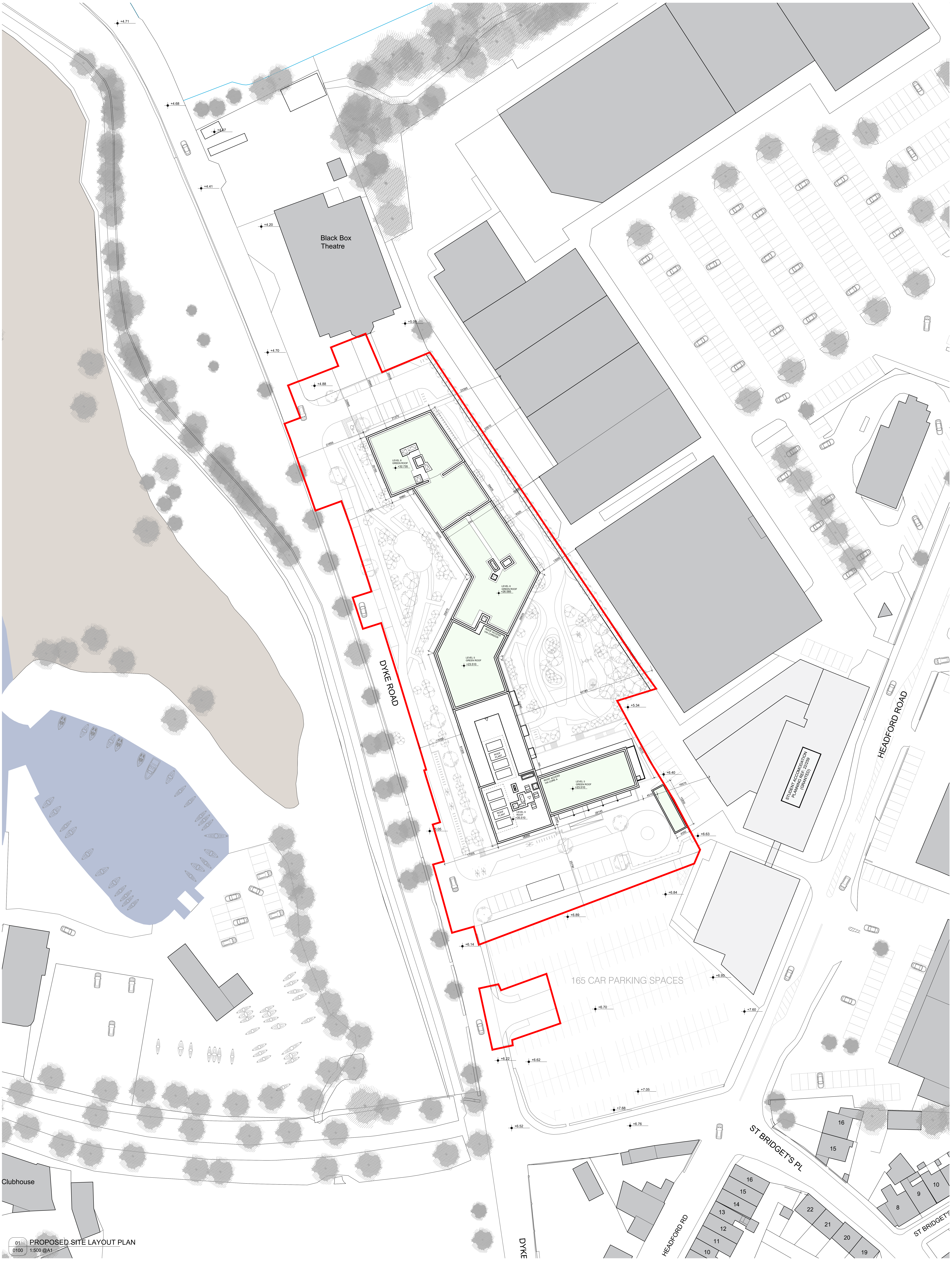
Appendix 1-1



01 0100 PROPOSED SITE LAYOUT PLAN
1:500 @A1

NOTES / LEGEND

0 5m 25m 50m

PHASE 1 PLANNING APPLICATION BOUNDARY

Key Plan (not to scale):

Rev:	Date:	Description:
01	19/03/2025	PLANNING ISSUE

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

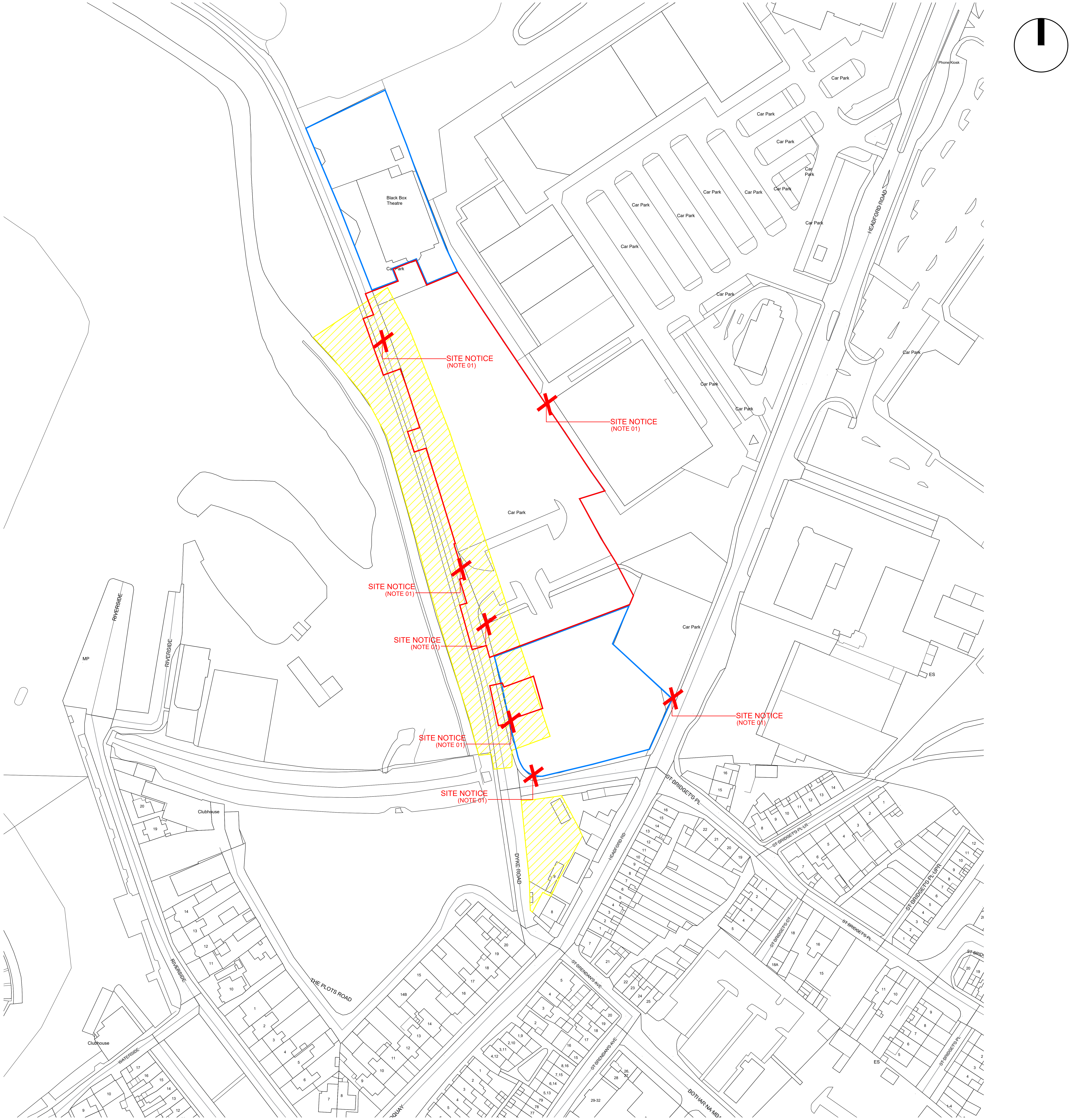
Project: CORRIB CAUSEWAY PHASE 1, DYKE ROAD

Drawing: PROPOSED SITE LAYOUT PLAN

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

Drawing No.: DRG-MOLA-ZZ-RF-DR-A-0100
Status:
Revision: 01

Appendix 1-2



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Digital Landscape Model (DLM)

Publisher / Source:
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Tailte Éireann

Data Source / Reference:
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PRIME2

File Format:
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Autodesk AutoCAD (DWG_R2013)

File Name:
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Date= 20-Feb-2025

Source Data Release:
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DCMLS Release V1.184.119

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Version= 1.4

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of a right of way.

This topographic map
does not show
legal property boundaries,
nor does it show
ownership of physical features.

Ní hionann bóthar,
bealach nó cosán a bheith
ar an léarscáil seo agus
fianaise ar chead slí.

Ní thaispeánann an léarscáil
topagrafach seo teorainneacha
réadmhaoine dlíthiúla,
agus ní léiríonn sé úinéireacht
ar ghnéithe fisiceacha.

NOTES / LEGEND

0   5m   25m   50m

― PHASE 1 PLANNING APPLICATION BOUNDARY (AREA - 1.144 ha)

― BLUE LINE INDICATES GCC OWNERSHIP BOUNDARY

✗ SITE NOTICE LOCATION
(NOTE 01: NOTICES TO BE PLACED AT A SAFE AND
LEGIBLE HEIGHT.)

― WAYLEAVE

Key Plan (not to scale):

Rev:	Date:	Description:
01	19.03.2025	PLANNING ISSUE

MOLA

2 Donnybrook Road,
Donnybrook,
Dublin 4, Ireland
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Stage:
PLANNING

Client: GALWAY CITY COUNCIL

Project: CORRIB CAUSEWAY PHASE 1, DYKE ROAD

Drawing: SITE LOCATION MAP - OS MAP

Date: MARCH 2025
Scale: 1:1000   @ A1
Int. Job No: 23018

Drawing No.: DRG-MOLA-ZZ-ZZ-DR-A-0001
Status:
Revision: 1

Appendix 6-1

Appendix 6-1 Designated Sites

Table 1 The Qualifying Interests (QIs) and Special Conservation Interests (SCIs) of the European and National sites in the vicinity of the proposed development site

European/National Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	**Location Relative to the Proposed Development Site**
Special Area of Conservation (SAC)	
Lough Corrib SAC [000297] 1029 Freshwater Pearl Mussel *Margaritifera margaritifera* 1092 White-clawed Crayfish *Austropotamobius pallipes* 1095 Sea Lamprey *Petromyzon marinus* 1096 Brook Lamprey *Lampetra planeri* 1106 Salmon *Salmo salar* 1303 Lesser Horseshoe Bat *Rhinolophus hipposideros* 1355 Otter *Lutra lutra* 1393 Slender Green Feather-moss *Drepanocladus vernicosus* 1833 Slender Naiad *Najas flexilis* 3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) 3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. 3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) 6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) 7110 Active raised bogs* 7120 Degraded raised bogs still capable of natural regeneration 7150 Depressions on peat substrates of the Rhynchosporion 7210 Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* 7220 Petrifying springs with tufa formation (Cratoneurion)* 7230 Alkaline fens 8240 Limestone pavements* 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles 91D0 Bog woodland* *S.I. No. 384/2022 - European Union Habitats (Lough Corrib Special Area of Conservation 000297) Regulations 2022.*	Approximately 15m west of the Proposed Development site.

European/National Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	**Location Relative to the Proposed Development Site**
NPWS (2017*) Conservation Objectives: Lough Corrib SAC 000297.* Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [1]	
Galway Bay Complex SAC [000268] 1140 Mudflats and sandflats not covered by seawater at low tide 1150 Coastal lagoons* 1160 Large shallow inlets and bays 1170 Reefs 1220 Perennial vegetation of stony banks 1310 *Salicornia* and other annuals colonising mud and sand 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) 1355 Otter *Lutra lutra* 1365 Harbour seal *Phoca vitulina* 1410 Mediterranean salt meadows (Juncetalia maritimi) 3180 Turloughs* 5130 *Juniper communis* formations on heaths or calcareous grasslands 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates(Festuco Brometalia)(*important orchid sites) 7210 Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* 7230 Alkaline fens *S.I. No. 548/2021 - European Union Habitats (Galway Bay Complex Special Area of Conservation 000268) Regulations 2021.* NPWS (2013*) Conservation Objectives: Galway Bay Complex SAC 000268.* Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	Approximately 700m south of the Proposed Development site.
Connemara Bog Complex SAC [002034] 1065 Marsh Fritillary *Euphydryas aurinia* 1106 Salmon *Salmo salar* 1150 Coastal lagoons* 1170 Reefs 1355 Otter *Lutra lutra* 1833 Slender Naiad *Najas flexilis* 3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) 3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea 3160 Natural dystrophic lakes and ponds	Approximately 12.7km west of the Proposed Development site.

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[1] The versions of the conservation objectives documents referenced in this table are the most recent published versions at the time of writing

European/National Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	**Location Relative to the Proposed Development Site**
3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation 4010 Northern Atlantic wet heaths with *Erica tetralix* 4030 European dry heaths 6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) 7130 Blanket bogs (* if active bog) 7140 Transition mires and quaking bogs 7150 Depressions on peat substrates of the Rhynchosporion 7230 Alkaline fens 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles NPWS (2015) *Conservation Objectives: Connemara Bog Complex SAC 002034.* Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	
Ross Lake and Woods SAC [001312] 1303 Lesser Horseshoe Bat *Rhinolophus hipposideros* 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. *S.I. No. 656/2019 - European Union Habitats (Ross Lake and Woods Special Area of Conservation 001312) Regulations 2019* NPWS (2018) *Conservation Objectives: Ross Lake and Woods SAC 001312.* Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.	Approximately 13.5km northwest of the Proposed Development site.
Lough Fingall Complex SAC [000606] 1303 Lesser Horseshoe Bat *Rhinolophus hipposideros* 3180 Turloughs* 4060 Alpine and Boreal heaths 5130 *Juniper communis* formations on heaths or calcareous grasslands 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) 7210 Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* 8240 Limestone pavements* NPWS (2019) *Conservation Objectives: Lough Fingall Complex SAC 000606. Version 1.* National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.	Approximately 14km southeast of the Proposed Development site.
East Burren Complex SAC [001926] 1065 Marsh Fritillary *Euphydryas aurinia* 1303 Lesser Horseshoe Bat *Rhinolophus hipposideros* 1355 Otter *Lutra lutra* 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. 3180 Turloughs*	Approximately 14.4km south of the Proposed Development site.

European/National Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	**Location Relative to the Proposed Development Site**
3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation 4060 Alpine and Boreal heaths 5130 *Juniperus communis* formations on heaths or calcareous grasslands 6130 Calaminarian grasslands of the Violetalia calaminariae 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) 6510 Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) 7210 Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* 7220 Petrifying springs with tufa formation (Cratoneurion)* 7230 Alkaline fens 8240 Limestone pavements* 8310 Caves not open to the public 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnionincanae, Salicion albae)* NPWS (2022) *Conservation Objectives: East Burren Complex SAC 001926. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.	
Special Protection Area (SPA)	
Inner Galway Bay SPA [004031] A003 Great Northern Diver *Gavia immer* A017 Cormorant *Phalacrocorax carbo* A028 Grey Heron *Ardea cinerea* A046 Brent Goose *Branta bernicla hrota* A050 Wigeon *Anas penelope* A052 Teal *Anas crecca* A056 Shoveler *Anas clypeata* A069 Red-breasted Merganser *Mergus serrator* A137 Ringed Plover *Charadrius hiaticula* A140 Golden Plover *Pluvialis apricaria* A142 Lapwing *Vanellus vanellus* A149 Dunlin *Calidris alpina alpina* A157 Bar-tailed Godwit *Limosa lapponica* A160 Curlew *Numenius arquata* A162 Redshank *Tringa totanus* A169 Turnstone *Arenaria interpres* A179 Black-headed Gull *Chroicocephalus ridibundus* A182 Common Gull *Larus canus* A191 Sandwich Tern *Sterna sandvicensis* A193 Common Tern *Sterna hirundo* A999 Wetlands	Approximately 700m south of the Proposed Development site.

European/National Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	**Location Relative to the Proposed Development Site**
S.I. No. 515/2019 - European Union Conservation of Wild Birds (Inner Galway Bay Special Protection Area 004031) Regulations 2019 NPWS (2013*) Conservation Objectives: Inner Galway Bay SPA 004031. Version 1.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	
Lough Corrib SPA [004042] A051 Gadwall *Anas strepera* A056 Shoveler *Anas clypeata* A059 Pochard *Aythya ferina* A061 Tufted Duck *Aythya fuligula* A065 Common Scoter *Melanitta nigra* A082 Hen Harrier *Circus cyaneus* A125 Coot *Fulica atra* A140 Golden Plover *Pluvialis apricaria* A179 Black-headed Gull *Chroicocephalus ridibundus* A182 Common Gull *Larus canus* A193 Common Tern *Sterna hirundo* A194 Arctic Tern *Sterna paradisaea* A395 Greenland White-fronted Goose *Anser albifrons flavirostris* A999 Wetlands *S.I. No. 455/2012 - European Communities (Conservation of Wild Birds (Lough Corrib Special Protection Area 004042)) Regulations 2012.* NPWS (2023a) *Conservation Objectives: Lough Corrib SPA 004042. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.	Approximately. 2.8km north of the Proposed Development site.
Cregganna Marsh SPA [004142] A395 Greenland White-fronted Goose *Anser albifrons flavirostris* *S.I. No. 514/2019 - European Union Conservation of Wild Birds (Cregganna Marsh Special Protection Area 004142) Regulations 2019* NPWS (2023b) *Conservation Objectives: Cregganna Marsh SPA 004142. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.	Approximately 8.1km east of the Proposed Development site.

Table 2 National Sites in the vicinity of the Proposed Development

Natural Heritage Area	
Moycullen Bog NHA [002364] The main habitat on the site is blanket bog, usually dominated by Purple Moor-grass *Molinia caerulea*, Cross-leaved Heath *Erica tetralix* and Ling Heather *Calluna vulgaris* Other species present include Common Cotton-grass *Eriophorum angustifolium*, Hare's-tail Cottongrass *Eriophorum vaginatum*, Bog Asphodel *Narthecium ossifragum,* Black-bog Rush *Schoenus nigricans,* Tormentil *Potentilla erecta*, Heath Milkwort *Polygala serpyllifolia*, Deergrass *Scirpus cespitosus*, Carnation Sedge *Carex panicea* and Bog-myrtle *Myrica gale*. Bog mosses present include *Sphagnum papillosum*, *S. imbricatum* and *S. capillifolium* with mosses *Hypnum cupressiforme*, *Racomitrium lanuginosum* and *Leucobryum glaucum* and the liverwort *Odontoschisma sphagnii.* The lichen *Cladonia portentosa* also occurs.	Approximately 3.1km west of the Proposed Development site
Cregganna Marsh NHA [000253] Cregganna Marsh SPA is of ornithological importance because it is regularly utilised by a nationally important flock of Greenland White-fronted Goose, a species listed on Annex I of the E.U. Birds Directive.[2]	Approximately 8.1km southeast of the Proposed Development site
Proposed Natural Heritage Areas (pNHA)	
Lough Corrib pNHA [000297] No site synopsis available from NPWS – see QIs of Lough Corrib SAC & Lough Corrib SPA in Appendix 2.	Approximately.500m northwest of the Proposed Development site
Galway Bay Complex pNHA [000268] No site synopsis available from NPWS – see QIs of Galway Bay Complex SAC and Inner Galway Bay SPA in Appendix 2.	Approximately700m south of the Proposed Development site
Kiltullagh Turlough pNHA [000287] This ephemeral area is at the extreme end of dry turloughs and comprises a large proportion of dry grassland and may be impacted by the River Clare drainage scheme. It is covered by pasture with tormentil *Potentilla erecta*, common sedge *Carex nigra* and creeping cinquefoil *Potentilla reptans* forming the dominant vegetation[3].	Approximately7.3km northeast of the Proposed Development site
Ballycuirke Lough pNHA [000228] No site synopsis available from NPWS.	Approximately. 8km northwest of the Proposed Development site
Killarainy Lodge, Moycullen pNHA [002083] This site is a nursery roost for Natterer's bat *Myotis nattereri* where approximately 70 bats use a stone building which depend on the surrounding woodland[4].	Approximately10.6km northwest of the Proposed Development site

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[2] NPWS (2015) Site Synopsis. Cregganna Marsh NHA. Site Code 000253. Available online at https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004142.pdf

[3] NPWS (2009a). Site synopsis. Kiltullagh Turlough. Site Code: 000287.

[4] NPWS (2009b). Site synopsis. Killarainy Lodge, Moycullen. Site Code: 002083.

Drimcong Wood pNHA [001260] This site comprises an area deciduous and coniferous woodland and also includes two lakes (Lough Aroraun and Lough Pollalehy) which are bordered by reed swamp with common reed *Phragmites australis*. The area is subject to pressures including afforestation and recreational activities[5].	Approximately11.6km northwest of the Proposed Development site
Connemara Bog Complex pNHA [002034] No site synopsis available from NPWS – see QIs of Connemara Bog SAC in Appendix 2.	Approximately12.7km west of the Proposed Development site
Ross Lake and Woods pNHA [001312] No site synopsis available from NPWS.	Approximately13.5km northwest of the s Proposed Development site
Lough Fingall Complex pNHA [000606] No site synopsis available from NPWS – see QIs of Lough Fingall Complex SAC in Appendix 2	Approximately14km southeast of the Proposed Development site
East Burren Complex pNHA [001926] No site synopsis available from NPWS – see QIs of East Burren Complex SAC in Appendix 2.	Approximately14.4km south of the Proposed Development t site

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[5] NPWS (2009c). Site synopsis. Drimcong Wood. Site Code: 001260.

Appendix 6-2

Appendix 6-2 Criteria for Ecological Evaluation

Ecological Valuation Criteria

International Importance:

- 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.
- Proposed Special Protection Area (pSPA).
- Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).
- Features essential to maintaining the coherence of the Natura 2000 Network.[6]
- Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.
- Resident or regularly occurring populations (assessed to be important at the national level)[7] of the following:
    - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and / or
    - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.
- Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
- World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).
- Biosphere Reserve (UNESCO Man & The Biosphere Programme).
- Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).
- Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
- Biogenetic Reserve under the Council of Europe.
- European Diploma Site under the Council of Europe.
- Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).[8]

National Importance:

- Site designated or proposed as a Natural Heritage Area (NHA).
- Statutory Nature Reserve.
- Refuge for Fauna and Flora protected under the Wildlife Acts.
- National Park.

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[6] See Articles 3 and 10 of the Habitats Directive.

[7] It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[8] Note that such waters are designated based on these waters' capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).

- Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.
- Resident or regularly occurring populations (assessed to be important at the national level)[9] of the following:
    - Species protected under the Wildlife Acts; and/or
    - Species listed on the relevant Red Data list.
- Site containing 'viable areas'[10] of the habitat types listed in Annex I of the Habitats Directive.

County Importance:

- Area of Special Amenity.[11]
- Area subject to a Tree Preservation Order.
- Area of High Amenity, or equivalent, designated under the County Development Plan.
- Resident or regularly occurring populations (assessed to be important at the County level)[12] of the following:
    - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
    - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
    - Species protected under the Wildlife Acts; and/or
    - Species listed on the relevant Red Data list.
- Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.
- County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local Biodiversity Action Plan (BAP) if this has been prepared.
- Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.
- Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local Importance (higher value):

- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;

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[9] It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[10] A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

[11] It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

[12] It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County importance where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

- Resident or regularly occurring populations (assessed to be important at the Local level)[13] of the following:
    - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
    - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
    - Species protected under the Wildlife Acts; and/or
    - Species listed on the relevant Red Data list.
- Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;
- Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local Importance (lower value):

- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;
- Sites or features containing non-native species that are of some importance in maintaining habitat links.

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[13] It is suggested that, in general, 1%of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

Appendix 6-3

Appendix 6-3 Relevant projects in the vicinity of the Proposed Development site with regard to the cumulative assessment

Application Reg. Ref. and Applicant Name	Address	Development Proposal	Distance from the Proposed Development	Decision
ABP Ref. ABP-302848-18, ABP302885-18 Galway County Council	Galway	Galway City Ring Road (GCRR)	1.4km north	Live Case 30/01/2023 Board's Decision quashed by Order of the High Court (Perfected on the 9th February, 2023), New Case Number ABP-318220-23 06/12/2021 Approved with Conditions
ABP Ref. 320181 Galway City Council	Dyke Road, Galway	Development of water sports centre at Dyke Road, Galway	0.5km north	Lodged 11/07/2024 Decision: Further consideration needed
GCC planning ref. 2460108 Summix BNM Developments Limited	Corner of Lough Atalia Road and Bóthar na Long, Galway, H91 HY45	The development will include demolition of a vacant industrial structure (115 sq m), the external canopy structure (170 sq m) and the boundary walls along the southern, western and north-western boundaries of the site; and the construction of a 15 No. storey hotel (including part mezzanine at ground floor level) providing 189 No. bedrooms (7,514 sq m), incorporating food and beverage areas and provision of a single storey service building to the northwest of the site on a 0.2217 Ha site.	0.9km southeast	Refused 06/06/2024 Appealed 05/07/2024
ABP- 314597-22 Galway City Council	University Road to Dublin Road, Galway City	BusConnects Galway Cross-City Link Scheme	0.2km south	Lodged 09/09/2022

Application Reg. Ref. and Applicant Name	Address	Development Proposal	Distance from the Proposed Development	Decision
GCC planning ref. 20184 (Amended by ref. 22259) Cleverson Ltd	Headford Road, Townparks, Galway	Demolition of an ESB enclosure and construction of a seven/eight storey development comprising 4 retail units, a gymnasium and student accommodation 7 storeys in height (272 beds).	Directly adjacent (east)	Grant permission 12/07/2021
GCC planning ref. 1847 (amended by ref. 20235) K. King Construction Claregalway Ltd.	33-35 Saint Brendan's Avenue, Woodquay, Galway	Construction of 27 no. duplex / apartments including 3 to 6 storey apartment block and all associated site development works and services.	0.3km south	Grant permission 14/12/2020
GCC planning ref. 19107 Irish Water	Dyke Road, Terryland, Galway	Permission for development which comprises of a new raw water intake works located on the east bank of the River Corrib, 100m downstream of Quincentenary Bridge to supply the Terryland Water Treatment Plant.	0.5km northwest	Grant permission 24/02/2020
GCC planning ref. 2047 Seagullpoint Limited	Lands to the rear of Ceannt Train Station, Station Road, Galway City	Large-scale, mixed-use development consisting of 376 no. apartments, retail units, café/restaurant/bar units, hotel, office use, childcare facility, car parking and other services and associated site works.	0.8km southeast	Grant permission 24/05/2021
N/A Galway City Council with Failte Ireland	Woodquay Park, Terryland, Galway	Woodquay Park Landscape Upgrade: Included in the plans is the creation of accessible, public, green space, with biodiversity-friendly planting, age and mobility-friendly pathways, sheltered seating niches and spaces for play and for rest. The project will also involve traffic calming upgrades and improved	0.3km southwest	Lodged 27/09/2024 Case is due to be decided by 25/03/2025

Application Reg. Ref. and Applicant Name	Address	Development Proposal	Distance from the Proposed Development	Decision
		pedestrian facilities to the surrounding streets.		
N/A Galway City Council	Across the River Corrib, adjacent to Dyke Road	Clifden Railway Bridge Pedestrian and Cycle Bridge: Construction of a pedestrian and cycle bridge which will span the River Corrib connecting the University of Galway (UG) campus to the City Centre via Riverside and Woodquay.	0.2km southwest	Intended lodgement date unknown

Appendix 6-4

Appendix 6-4 Desktop Study Records

Desktop records of protected, rare, or other notable plant species are listed below in **Table 3**. These are plant species which are legally protected under the Flora (Protection) Order, 2022 and/or are listed as Critically Endangered, Endangered or Vulnerable on the relevant national Red Data list for Ireland[14].

Table 3 Records of protected, red-listed or notable flora recorded from the desk study in the vicinity of the study area

Common Name/ Scientific name	Legal Status[15]	Red List Status	Source
Brackish Water-crowfoot *Ranunculus baudotii*	n/a	Near threatened	NBDC online database record
Canadian Waterweed *Elodea canadensis*	n/a	n/a	NBDC online database record
Bohemian knotweed *Fallopia japonica x sachalinensis = F. x bohemica*	Invasive Species - Regulation S.I. 477 (Ireland)	n/a	NBDC online database record
Giant Hogweed *Heracleum mantegazzianum*	Invasive Species - Regulation S.I. 477 (Ireland)	n/a	NBDC online database record
Giant-rhubarb *Gunnera tinctoria*	Invasive Species - Regulation S.I. 477 (Ireland)	n/a	NBDC online database record
Greater Knapweed *Centaurea scabiosa*	n/a	Near threatened	NBDC online database record
Green Field-speedwell *Veronica agrestis*	n/a	Near threatened	NBDC online database record
Indian Balsam *Impatiens glandulifera*	Invasive Species - Regulation S.I. 477 (Ireland)	n/a	NBDC online database record
Japanese Knotweed *Fallopia japonica*	Invasive Species - Regulation S.I. 477 (Ireland)	n/a	NBDC online database record
Slender Tufted-sedge *Carex acuta*	n/a	Near threatened	NBDC online database record
Spanish Bluebell *Hyacinthoides hispanica*	Invasive Species - Regulation S.I. 477 (Ireland)	n/a	NBDC online database record
Spiked Sedge *Carex spicata*	n/a	Near threatened	NBDC online database record
Strawberry-tree	n/a	Near threatened	NBDC online database record

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[14] Vascular flora from Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) *Ireland Red List No. 10: Vascular Plants*. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

Bryophytes from Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) *Ireland Red List No.8: Bryophytes.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

[15] HDII/IV/V = Habitats Directive Annexes II/IV/V; FPO = Flora (Protection) Order, 2022; WA = Wildlife Acts

Common Name/ Scientific name	**Legal Status**[15]	**Red List Status**	**Source**
Arbutus unedo			
Three-cornered Garlic *Allium triquetrum*	Invasive Species - Regulation S.I. 477 (Ireland)	n/a	NBDC online database record
Tubular Water-dropwort *Oenanthe fistulosa*	n/a	Near threatened	NBDC online database record

Desktop records of protected, rare, or other notable fauna species are listed below in **Table 4**. In relation to amphibian, reptile and mammal species those which are protected under the Wildlife Acts, the Habitats Directive and/or are listed as threatened (Vulnerable to Critically Endangered) on the relevant national Red Lists are included. In the case of bird species, only those species listed in Annex I of the Birds Directive or on the Birds of Conservation Concern in Ireland (BoCCI) Red List are included in the table below. For invertebrate species, those which are listed as threatened (Vulnerable to Critically Endangered) on the relevant national Red List are included.

Table 4 Records of protected, red-listed or notable fauna from the desktop study in the vicinity of the Proposed Development

Common Name/ Scientific Name	Legal Status[16]	Red List Status[17]	Source
Amphibians			
Common frog *Rana temporaria*	HD_V, WA	Least concern	NBDC online database record
Smooth newt *Triturus vulgaris*	WA	Least concern	NBDC online database record
Reptiles			
Common lizard *Lacerta vivipara*	WA	Least concern	NBDC online database record
Mammals (Marine)			
Grey seal *Halichoerus grypus*	HD_II & IV, WA	n/a	NBDC online database record
Common seal *Phoca vitulina*	HD_II & IV, WA	n/a	NBDC online database record
Striped Dolphin Stenella coeruleoalba	HD_IV, WA	n/a	NBDC online database record
Common porpoise *Phocoena phocoena*	HD_II & IV, WA	n/a	NBDC online database record
Bottle-nosed dolphin *Tursiops truncatus*	HD_II & IV, WA	n/a	NBDC online database record
Mammals (Terrestrial)			
Eurasian Badger *Meles meles*	WA	Least concern	NBDC online database record

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[16] HD_II/IV/V = Habitats Directive Annexes II/IV/V; WA = Wildlife Acts; BD_I/II/III = Birds Directive Annex I/II/III; OSPAR = Convention for the protection of the marine environment of the North-east Atlantic 1992

[17] Mammal Red-list from Marnell, F., Kingston, N. & Looney, D. (2009) *Ireland Red List No. 3: Terrestrial Mammals* and Marnell, F., Looney, D. & Lawton, C. (2019) *Ireland Red List No. 12: Terrestrial Mammals*.

Birds from Gilbert, G., Stanbury, A. & Lewis, L (2021) Birds of Conservation Concern in Ireland 4: 2020–2026. *Irish Birds 43*: 1–22.

Amphibians, reptiles and fish from King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., Fitzpatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish.

Non-Marine Molluscs from Byrne, A., Moorkens, E.A., Anderson, R., Killeen, I.J. & Regan, E.C. (2009) *Ireland Red List No. 2 – Non-Marine Molluscs*.

Butterflies from Regan, E.C., Nelson, B., Aldwell, B., Bertrand, C., Bond, K., Harding, J., Nash, D., Nixon, D., & Wilson, C.J. (2010) Ireland Red List No. 4 – Butterflies.

Moths from Allen, D., O'Donnell, M., Nelson, B., Tyner, A., Bond, K.G.M., Bryant, T., Crory, A., Mellon, C., O'Boyle, J., O'Donnell, E., Rolston, T., Sheppard, R., Strickland, P., Fitzpatrick, U., & Regan, E. (2016) *Ireland Red List No. 9: Macro-moths (Lepidoptera).*

Damselflies and dragonflies from Nelson, B., Ronayne, C. & Thompson, R. (2011) *Ireland Red List No.6: Damselflies & Dragonflies (Odonata).*

Water beetles from Foster, G. N., Nelson, B. H. & O Connor, Á. (2009) *Ireland Red List No. 1 – Water beetles.*

Common Name/ Scientific Name	Legal Status[16]	Red List Status[17]	Source
American Mink *Mustela vison*	Invasive Species - Regulation S.I. 477 (Ireland)	n/a	NBDC online database record
Otter *Lutra lutra*	HD_II & IV, WA	Least concern	NBDC online database record
Brown Rat *Rattus norvegicus*	Invasive Species - Regulation S.I. 477 (Ireland)	n/a	NBDC online database record
Lesser horseshoe bat *Rhinolophus hipposideros*	HD_II & IV, WA	Least concern	BCI database record NBDC online database record
Daubenton's bat *Myotis daubentonii*	HD_IV, WA	Least concern	BCI database record NBDC online database record
Leisler's bat *Nyctalus leisleri*	HD_IV, WA	Least concern	BCI database record NBDC online database record
Soprano pipistrelle *Pipistrellus pygmaeus*	HD_IV, WA	Least concern	BCI database record NBDC online database record
Pipistrelle *Pipistrellus pipistrellus sensu lato*	HD_IV, WA	Least concern	BCI database record NBDC online database record
Hedgehog *Erinaceus europaeus*	WA	Least concern	NBDC online database record
Irish hare *Lepus timidus* subsp. *hibernicus*	HD_V, WA	Least concern	NBDC online database record
Pine marten *Martes martes*	HD_V, WA	Least concern	NBDC online database record
Red squirrel *Sciurus vulgaris*	WA	Least concern	NBDC online database record
Pygmy shrew *Sorex minutus*	WA	Least concern	NBDC online database record
Fish			
Eel *Anguilla anguilla*	OSPAR Protected under Fisheries Acts and fishing by-laws	Critically endangered	Galway Harbour Company (2014) NBDC online database record
Brown/ Sea trout *Salmo trutta*	Protected under Fisheries Acts and fishing by-laws	Least concern	NBDC online database record
Birds			
Arctic Tern *Sterna paradisaea*	WA, BD_I	Amber	NBDC online database record
Balearic shearwater *Puffinus mauretanicus*	WA, BD_I	Red	NBDC online database record

Common Name/ Scientific Name	**Legal Status[16]**	**Red List Status[17]**	**Source**
Barn owl *Tyto alba*	WA	Red	NBDC online database record
Barn swallow *Hirundo rustica*	WA	Amber	NBDC online database record
Bar-tailed godwit *Limosa lapponica*	WA, BD_I	Red	NBDC online database record
Black-headed gull *Chroicocephalus ridibundus*	WA	Red	NBDC online database record
Black guillemot *Cepphus grylle*	WA	Red	NBDC online database record
Black-tailed godwit *Limosa limosa*	WA	Red	NBDC online database record
Black-throated diver *Gavia arctica*	WA, BD_I	Amber	NBDC online database record
Common scoter *Melanitta nigra*	WA	Red	NBDC online database record
Curlew *Numenius arquata*	BD_II (II), WA	Red	NBDC online database record
Dunlin *Calidris alpina*	BD_I	Red	NBDC online database record
Golden plover *Pluvialis apricaria*	BD_I, II (II), III (III), WA	Red	NBDC online database record
Goldeneye *Bucephala clangula*	BD_II (II), WA	Red	NBDC online database record
Herring gull *Larus argentatus*	WA	Red	NBDC online database record
Lapwing *Vanellus vanellus*	BD_II (II), WA	Red	NBDC online database record
Long-tailed duck *Clangula hyemalis*	BD_II (II), WA	Red	NBDC online database record
Pintail *Anas acuta*	BD_II (I), III (II), WA	Red	NBDC online database record
Pochard *Aythya ferina*	BD_II (I), III (II), WA	Red	NBDC online database record
Red grouse *Lagopus lagopus*	BD_II (I), III (I), WA	Red	NBDC online database record
Redshank *Tringa totanus*	WA	Red	NBDC online database record
Shoveler *Anas clypeata*	BD_II (I), III (III), WA	Red	NBDC online database record
Tufted duck *Aythya fuligula*	BD_II (I), III (II), WA	Red	NBDC online database record
Wigeon *Anas penelope*	BD_II (I), III (II), WA	Red	NBDC online database record

Common Name/ Scientific Name	**Legal Status[16]**	**Red List Status[17]**	**Source**
Woodcock *Scolopax rusticola*	BD_II (I), III (III), WA	Red	NBDC online database record
Common tern *Sterna hirundo*	BD_I, WA	Amber	NBDC online database record
Great northern diver *Gavia immer*	BD_I, WA	Amber	NBDC online database record
Greater white-fronted goose *Anser albifrons*	BD_I, WA	Amber	NBDC online database record
Hen harrier *Circus cyaneus*	BD_I, WA	Amber	NBDC online database record
Kestrel *Falco tinnunculus*	BD_I, WA	Amber	NBDC online database record
Kingfisher *Alcedo atthis*	BD_I, WA	Amber	NBDC online database record
Little egret *Egretta garzetta*	BD_I, WA	Green	NBDC online database record
Little gull *Larus minutus*	BD_I, WA	Amber	NBDC online database record
Little tern *Sterna albifrons*	BD_I, WA	Amber	NBDC online database record
Mediterranean gull *Larus melanocephalus*	BD_I, WA	Amber	NBDC online database record
Merlin *Falco columbarius*	BD_I, WA	Amber	NBDC online database record
Peregrine *Falco peregrinus*	BD_I, WA	Green	NBDC online database record
Red-throated diver *Gavia stellata*	BD_I, WA	Amber	NBDC online database record
Ruff *Philomachus pugnax*	BD_I, WA	Amber	NBDC online database record
Sandwich tern *Sterna sandvicensis*	BD_I, WA	Amber	NBDC online database record
Snowy owl *Nyctea scandiaca*	BD_I, WA	Green	NBDC online database record
Whooper swan *Cygnus cygnus*	BD_I, WA	Amber	NBDC online database record
Brent goose *Branta bernicula hrota*	WA	Amber	NBDC online database record
Common coot Fulica atra	WA	Amber	NBDC online database record
Common greenshank Tringa nebularia	WA	Green	NBDC online database record
Common guillemot *Uria aalge*	WA	Amber	NBDC online database record

Common Name/ Scientific Name	**Legal Status[16]**	**Red List Status[17]**	**Source**
Linnet *Linaria cannabina*	WA	Amber	NBDC online database record
Pheasant *Phasianus colchicus*	WA, BD_II(I), III(I)	Green	NBDC online database record
Common sandpiper *Actitis hypoleucos*	WA	Amber	NBDC online database record
Shelduck *Tadorna tadorna*	WA	Amber	NBDC online database record
Snipe *Gallinago gallinago*	WA, BD_II (I), III (III)	Red	NBDC online database record
Starling *Sturnus vulgaris*	WA	Amber	NBDC online database record
Swift *Apus apus*	WA	Red	NBDC online database record
Oystercatcher *Haematopus ostralegus*	WA	Red	NBDC online database record
Teal *Anas crecca*	WA, BD_II (I) III (II)	Amber	NBDC online database record
Shag *Gulosus aristotellis*	WA	Amber	NBDC online database record
Gadwall *Mareca strepera*	WA	Amber	NBDC online database record
Great black-backed gull *Larus marinus*	WA	Green	NBDC online database record
Cormorant *Phalacrocorax carbo*	WA	Amber	NBDC online database record
Great crested grebe *Podiceps cristatus*	WA	Amber	NBDC online database record
Greater scaup *Aythya marila*	WA, BD_II (II), III (III)	Red	NBDC online database record
Grey plover *Pluvialis squatarola*	WA	Red	NBDC online database record
House martin *Delichon urbicum*	WA	Amber	NBDC online database record
House sparrow *Passer domesticus*	WA	Amber	NBDC online database record
Jack snipe *Lymnocryptes minimus*	WA	Green	NBDC online database record

Common Name/ Scientific Name	**Legal Status[16]**	**Red List Status[17]**	**Source**
Lesser black-backed gull *Larus fuscus*	WA	Amber	NBDC online database record
Little grebe *Tachybaptus ruficollis*	WA	Green	NBDC online database record
Mallard *Anas platyrhynchos*	WA, BD_II (I), III (I)	Amber	NBDC online database record
Common gull *Larus canus*	WA	Amber	NBDC online database record
Mute swan *Cygnus olor*	WA	Amber	NBDC online database record
Northern gannet *Morus bassanus*	WA	Amber	NBDC online database record
Wheatear *Oenanthe oenanthe*	WA	Amber	NBDC online database record
Razorbill *Alca torda*	WA	Red	NBDC online database record
Knot *Calidris canutus*	WA	Red	NBDC online database record
Red-breasted merganser *Mergus serrator*	WA, BD_II (II)	Amber	NBDC online database record
Ringed plover *Charadrius hiaticula*	WA	Amber	NBDC online database record
Rock pigeon *Columba livia*	WA, BD_II (I)	Green	NBDC online database record
Sand martin *Riparia riparia*	WA	Amber	NBDC online database record
Skylark *Alauda arvensis*	WA	Amber	NBDC online database record
Slavonian grebe *Podiceps auritus*	WA, BD_I	Red	NBDC online database record
Spotted flycatcher *Muscicapa striata*	WA	Amber	NBDC online database record
Water rail *Rallus aquaticus*	WA	Green	NBDC online database record
Kittiwake *Rissa tridactyla*	WA	Red	NBDC online database record
Yellowhammer *Emberiza citrinella*	WA	Red	NBDC online database record
Invertebrates			
Marsh fritillary butterfly *Euphydryas aurinia*	HD_II	Vulnerable	NBDC online database record

Common Name/ Scientific Name	**Legal Status[16]**	**Red List Status[17]**	**Source**
Zebra Mussel *Dreissena polymorpha*	Invasive Species - Regulation S.I. 477 (Ireland)	n/a	NBDC online database record

Appendix 7-1

LDA Dyke Road
Galway

Geophysical Survey

Report Status: Final

MGX Project Number: 6756

MGX File Reference: 6756f-005.doc

1st July 2024

Confidential Report To:

Land Development Agency 2nd Floor, Ashford House Tara Street Dublin 2 D02 VX67	**AECOM** 4th Floor, Adelphi Plaza George's Street Upper Dun Laoghaire A96 T927

Report submitted by:
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Reviewer: Hartmut Krahn (Senior Geophysicist)

Minerex Geophysics Limited

Subsurface Geophysical Investigations

EXECUTIVE SUMMARY

1. Minerex Geophysics Ltd. (MGX) carried out a geophysical survey consisting of 2D-Resistivity (ERT), seismic refraction (p-wave) and MASW (s-wave) surveying for the ground investigation for the proposed LDA development at Dyke Road, County Galway.
2. The main objectives of the survey were to determine the ground conditions under the site, to determine the depth to rock and the overburden thickness, and to detect possible karstified rock in order to help guide the locations of direct ground investigations.
3. The recommended locations were drilled and the results are a zone of Metagabbro (BRC04) within the limestone and a deeper pocket of very stiff to hard clay within the good limestone (BRC03).
4. The clean limestone present is liable to karstification, but it does not have to be karstified.
5. The three different methods allowed for correlations to be identified between them and to improve the interpretation.
6. The urban nature of the site has negative effects on all the surveying methods.
7. The seismic refraction data was interpreted with four layers.
8. Layer 1 is interpreted as road construction material underlain by urban made ground and peat.
9. Layer 2 is described as soft to firm clay and silt or urban made ground or peat and extends to depths of 4 – 8m below ground level (bgl).
10. Layer 3 is only present in the NW of the site and is interpreted as very stiff or very dense overburden but may contain some very weathered rock.
11. Rock is indicated by Layer 4. The depth to the top of this layer ranges from 4 – 9m bgl across most of the site but is 11 to 12m bgl in the NW in BRC01 and BH01.
12. Peat present in layer 1 or 2 would be compressed because of the urban layers.
13. Map 2 indicates three zones reviewed as ‘Deep Rock’, ‘very stiff to hard Clay’ and ‘Metagabbro/anomalous Rock’. These were interpreted after targeted drilling.
14. The MASW data gives results for 3.6m to 4.5m of soft to firm material across much of the site and to deeper levels in the NW.
15. This report was reviewed and finalised after the complete direct ground investigation data had been received.

CONTENTS

List of Tables, Maps and Figures:

1. INTRODUCTION

1.1 Background

Minerex Geophysics Ltd. (MGX) carried out a geophysical survey for an LDA site on the Dyke Road, Galway. The survey consisted of 2D-Resistivity (ERT), seismic refraction (p-wave) and MASW (s-wave) measurements. The survey was commissioned by the LDA.

This survey utilized various complementary geophysical methods to improve final interpretations. The role of geophysics as a non-destructive fast method is to provide a geological interpretation over a wide area to complement direct ground investigations at specific locations. The direct ground investigation results can be used to improve the initial geophysical results and interpretation.

The survey was aimed at investigating the ground conditions under the site, the depth to rock and identifying possible karstified rock.

During the tender stage, MGX indicated to the client limitations of the survey in this urban setting and improved the methodology and choice of geophysical methods.

The main purpose of a geophysical survey in this setting is to guide the locations for boreholes, rather than creating a ground model with an accuracy like on a greenfield site. The geophysics will rather have an outcome in a relative scale, like the rock is deeper here than there, and there is rather karst here than there. Then such comparisons can be use to target boreholes.

1.2 Objectives

The main objectives of the geophysical survey were:

- To determine the ground conditions under the site
- To determine the depth to rock and the overburden thickness
- To estimate the strength or stiffness or compaction of overburden materials and the rock quality
- To determine the type of overburden and rock
- To detect lateral changes within the geological layers
- To detect possible karstified zones within the rock or karst features
- To determine the s-wave velocity and to calculate the small strain shear modulus G_{max}

1.3 Site Description

The site is located in a number of carparks along the Dyke Road just east of the Corrib River in Galway City. The site is bordered by roads to the west, south and southeast, a Retail Park to the east and a greenfield site to the north. The Black Box Theatre is in the north of the site. Access was from the Dyke Road in the west.

The whole site is underlain by tarmac. The total survey area covered an area of approx. 18,000m^2.

1.4 Geology

Online geological maps of Ireland (GSI, 2024) give the following information:

The quaternary sediments are described as urban while there is fen peat noted on the opposite side of the road to the west.

In terms of rock, the survey area is underlain by Visean Limestones, described as undifferentiated limestones.

Visean Limestones are karstifiable and there are many karst features noted in the Galway area, however the nearest features noted to this site are over 2km to the east.

There is an unconformity approx. 200m to the west with metamorphic rock to the west of it.

1.5 Report

This report includes the results and interpretation of the geophysical survey. Maps, figures and tables are included to illustrate the results of the survey. More detailed descriptions of geophysical methods and measurements can be found in GSEG (2002), Milsom (1989) and Reynolds (1997).

The description of soil, rock and the use of geotechnical terms (soft, stiff, dense etc) follows Eurocode (2007) and BSI (2020) standards. The terms are defined in the standards and the physical parameters are related from experience. This geophysical survey has been acquired, processed, interpreted and reported in accordance with these guidelines.

The client provided maps of the site and the digital version was used as the background map in this report. Elevations were surveyed on site and are used in the vertical sections.

The interpretative nature and the non-invasive survey methods must be taken into account when considering the results of this survey and Minerex Geophysics Limited, while using appropriate practice to execute, interpret and present the data, give no guarantees in relation to the existing subsurface.

2. GEOPHYSICAL SURVEY

2.1 Methodology

The methodology consisted of using 2D-Resistivity (ERT), Seismic Refraction and MASW (Multi-Channel Analysis of Surface Waves) surveying.

The 2D-Resistivity survey was carried out first, the data was analysed on site and additional surveying was carried out targeting certain features and ensuring a good spread of lines across the site.

The survey locations are indicated on Map 1. The lines and parameters are tabulated in Table 1.

2.2 2D-Resistivity (ERT)

2D-Resistivity lines were surveyed with electrode spacing of 3m, up to 64 electrodes per set-up and a maximum length of 189m per set-up. The readings were taken with a Tigre Resistivity Meter, Imager Cables, stainless steel electrodes and a laptop with ImagerPro acquisition software.

Lines R2 and R3 were surveyed using the roll-along mode to lengths longer than 189m to achieve continuous coverage to a depth of 15m along the ends of the lines.

The electrodes were placed inside small drilled holes (12mm), and saline water was added to make a good electrical connection. The holes were subsequently re-sealed upon completion of the lines.

During 2D-Resistivity surveying, data is acquired in the form of linear arrays using a suite of metal electrodes. A current is induced into the ground via a pair of electrodes whilst a potential difference is measured across a second pair of electrodes. This allows for the recording of the apparent resistivity in a two-dimensional arrangement below the line. The data is inverted after the survey to obtain a model of subsurface resistivities. The generated model resistivity values and their spatial distribution can then be related to typical values for different geological materials.

The penetration depth of a resistivity set-up increases towards the centre where it reaches an approx. depth of 15m below ground level (bgl).

The presence of metal underground services like water pipes may influence the results of the survey. There are large diameter metal water mains along the dyke road and the resistivity lines were kept away from these in as much as possible.

2D-Resistivity has previously proven zones of anomalous or karstified rock with lateral extents of 10m and more.

2.3 Seismic Refraction

Seismic refraction lines were surveyed with geophone spacing of 3m and 24 geophones per set-up resulting in a 69m length per set-up. The recording equipment consisted of a 24 Channel GEOMETRICS ES-3000 engineering seismograph with 4.5Hz vertical geophones. The seismic energy source consisted of a hammer and plate. A zero-delay trigger was used to start the recording. Normally 7 shot points per p-wave set-up were used.

The seismic refraction survey method focuses on propagating p-waves travelling through the subsurface, which are generated by a seismic source. As the wave propagates through the subsurface, its velocity varies as it travels through overburden, rock with different elastic properties, and along geological boundaries. Velocity data is recorded via the surveying equipment, which is then processed, allowing geological layer thicknesses and boundaries to be established.

Seismic Refraction generally determines the depth to horizontal or near horizontal layers where the compaction or strength or rock quality changes with an accuracy of around 20% of the depth to that layer. Where the layers are shallower than the geophone spacing depth deviations of +- 1m to top of layers can occur. Where low velocity layers or shadow zones are present (e.g., below solid ground surface) or where layers dip with more than 20 degree angle the accuracy becomes much less. This lower accuracy is the case here on this project.

A low velocity layer exists for the seismic waves below the solid surface layer. This makes it less certain or impossible to pick first breaks from geophones near the source and therefore no velocity determination for the shallow subsurface is possible. This results in larger deviations in the modelling and borehole results are required for a final calibration of the results.

The seismic refraction set-ups with 69m individual length have a reasonable penetration depth of around 15m. An internationally accepted maximum depth estimate for a seismic refraction set-up is 1/6 of the set-up length including offshots. The depth penetration varies according to the velocity structure of the subsurface. In this report we used a depth of 15m bgl. where the seismic modelling was ended as deeper modelling becomes less meaningful.

2.4 MASW (Multichannel Analysis of Surface Waves)

The seismic shear wave velocity was determined by active MASW surveying. MASW (Multi-Channel Analysis of Surface Waves) determines the bulk seismic shear wave velocity versus depth. The velocities are used to determine the small strain shear modulus.

The MASW method was acquired along with the seismic refraction survey though the shots were done individually with a larger time window. The recording equipment consisted of a 24 Channel GEOMETRICS ES-3000 engineering seismograph with 4.5Hz vertical geophones. The seismic energy source consisted of a hammer and plate. A zero-delay trigger was used to start the recording. The shot points were located at the ends of the set-ups.

Many constraints exist for the MASW method and the main factors on this site that affect the methods are strong vertical velocity gradients, particularly between the overburden and rock, and changing velocity structure and layer thicknesses along the lines.

2.5 Site Work

The data acquisition was carried out on the nights of the 28th and 29th of March 2024. The weather conditions were fair throughout the acquisition period. Health and safety standards were adhered to at all times. A traffic management system was in place, clearly highlighted by the use of warning signs and cones.

The locations and elevations were surveyed with a Carlson NR3 RTK-GPS to accuracy < 0.05m.

3. RESULTS AND INTERPRETATION

The interpretation of geophysical data was executed utilizing the known response of geophysical measurements, typical physical parameters for subsurface features that may underlay the site, and the experience of the authors.

Ground investigation results were available after the survey and the abbreviated borehole logs are indicated on the sections. The overburden was abbreviated as clay, silt, sand and gravel. The rock was generally divided into weathered limestone (based on RQD value < 50%) and limestone or metagabbro rock (> 50%). This can be done only to a certain extend as the rock can be very variable. RQD values, fracture indices and non-intact zones often change rapidly with depth. The small size of a borehole only represents a very small volume of ground while the geophysical survey on the other end of the scale averages over a large volume of ground.

3.1 2D-Resistivity (ERT)

The 2D-Resistivity data was positioned and inverted with the RES2DINV inversion package. Lines using the roll-along method were concatenated for a joint inversion. The programme uses a smoothness constrained least-squares inversion method to produce a 2D model of the subsurface resistivities from the recorded apparent resistivity values. Three variations of the least squares method are available and for this project the Jacobian Matrix was recalculated for the first three iterations, then a Quasi-Newton approximation was used for subsequent iterations. Each dataset was inverted using seven iterations resulting in a typical RMS error of <3.0%. The resulting models were colour contoured with the same resistivity scale for all lines and they are displayed as cross sections (Figures 1a – 1b).

The data shows interference from urban ground and conditions. High resistivities near the surface are likely due to road construction material while rapid changes along some lines may be due to interference from surrounding metal.

Resistivities are characteristic for certain overburden and rock types. If there is a high content of clay minerals (which are electrically conductive) then the overburden resistivity will be lower than as if there is a high content of clastic grains like sand or gravel. The purer the clay and the lower the sand and gravel content, the lower the resistivity. Water content in overburden layers can influence the resistivities, but generally clay content has a more dominating effect.

Karstified rock is defined in this report as a formerly intact clean limestone rock, liable to karstification, that has been partially dissolved by water over long geological time scales and where the cavities and voids have either remained empty (filled by air) or became filled by overburden sediment (clay, silt, sand), weathering product of the broken rock itself or water. This process would lead to a reduction of the resistivity of the overall rock and therefore karstified rock has a lower resistivity than intact clean limestone rock. This is generally indicated by lower resistivities embedded within high resistivity at depth.

High resistivities near the surface are likely an effect of the material used for the construction of the carparks. The low resistivities underlying this are interpreted as peat or clay and silts. High resistivities at depth are interpreted as clean limestone while lower resistivities within the rock layer are described as possible karst features. Due to the built-up nature of the site, the data may be disturbed by non-geological features and any possible karst features would require direct ground investigations in order to determine the rock quality in these areas. Between 130 – 160m along line R4, the high resistivities near the surface are likely caused by some disturbance.

Some features within the 2D-Resistivity models may indicate possible karst zones, though disturbance from metal can never be ruled out. Three deeper areas with different resistivities are indicated Map 2. A linear feature within relatively shallow rock in the SE of the site stretching SW to NE is indicated on all four resistivity lines and in comparison with the rotary core logs was interpreted as Metagabbro or anomalous rock. In the NW of the site at the black box theatre the results indicate deeper rock and the modelling was only working to a depth of around 10m bgl. A third area in the central site area relates to a low resistivity feature within the rock layer along line R2 which was found in the drilling to be very stiff to hard Clay.

3.2 Seismic Refraction

The seismic refraction data was positioned and processed with the SEISIMAGER software package to give a layered model of the subsurface. The number of layers has been determined by analysing the seismic traces and a total of 4 layers were used in the models. All seismic lines were subject to a standardised processing sequence which consisted of a topographic correction which was based on integrated elevation data, first break picking, tomographic inversion, travel-time computation via ray-tracing and velocity modelling. Residual deviations of typically 0.4 to 1.8 msec RMS have been obtained for each line. Following each processing stage QC procedures were adhered to. The resulting layer boundaries are shown as thick lines overlaid on the 2D-Resistivity cross sections (Figure 1a – 1b). The average seismic velocities obtained within the layers are annotated on the sections as bold black numbers.

The p-wave seismic velocity is closely linked to the density of subsurface materials and to parameters like compaction, stiffness, strength and rock quality. The higher the density of the subsurface materials the higher the seismic velocity. More compacted, stiffer, denser and stronger material will have a higher seismic velocity. For rock, the seismic velocity is higher when the rock is stronger, less weathered and has a higher quality. If the rock is more weathered, broken, fractured, fissured or karstified then the seismic velocity will be reduced compared to that of intact fresh rock.

Because of the above relationship, the seismic refraction method and seismic velocities are suitable to investigate ground where the layers get denser, more compacted and stronger with depth. A disadvantage is that some materials may have the same seismic velocity: Stiff to very stiff highly consolidated overburden and a weathered rock can have the same seismic velocity range (as could be the case in the layer 3 below).

The modelled seismic data has created the following layered ground model:

Layer 1 has seismic velocities of 500m/s. The velocity is a mix of the tarmac and underlying material that represents a 'shadow zone' as described in Ch2.3.

Layer 2 was modelled with a velocity of 1200m/s and is interpreted as overburden material with soft to firm strength or compaction. This depth of the layer extends to elevation 0mOD across much of the site but is deeper to the NW where the deep rock is interpreted.

Layer 3 velocities of 2000m/s indicate a very stiff or very dense overburden. This layer is only present in the NW of the site. This layer may also contain some very weathered limestone.

Good Rock (Layer 4) is indicated by seismic velocities of 3500 - 4000m/s. The depth to the top of the good rock ranges from 4 – 9m below ground level (bgl) across much of the site but falls to 11 to 12m bgl in the NW in RC BRC01 and BH01. There is a pocket of very stiff to hard clay included in this layer, as drilled in BRC03.

3.3 Interpretation of Resistivity and Seismic Refraction

Table 2 summarises the interpretation. The stiffness or compaction of overburden and the rock strength or quality have been estimated from the seismic velocity. The estimation of the excavatability for the bedrock has been made according to the caterpillar chart published in Reynolds (1997). The geotechnical assessment for rippability will have to take factors like rock type and jointing into account and the estimation in this report is solely based on the seismic velocities.

Interpreted cross sections are shown in Figure 2a – 2b as well as areas highlighted as containing possible karstified limestone or deep rock. Possible Karst zones or deep rock are shown on Map 2. The interpretation has been made from all available information. For overburden layers and the top of the rock the seismic refraction data has been used as seismic refraction is the best method to delineate layer boundaries. The resistivity model values have been used in a general sense to determine overburden materials and rock type as well as identifying possible karst zones within the rock.

Resistivity data is better suited to show overburden material, rock types and features within the rock while seismic refraction velocities are indicating the change of compaction, stiffness or rock quality with depth. Along short sections where only one data type is available an interpolation for the interpreted layers was made.

Table 2: Summary of Interpretation

Layer	General Seismic Velocity Range (m/sec)	General Resistivity Range (Ohmm)	Interpretation	Estimated Excavation Method
1	500	Any	Road Construction Material over urban Made Ground or Peat	Diggable

2	1200	<125	Soft to firm Clay and Silt or urban Made Ground or Peat	Diggable
3	2000	<250	Very stiff or very dense Overburden	Diggable
4a	N/A	< 125	Very stiff to hard Clay	Digging and ripping
4b	3500 - 4000	Any	Limestone	Breaking & Blasting
4c	3500 - 4000	Any	Metagrabbro/anomalous Rock	Breaking & Blasting

3.4 MASW (Multichannel Analysis of Surface Waves)

The MASW lines were positioned, processed, analysed and modelled with the SEISIMAGER/SW and the SURFSEIS6 software packages. The objective is to obtain a model of shear wave velocity versus depth.

All shot points were analysed in order to extract the best possible dispersion curve for the modelling stage.

Following processing steps are done to achieve this:

1. Edit the shot point geometry and display the shot points for each array
2. Edit traces and/or apply filters to improve the shot record for the next step
3. A dispersion curve (phase velocity versus frequency plot or dispersion image) is computed
4. For each shot the maximum amplitude at each frequency of the dispersion image is selected and the picks for the dispersion curve are truncated (frequency gate), smoothed and brought forward into the modelling process
5. An initial model of shear-wave velocity, $V_{s,}$ versus depth is computed
6. An inversion is carried out to create the final V_s curve (Shear wave versus depth). The valid useful depth range is noted and the data saved in a file
7. For stable repeatable results the shear wave velocity versus depth is extracted and the depth range covered by the real survey data is then listed in Table 3
8. The results for the two opposed shot points at the end of each array are compared and an average shear wave velocity is computed
9. The small strain shear modulus (also named G_{max}) for each shot point and depth is computed by using a density of 1800 kg/m^3 typical for consolidated overburden (Eq. 1)

   (Eq. 1) $G = V_s^2 * \rho * 10^{-6}$

where G = Shear Modulus (MPa)

V_s = Seismic Shear Wave Velocity (m/s)

ρ = Density (kg/m^3)

The results are displayed in tabular format in Table 3. The results show the seismic shear wave velocity and the small strain shear modulus vs. depth. S-Wave Velocities across all the lines range from 74 – 292m/s and the small strain shear moduli from 10 – 153MPa.

The relationship between shear wave velocities and material stiffness is summarised below:

Table 4: Shear Wave Velocity to Stiffness Relationship

Shear Wave Velocity Vs Range in m/s	Material Stiffness
< 150	Soft
150 to 300	Firm
300 to 500	Stiff
> 500 m/s	Very Stiff

Intensive efforts have been made to extract the best dispersion curves by time gating, selecting and test processing various source versus receiver trace distances and trace ranges and by directional selection of traces.

The depth of surveying was generally restricted by the strong vertical velocity gradient in particular between the overburden and rock layers. The MASW data can survey the softer layers below the construction material which is not possible by the seismic refraction method. The data shows soft to firm material across the site. The depth of the survey ranges from 3.6m to 4.5m across much of the site but increases to 7.2 – 9m in the NW which also indicating a change in the depth to rock.

4. CONCLUSIONS

The following conclusions are made:

- The geophysical surveys carried out at the LDA Dyke Road site consisted of 2D-Resistivity (ERT), seismic refraction and MASW surveying.
- The purpose of this survey was to provide some guidance for borehole locations by indicating general geological changes across the site and highlighting possible areas of karstified limestone.
- The recommended locations were drilled and the results are incorporated into this interpretation.
- The drilling found a zone of Metagabbro (BRC04) within the limestone and a deeper pocket of very stiff to hard clay within the good limestone (BRC03).
- The urban environment has interfered with the data, namely the tarmac and low velocity layer for the seismic refraction and underground metal for the resistivity.
- At all locations there was a correlation between all three geophysical survey methods, high resistivities generally match with increases in seismic refraction velocities while the depth of the MASW survey showing soft to firm materials ties in with layers 1 and 2 from the seismic refraction survey and extends to greater depths in the NW where these layers are thicker.
- Some high resistivities at depth indicate that there is clean limestone present that is liable to karstification, but it does not have to be karstified.
- The seismic refraction survey was modelled with a total of four layers.
- Layer 1 is mainly affected by the road construction. High resistivities near the surface indicate road construction material such as gravel and tarmac. This layer would also contain urban made ground and peat.
- Layer 2 is interpreted as soft to firm clay and silt or urban made ground or peat. This layer extends down to an elevation of approx. 0mOD across much of the site but extends deeper in the NW.
- Layer 3 is described as very stiff or very dense overburden. This layer is only present in the NW of the site. It may contain some very weathered rock.
- Layer 4 is interpreted as rock. The depth to the top of this layer is between 4 – 9m bgl across most of the site but 11 to 12m bgl in the NW in RC BRC01 and BH01. Due to the interference the seismic modelling depth was limited here to around 10m.
- Resistivities and rotary coring lead to a subdivision of Layer 4 into 3 zones with 4a as very stiff to hard clay, 4b limestone and 4c metagabbro/anomalous rock. These are indicated in Figures 2a and 2b.

- The resistivities give general indications of overburden types and possible features within the rock but the built-up nature of the site can have a non-geological effect on the data as well and care must be taken when using the interpretation.
- There are generally high resistivities near the surface. This would be typical for road construction materials such as tarmac and gravel fill.
- Peat present in layer 1 or 2 would be compressed because of the urban layers.
- Map 2 indicates three zones reviewed as 'Deep Rock' in the NW, very stiff to hard Clay and Metagabbro/anomalous Rock. These were interpreted after targeted drilling.
- Table 3 gives the results from the MASW survey and shows shear wave velocities of 74 – 292m/s across the site which indicates soft to firm material. The small strain shear moduli range from 10 to 153MPa. The depth of these layers is shown to increase towards the NW.
- The interpretation presented here was reviewed after the geotechnical data became available.

5. REFERENCES

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Table 1: Geophysical Survey Locations and Acquisition Parameters

2D-Resistivity (ERT) Survey

Site	Line	Electrode Spacing (m)	Length (m)	Display direction	Survey Type/Mode
Car Park	R1	3	189	NW-SE	Traverse
Car Park	R2	3	333	N-S	Roll Along
Car Park	R3	3	237	NW-SE	Roll Along
Car Park	R4	3	189	NW-SE	Traverse
		SUM	**948**		

Seismic Refraction Survey

Site	Line	Geophone Spacing (m)	Length (m)	Display direction	Survey Type/Mode
Car Park	S1	3	69	NW-SE	Single Setup
Car Park	S2	3	69	N-S	Single Setup
Car Park	S3	3	69	N-S	Single Setup
Car Park	S4	3	69	N-S	Single Setup
Car Park	S5	3	69	N-S	Single Setup
Car Park	S6	3	69	N-S	Single Setup
Car Park	S7	3	69	NW-SE	Single Setup
Car Park	S8	3	69	NW-SE	Single Setup
Car Park	S9	3	69	NW-SE	Single Setup
Car Park	S10	3	69	NW-SE	Single Setup
		SUM	**690**		

MASW Survey

Site	Line	Geophone Spacing (m)	Length (m)	Display direction	Survey Type/Mode
Car Park	M1	3	69	NW-SE	1D-MASW
Car Park	M2	3	69	N-S	1D-MASW
Car Park	M3	3	69	N-S	1D-MASW
Car Park	M4	3	69	N-S	1D-MASW
Car Park	M5	3	69	N-S	1D-MASW
Car Park	M6	3	69	N-S	1D-MASW
Car Park	M7	3	69	NW-SE	1D-MASW
Car Park	M8	3	69	NW-SE	1D-MASW
Car Park	M9	3	69	NW-SE	1D-MASW
Car Park	M10	3	69	NW-SE	1D-MASW
		SUM	**690**		

Table 3: MASW S-Wave Velocities and Gmax

Line	Depth (m)	Left S-Wave Velocity (m/s)	Right S-Wave Velocity (m/s)	Average S-Wave Velocity (m/s)	Average Gmax - Shear Modulus (Mpa)
S1					
	0.8	160	147	**153**	**42**
	1.6	178	165	**171**	**53**
	2.4	122	117	**119**	**26**
	3.2	107	53	**80**	**11**
	4.0	151	129	**140**	**35**
	4.8	143	192	**168**	**51**
	5.6	146	96	**121**	**26**
	6.4	141	92	**117**	**25**
	7.2	181	92	**136**	**33**
S2					
	0.4	66	82	**74**	**10**
	0.8	131	111	**121**	**27**
	1.2	168	138	**153**	**42**
	1.6	147	114	**130**	**31**
	2.0	103	114	**109**	**21**
	2.4	66	113	**90**	**14**
	2.8	80	116	**98**	**17**
	3.2	120	106	**113**	**23**
	3.6	112	105	**108**	**21**
S3					
	1.0	247	217	**232**	**97**
	2.0	234	278	**256**	**118**
	3.0	269	232	**250**	**113**
	4.0	108	147	**128**	**29**

Table 3: MASW S-Wave Velocities and Gmax

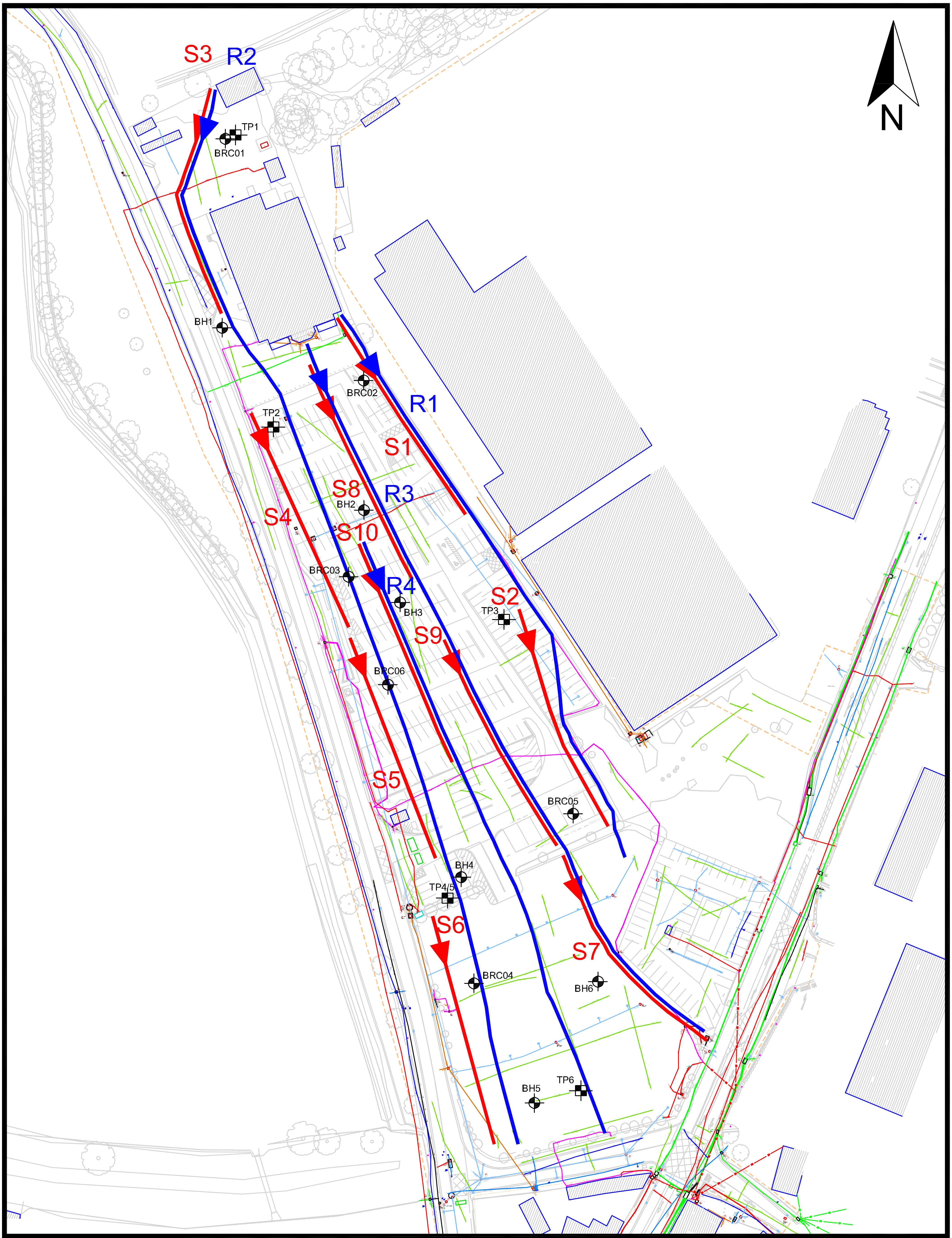
Line	Depth (m)	Left S-Wave Velocity (m/s)	Right S-Wave Velocity (m/s)	Average S-Wave Velocity (m/s)	Average Gmax - Shear Modulus (Mpa)
	5.0	79	110	**95**	**16**
	6.0	145	173	**159**	**46**
	7.0	279	247	**263**	**124**
	8.0	293	259	**276**	**137**
	9.0	135	189	**162**	**47**
S4					
	1.0	213	240	**226**	**92**
	2.0	286	248	**267**	**129**
	3.0	263	133	**198**	**71**
	4.0	173	98	**135**	**33**
	5.0	124	170	**147**	**39**
	6.0	180	219	**200**	**72**
	7.0	240	228	**234**	**99**
	8.0	304	208	**256**	**118**
	9.0	300	186	**243**	**106**
S5					
	0.4	101	152	**126**	**29**
	0.8	81	161	**121**	**26**
	1.2	111	166	**139**	**35**
	1.6	157	159	**158**	**45**
	2.0	175	144	**159**	**46**
	2.4	162	128	**145**	**38**
	2.8	138	116	**127**	**29**
	3.2	115	110	**113**	**23**
	3.6	104	107	**105**	**20**

Table 3: MASW S-Wave Velocities and Gmax

Line	Depth (m)	Left S-Wave Velocity (m/s)	Right S-Wave Velocity (m/s)	Average S-Wave Velocity (m/s)	Average Gmax - Shear Modulus (Mpa)
S6					
	0.4	210	227	219	86
	0.8	234	253	244	107
	1.2	248	288	268	129
	1.6	231	311	271	132
	2.0	190	316	253	115
	2.4	135	300	217	85
	2.8	108	257	183	60
	3.2	86	216	151	41
	3.6	77	120	99	18
S7					
	0.5	214	242	228	94
	1.0	281	250	266	127
	1.5	319	265	292	153
	2.0	289	256	273	134
	2.5	215	242	229	94
	3.0	139	217	178	57
	3.5	117	204	161	46
	4.0	142	198	170	52
	4.5	164	193	178	57
S8					
	1.0	118	136	127	29
	2.0	192	171	182	59
	3.0	157	125	141	36
	4.0	86	94	90	15

Table 3: MASW S-Wave Velocities and Gmax

Line	Depth (m)	Left S-Wave Velocity (m/s)	Right S-Wave Velocity (m/s)	Average S-Wave Velocity (m/s)	Average Gmax - Shear Modulus (Mpa)
	5.0	61	153	107	21
	6.0	80	126	103	19
	7.0	122	124	123	27
	8.0	149	179	164	49
	9.0	136	156	146	38
S9					
	0.4	110	126	118	25
	0.8	154	187	171	52
	1.2	192	233	212	81
	1.6	215	232	223	90
	2.0	221	184	203	74
	2.4	220	117	168	51
	2.8	197	80	138	34
	3.2	140	65	102	19
	3.6	92	59	75	10
S10					
	0.5	80	88	84	13
	1.0	180	173	176	56
	1.5	266	235	250	113
	2.0	235	215	225	91
	2.5	158	165	161	47
	3.0	199	154	177	56
	3.5	245	166	206	76
	4.0	190	182	186	62
	4.5	169	169	169	51



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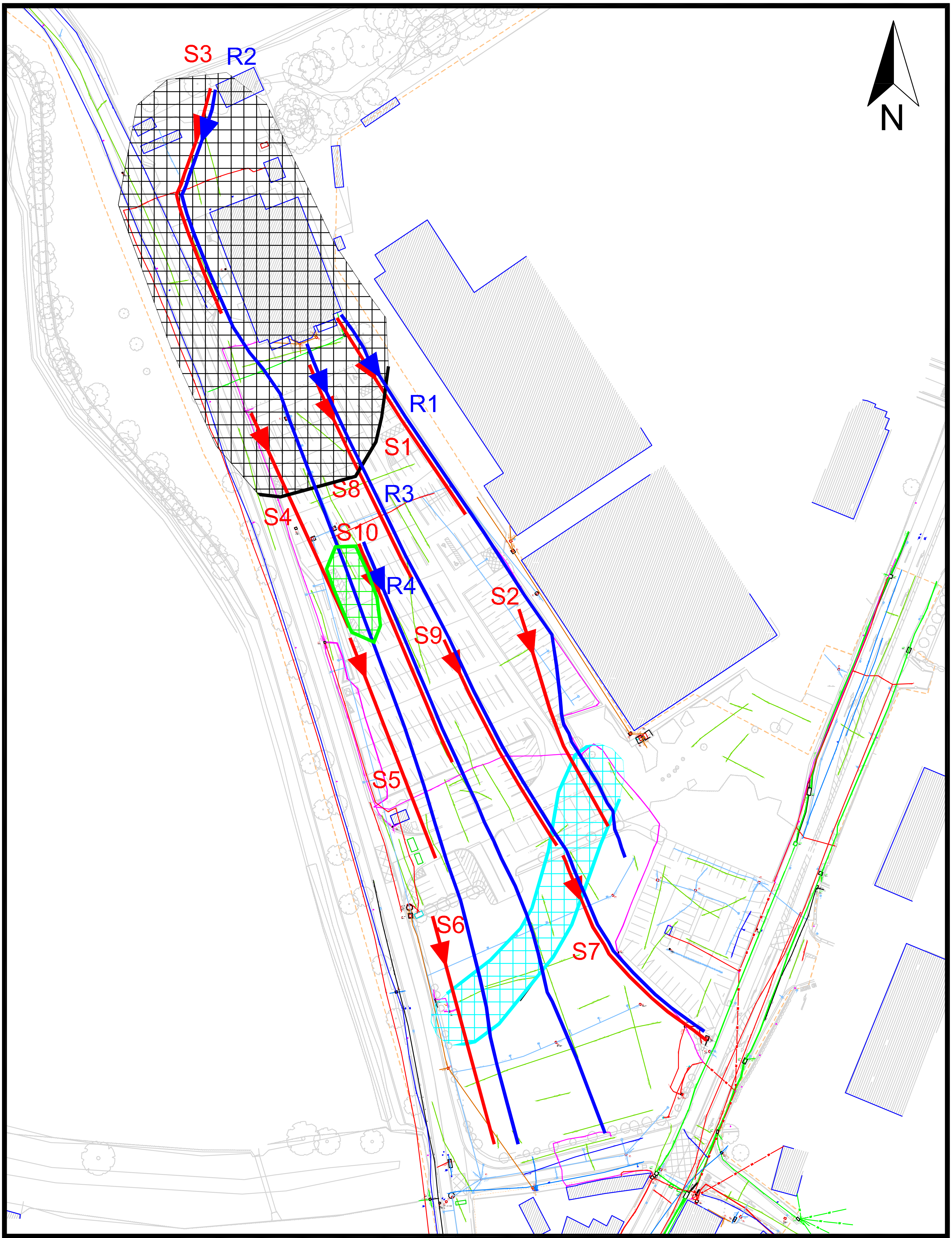
CLIENT	Land Development Agency Aecom
PROJECT	Dyke Road, Galway City Geophysical Survey
TITLE	Map 1: Geophysical Survey Location Map

SCALE:	1:1000 @ A3
PROJECT:	6756
DRAWN:	JS
DATE:	01/07/2024
MGX FILE:	6756f_Drawings.dwg
STATUS:	Final

Geophysical Survey Locations:

R2	2D-Resistivity Line
S1	Seismic Refraction and MASW Line
BH1	Bore Hole
BRC01	Rotary Core Hole
TP1	Trial Pit

Locations are in Irish Transverse Mercator (ITM), Elevations are in mOD (Malin Head)



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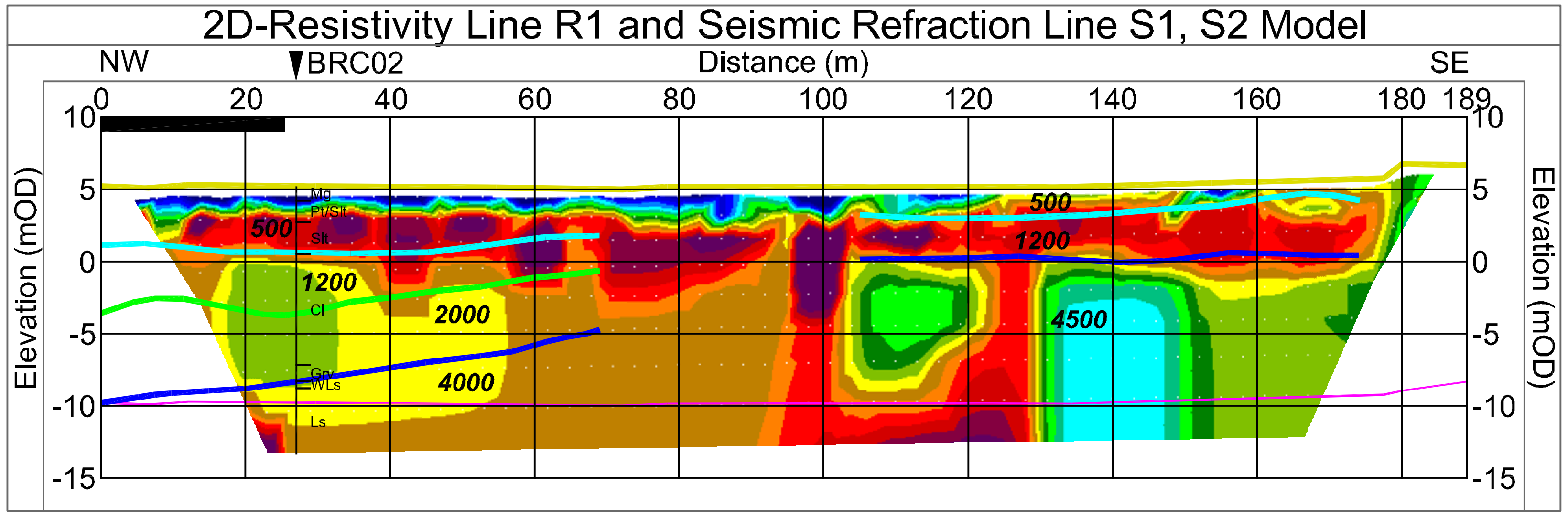
CLIENT	Land Development Agency Aecom
PROJECT	Dyke Road, Galway City Geophysical Survey
TITLE	Map 2: Geophysical Survey Interpretation Map

SCALE:	1:1000 @ A3
PROJECT:	6756
DRAWN:	JS
DATE:	01/07/2024
MGX FILE:	6756f_Drawings.dwg
STATUS:	Final

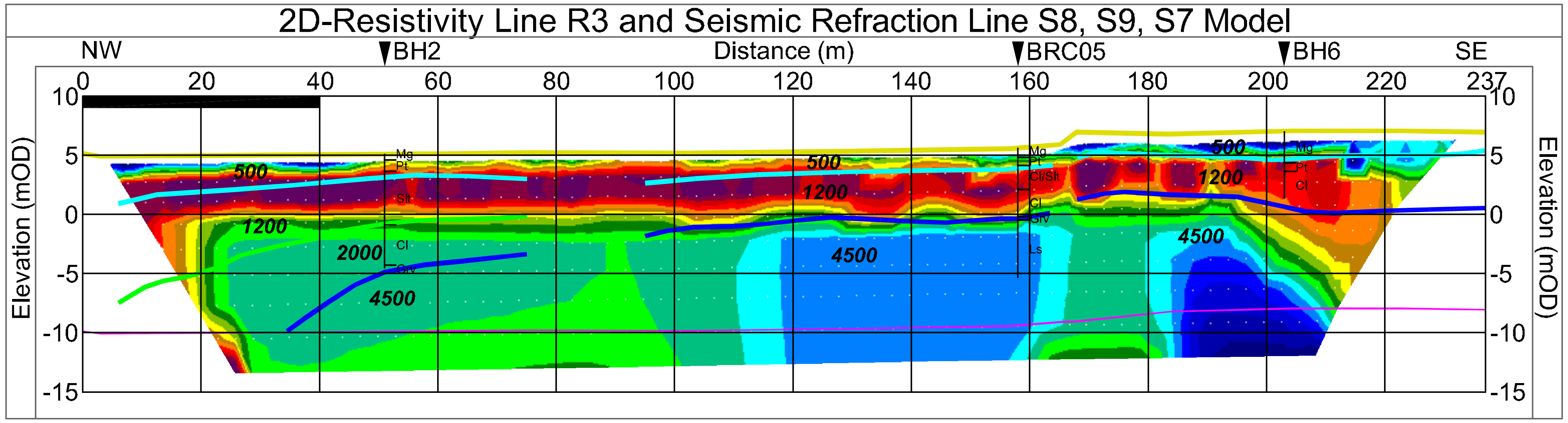
Geophysical Survey Locations:

R2	2D-Resistivity Line
S1	Seismic Refraction and MASW Line
▦	Deep Rock
▦	Very stiff to hard Clay
▦	Metagabbro/anomalous Rock

Locations are in Irish Transverse Mercator (ITM), Elevations are in mOD (Malin Head)



2D-Resistivity Line R1 and Seismic Refraction Line S1, S2 Model



2D-Resistivity Line R3 and Seismic Refraction Line S8, S9, S7 Model

Abbreviated GI Logs:

▼BRC06 Borehole Name and Location

Pt	Peat	Mg	Made Ground
Cl	Clay	Slt	Silt
Grv	Gravel	WLs	Weathered Limestone
Sd	Sand	Ls	Limestone

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CLIENT Land Development Agency
AECOM

PROJECT LDA Dyke Road, Galway
Geophysical Survey

TITLE Figure 1a: Models
of Geophysical Survey

SCALE:	1:1000 @ A3, VE x 2
PROJECT:	6756
DRAWN:	JS
DATE:	01/07/2024
MGX FILE:	6756f_Drawings.dwg
STATUS:	Final

2D-Resistivity Model Values:

Resistivities (Ohmm)

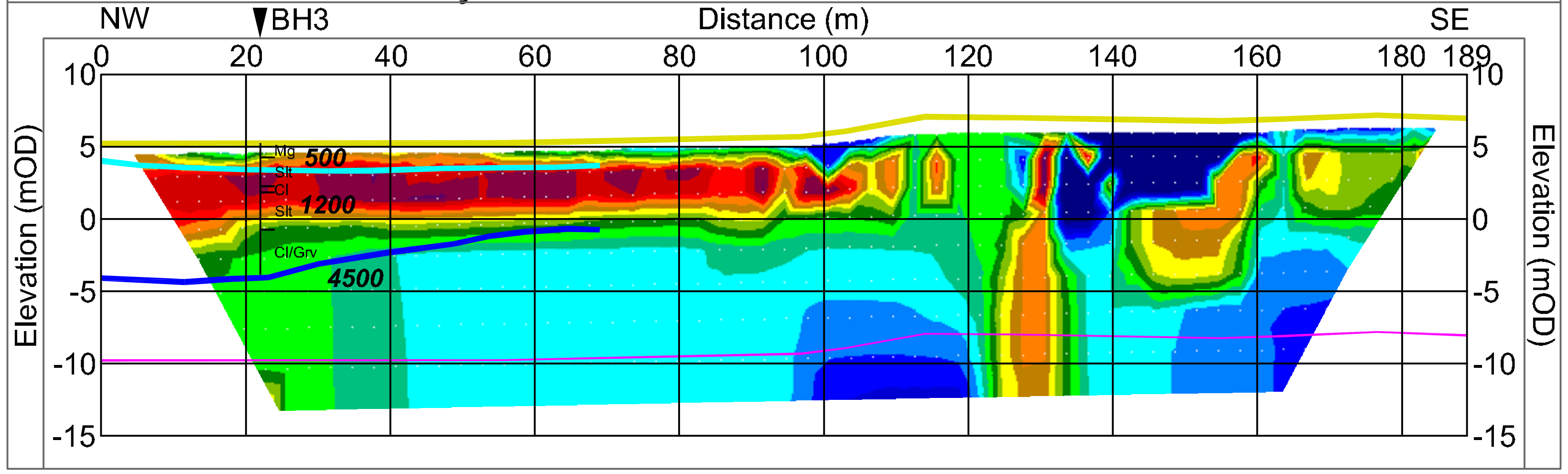
15.6 31.2 62.5 125 250 500 1000 2000

▬ Zone of deep Rock

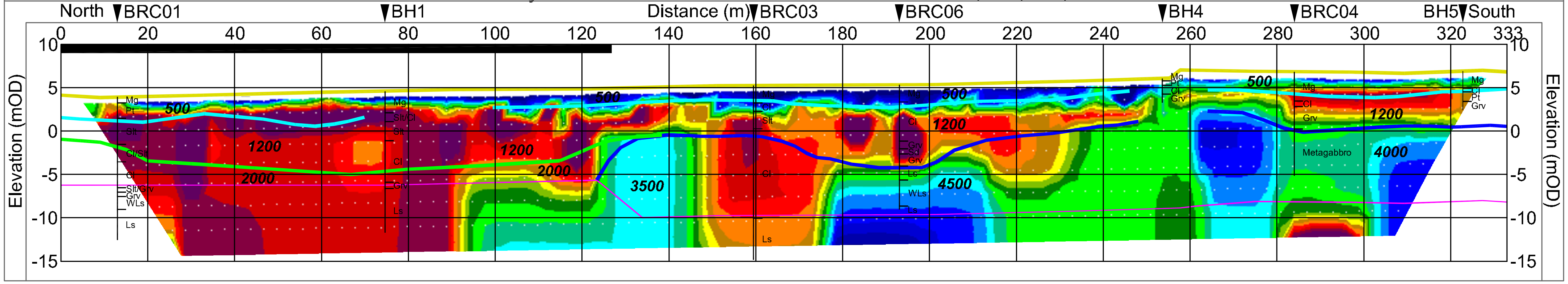
Layers from Seismic Refraction Model:

— Ground Surface/Top of Layer 1 (500 m/s)
— Top of Layer 2 (1200 m/s)
— Top of Layer 3 (2000 m/s)
— Top of Layer 4 (3500 - 4500 m/s)
— Seismic Modelling Depth
1800 Seismic Velocity in m/s

2D-Resistivity Line R4 and Seismic Refraction Line S10 Model



2D-Resistivity Line R2 and Seismic Refraction Line S3, S4, S5, S6 Model



Abbreviated GI Logs:

▼BRC06	Borehole Name and Location		
Pt	Peat	Mg	Made Ground
Cl	Clay	Slt	Silt
Grv	Gravel	WLs	Weathered Limestone
Sd	Sand	Ls	Limestone

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CLIENT Land Development Agency
AECOM

PROJECT LDA Dyke Road, Galway
Geophysical Survey

TITLE Figure 1b: Models
of Geophysical Survey

SCALE: 1:1000 @ A3, VE x 2
PROJECT: 6756
DRAWN: JS
DATE: 01/07/2024
MGX FILE: 6756f_Drawings.dwg
STATUS: Final

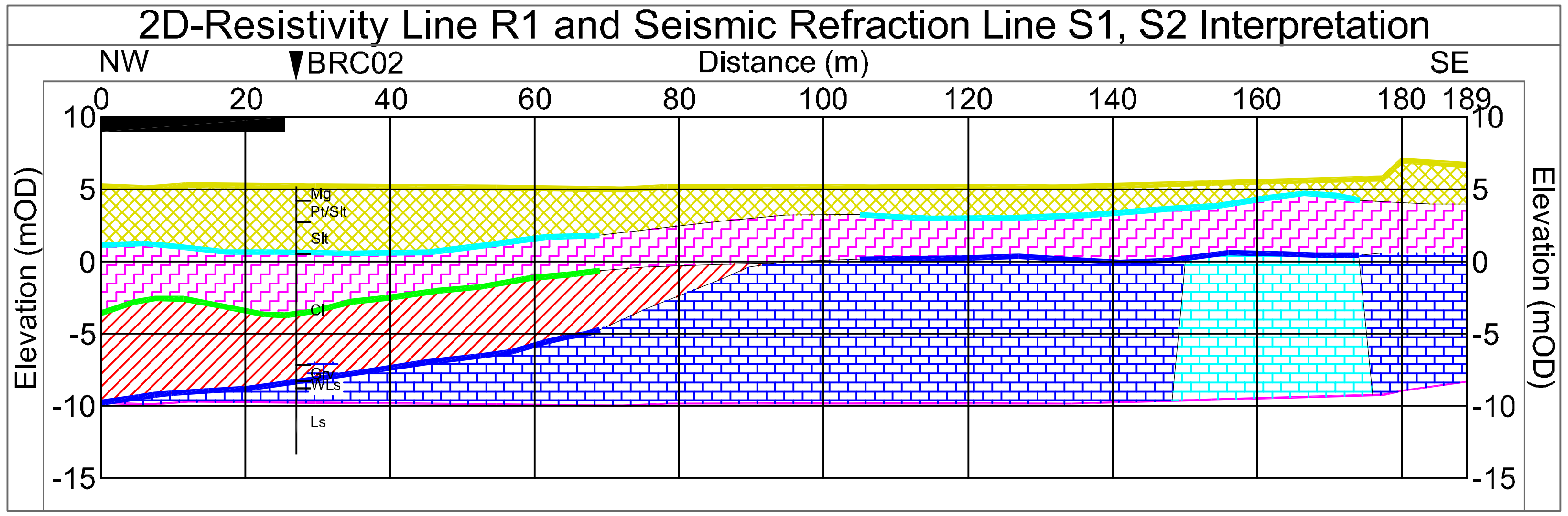
2D-Resistivity Model Values:

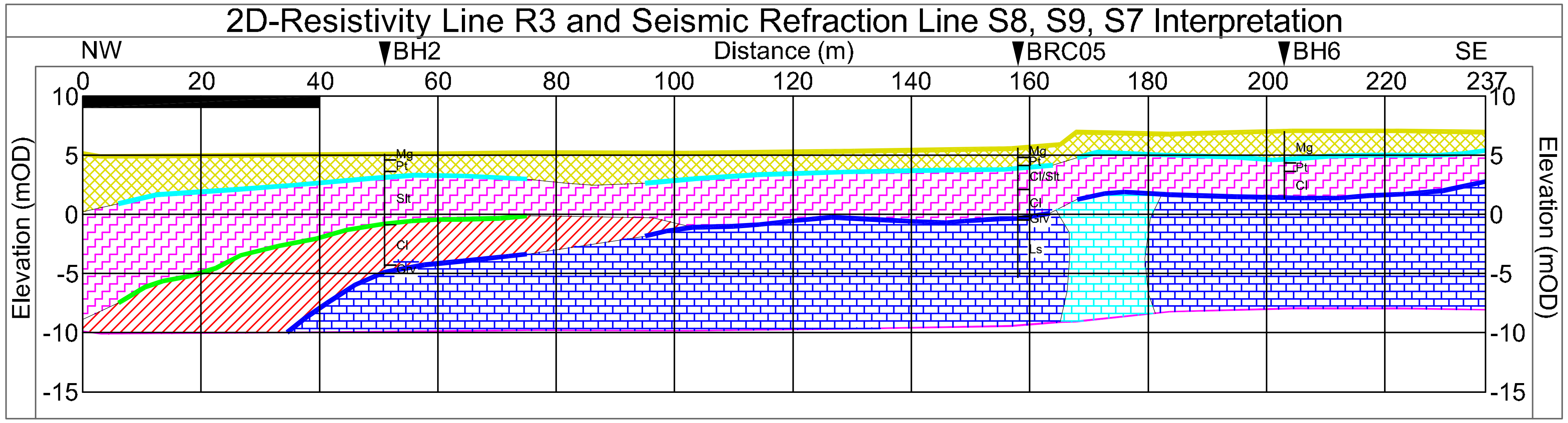
Resistivities (Ohmm)

▬ Zone of deep Rock

Layers from Seismic Refraction Model:

Ground Surface/Top of Layer 1 (500 m/s)
Top of Layer 2 (1200 m/s)
Top of Layer 3 (2000 m/s)
Top of Layer 4 (3500 - 4500 m/s)
Seismic Modelling Depth
1800 Seismic Velocity in m/s


2D-Resistivity Line R1 and Seismic Refraction Line S1, S2 Interpretation


2D-Resistivity Line R3 and Seismic Refraction Line S8, S9, S7 Interpretation

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CLIENT
Land Development Agency
AECOM

PROJECT
LDA Dyke Road, Galway
Geophysical Survey

TITLE
Figure 2a: Interpretation
of Geophysical Survey

SCALE:	1:1000 @ A3, VE x 2
PROJECT:	6756
DRAWN:	JS
DATE:	01/07/2024
MGX FILE:	6756f_Drawings.dwg
STATUS:	Final

Interpretation:

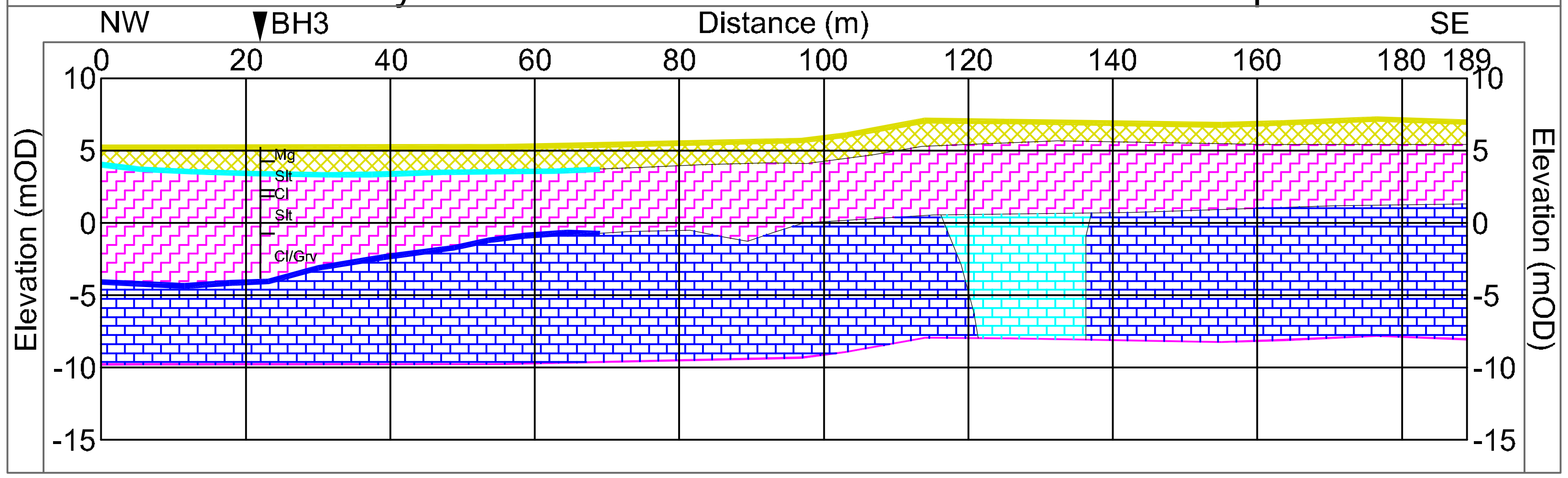
- ▨ 1 Road Construction Material over Urban Made Ground or Peat
- ▨ 2 Soft to firm Clay and Silt or urban Made Ground or Peat
- ▨ 3 Very stiff or very dense Overburden
- 🟩 4a Very stiff to hard Clay
- 🟦 4b Limestone
- ▨ 4c Metagabbro/anomalous Rock
- ■ Zone of deep Rock

Abbreviated GI Logs:

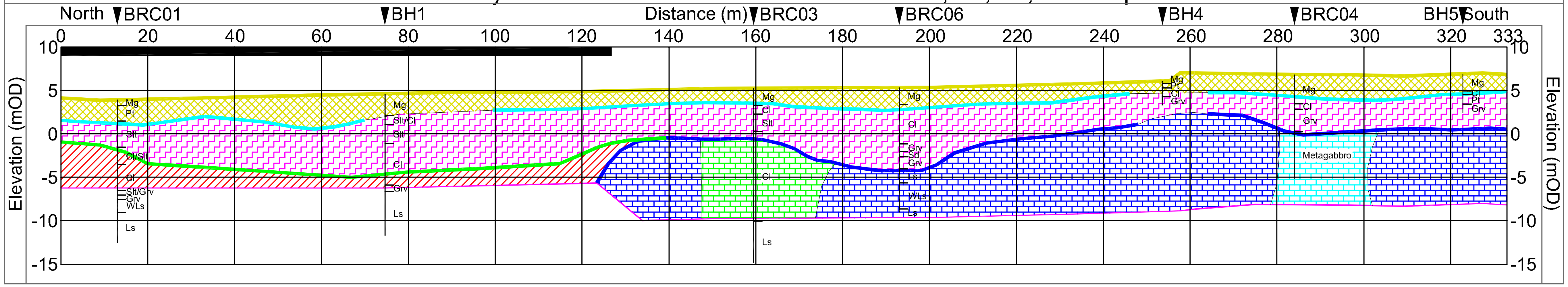
▼BRC06 Borehole Name and Location

Pt	Peat	Mg	Made Ground
Cl	Clay	Slt	Silt
Grv	Gravel	WLs	Weathered Limestone
Sd	Sand	Ls	Limestone

2D-Resistivity Line R4 and Seismic Refraction Line S10 Interpretation



2D-Resistivity Line R2 and Seismic Refraction Line S3, S4, S5, S6 Interpretation



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CLIENT	Land Development Agency AECOM
PROJECT	LDA Dyke Road, Galway Geophysical Survey
TITLE	Figure 2b: Interpretation of Geophysical Survey

SCALE:	1:1000 @ A3, VE x 2
PROJECT:	6756
DRAWN:	JS
DATE:	01/07/2024
MGX FILE:	6756f_Drawings.dwg
STATUS:	Final

Interpretation:

▨	1 Road Construction Material over Urban Made Ground or Peat
▨	2 Soft to firm Clay and Silt or urban Made Ground or Peat
▨	3 Very stiff or very dense Overburden
▦	4a Very stiff to hard Clay
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▬	Zone of deep Rock

Abbreviated GI Logs:

▼BRC06 Borehole Name and Location

Pt	Peat	Mg	Made Ground
Cl	Clay	Slt	Silt
Grv	Gravel	WLs	Weathered Limestone
Sd	Sand	Ls	Limestone

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Ground Investigations Ireland

Dyke Road Galway

Aecom

Ground Investigation Report

June 2024

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DOCUMENT CONTROL SHEET

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Client	Land Development Agency
Engineer	Aecom
Project No	13614-02-24
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Interim	AM	MS	MS	Dublin	24 June 2024

Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.

CONTENTS

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Appendix 1	**Site Location Plan**
Appendix 2	**Trial Pit Records**
Appendix 3	**Slit Trench Records**
Appendix 4	**Soakaway Records**
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Appendix 6	**Insitu Plate Bearing Test Results**
Appendix 7	**TRL Dynamic Cone Penetrometer Records**
Appendix 8	**Groundwater Monitoring Records**
Appendix 9	**Laboratory Results**

1.0 Preamble

On the instructions of Aecom Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between April and June 2024 at the site of the proposed development in Galway City.

2.0 Overview

2.1. Background

It is proposed to construct a new residential and commercial/retail development with associated services, access roads and car parking at the proposed site. The site is currently occupied by a car park and is situated near the centre of Galway City. The proposed construction is envisaged to consist of piled foundations and pavement make up with some local excavations for services and plant

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 6 No. Trial Pits to a maximum depth of 3.0m BGL
- Carry out 4 No. Slit Trenches to determine existing service details
- Carry out 2 No. Soakaways to determine a soil infiltration value to BRE digest 365
- Carry out 11 No. Cable Percussion boreholes to a maximum depth of 10.10m BGL
- Carry out 7 No. Rotary Core Boreholes to a maximum depth of 20.10m BGL
- Carry out 1 No. Insitu Plate Bearing Tests
- Carry out 4 No. TRL Dynamic Cone Penetrometer Tests
- Installation of 4 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.

The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using a 3T tracked excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Slit Trenching

The slit trenches were excavated using a 3T tracked excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The soil was slowly stripped using a spotter on the trench to alert the driver if any services were seen, to avoid damage to any underlying services. The slit trenches were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the slit trench records which are provided in Appendix 3 of this Report.

3.4. Soakaway Testing

The soakaway testing was carried out in selected trial pits at the locations shown in the exploratory hole location plan in Appendix 1. These pits were carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pits were logged prior to completing the soakaway test and were backfilled with arising’s upon completion. The soakaway test results are provided in Appendix 4 of this Report.

3.5. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.

The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular

material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.
Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60º cone. The Standard Penetration Test number referred to as the ‘N’ value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 5 of this Report.

3.6. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.
The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the “overshoot” recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 5 of this Report.

3.7. Surveying

The exploratory hole locations have been recorded using a KQ GEO Technologies KQ-M8 System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.8. Groundwater/Gas Monitoring Installations

Groundwater and or Gas Monitoring Installation were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm uPVC/HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.9. Insitu Plate Bearing Test

The plate bearing tests were carried out using a 450mm diameter plate at the locations shown on the site plan in Appendix 1. The plate was loaded in increments using a hydraulic jack and an excavator to provide a reaction and the displacement was monitored in accordance with BS1377 Part 9 using independently mounted digital strain gauges. The constrained modulus and equivalent CBR are calculated in accordance with HD29/75 and are provided on the test reports in Appendix 6 of this Report.

3.10. TRL Dynamic Cone Penetrometer

The TRL DCP tests were carried out at locations specified by the Consulting Engineer to determine a CBR design value for the design of external pavements. The testing was carried out below the Topsoil or existing pavement at the depths detailed on the test report. The test consists of dropping a 10kg weight on an anvil to drive a small diameter cone and recording the blows for a given penetration. The results of the DCP testing are included in Appendix 7 of this Report.

3.11. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.

Environmental & Chemical testing as required by the specification, including the Rilta Suite and Engineers Ireland Suites E and D was carried out by Element Materials Technology Laboratory in the UK. The Rilta suite testing includes both Solid Waste and Leachate Waste Acceptance Criteria. Chemical testing including organic matter content, sulphate content, chloride content and pH was carried out in Professional Soils Laboratory (PSL Ltd) in the UK.

Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), hydrometer and Moisture Condition Value (MCV) tests were also carried out in Professional Soils Laboratory (PSL Ltd). Specialist shear strength testing consisting of quick undrained, shear box and consolidation testing was carried out on undisturbed U100 or piston samples where recovered.

Rock strength testing including Point Load (Is_{50}) and Unconfined Compressive Strength (UCS) testing was carried out by Construction Materials Testing Laboratories (CTML) Ireland.
The results of the laboratory testing are included in Appendix 8 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to in situ and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were generally consistent across the site and generally comprised;

- Surfacing
- Made Ground
- Organic Deposits
- Soft Cohesive Deposits
- Cohesive Deposits
- Granular Deposits
- Bedrock

SURFACING: Tarmac surfacing was present typically to a depth of 0.06m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Surfacing and were generally present to depths of between 0.5m and 1.0m BGL and a maximum of 3.4m BGL in BRC04. These deposits were described generally as *grey Sand and Gravel FILL and contained occasional fragments of tarmacadam* occasionally overlying *grey slightly sandy gravelly Clay* and *brownish black gravelly Peat with occasional red brick, ceramic and rubbish fragments.*

ORGANIC DEPOSITS: Organic deposits were generally encountered beneath the Made Ground and were described typically as *brownish black slightly clayey slightly gravelly PEAT.* The secondary constituents varied across the site, with silt and clay lenses occasionally present in the peat. The strength of the deposits was typically very soft based on SPT N values.

SOFT COHESIVE DEPOSITS: Soft Cohesive deposits were encountered beneath the organic deposits and were generally described as *beige or cream clayey SILT with frequent shell fragments* occasionally onto *light grey slightly sandy slightly gravelly clayey SILT with occasional cobbles.* The secondary sand and gravel constituents varied across the site and with depth, and peat lenses were occasionally present within the deposits. The strength of the soft cohesive deposits was typically very soft to soft.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the soft cohesive deposits at some locations and were described typically as *light grey to grey slightly sandy slightly gravelly silty CLAY with occasional cobbles*. The secondary sand and gravel constituents varied across the site and with depth. The strength of the cohesive deposits typically increased with depth and was stiff or very stiff below 6.0m BGL in the majority of the exploratory holes. These deposits had some occasional cobble content, where noted on the exploratory hole logs.

GRANULAR DEPOSITS: Granular deposits were occasionally encountered at the base of the cohesive deposits and were typically described as *grey very sandy subangular to subrounded fine to coarse GRAVEL with occasional cobbles.* The secondary sand constituents varied across the site while occasional cobble content was also present where noted on the exploratory hole logs.
Based on the SPT N values the deposits are typically medium dense to dense and become dense with depth. Groundwater strikes were occasionally noted in the boreholes on encountering the granular deposits.

BEDROCK: The rotary core boreholes recovered Strong thinly to medium bedded grey fine to medium grained fossiliferous LIMESTONE, with the exception of BRC04 which recovered strong to very strong thinly to thickly banded dark green medium to coarsely crystalline METAGABBRO. Occasional calcite veins were noted during logging.
The depth to rock increases to the southeast from 11.2m BGL in BH01 in the north western corner of the site to a maximum of 15.3m BGL in BRC03 in the centre. The depth to rock decreases to 9.4m BGL in BRC06, and further decreases to between 6.6m and 6.1m BGL respectively in BRC04 and BRC05 in the southeastern portion of the site. The total core recovery is typically 100% within bedrock. The SCR and RQD are generally poorer in the upper weathered zone, however both indices show an increase with depth in each of the boreholes.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs 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. The groundwater monitoring is included in Appendix 9 of this Report.

4.3. Laboratory Testing

4.3.1. Geotechnical Laboratory Testing

Results from geotechnical laboratory testing will be included in the final report.

4.3.2. Chemical Laboratory Testing

The pH and sulphate testing carried out indicate that pH results are near neutral to alkaline, with values ranging from 7.1 to 9.6, and that the water soluble sulphate results is low when compared to the guideline values from BRE Special Digest 1:2005. The samples tested classify the soil as a Design Sulphate Level DS-1.

4.3.3. Environmental Laboratory Testing

A number of samples were analysed for a suite of parameters which allows for the assessment of the sampled material in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous*. The suite also allows for the assessment of the sampled material in terms of suitability for placement at licenced landfills (inert, stable non-reactive, hazardous etc.). The parameter list for the suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.

The suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are total organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

As part of the suite a leachate is generated from the solid sample which is analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS).

While the laboratory report provides a comparison with the waste acceptance criteria limits it does not provide a waste classification of the material sampled nor does it comment on any potentially hazardous properties of the materials tested. The possibility for contamination, not revealed by the testing undertaken should be borne in mind particularly where Made Ground deposits are present or the previous site use or location indicate a risk of environmental variation. The waste classification report is included under the cover of a separate report by Ground Investigations Ireland.

4.3.4. Rock Laboratory Testing

Results from rock testing will be included in the final report.

The results from the completed laboratory testing are included in Appendix 8 of this report.

5.0 Recommendations & Conclusions

5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Foundations

Due to the presence of soft and compressible Cohesive deposits beneath the footprint of the proposed structure and high loading anticipated, piled foundations are recommended for the proposed building. The type, size and depth of the pile foundations should be confirmed by a specialist piling contractor based on the loading from the proposed building. The floor slab is recommended be suspended and also supported on the building piles.

Negative skin friction from the very soft cohesive deposits should be considered in the pile design due to the possibility of loading from working platforms or the adjacent pavement make up.

The pH and sulphate testing completed on samples recovered from the exploratory holes indicates the pH results are near neutral and the sulphate results are low, when compared to the guideline values from BRE Special Digest 1:2005. No special precautions are required for concrete foundations to prevent sulphate attack. The samples tested were below the limits of DS1 in the BRE Special Digest 1:2005.

5.3. External Pavements

The proposed pavements are recommended to be designed in accordance with the CBR test results included in the Appendices of this Report. The low CBR test results indicate that a capping layer or a sufficient depth of crushed stone fill may be required. Plate bearing tests are recommended at the time of construction to verify the design assumptions for the proposed pavement make up and to verify adequate compaction has been achieved.

The use of a geogrid and separation membrane may improve the performance of the proposed pavement and enable a more economical pavement design to be achieved, a specialist supplier is recommended to advise of the required strength, depth and type of geotextile for the proposed design.

5.4. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

Excavations in the Made Ground, Peat or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.

Any excavations which penetrate the granular deposits will require to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages noted in the exploratory hole logs in the Appendices of this Report.

The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations. Generally, where significant excavations are required in water bearing granular deposits a cut-off wall may be more cost effective than extensive dewatering. An assessment by a specialist dewatering contractor is recommended to determine the most cost effective approach to the proposed excavation.

Excavations in the upper cohesive are expected to be excavatable with conventional excavation equipment

Any waste material to be removed off site should be disposed of to a suitably licenced landfill.

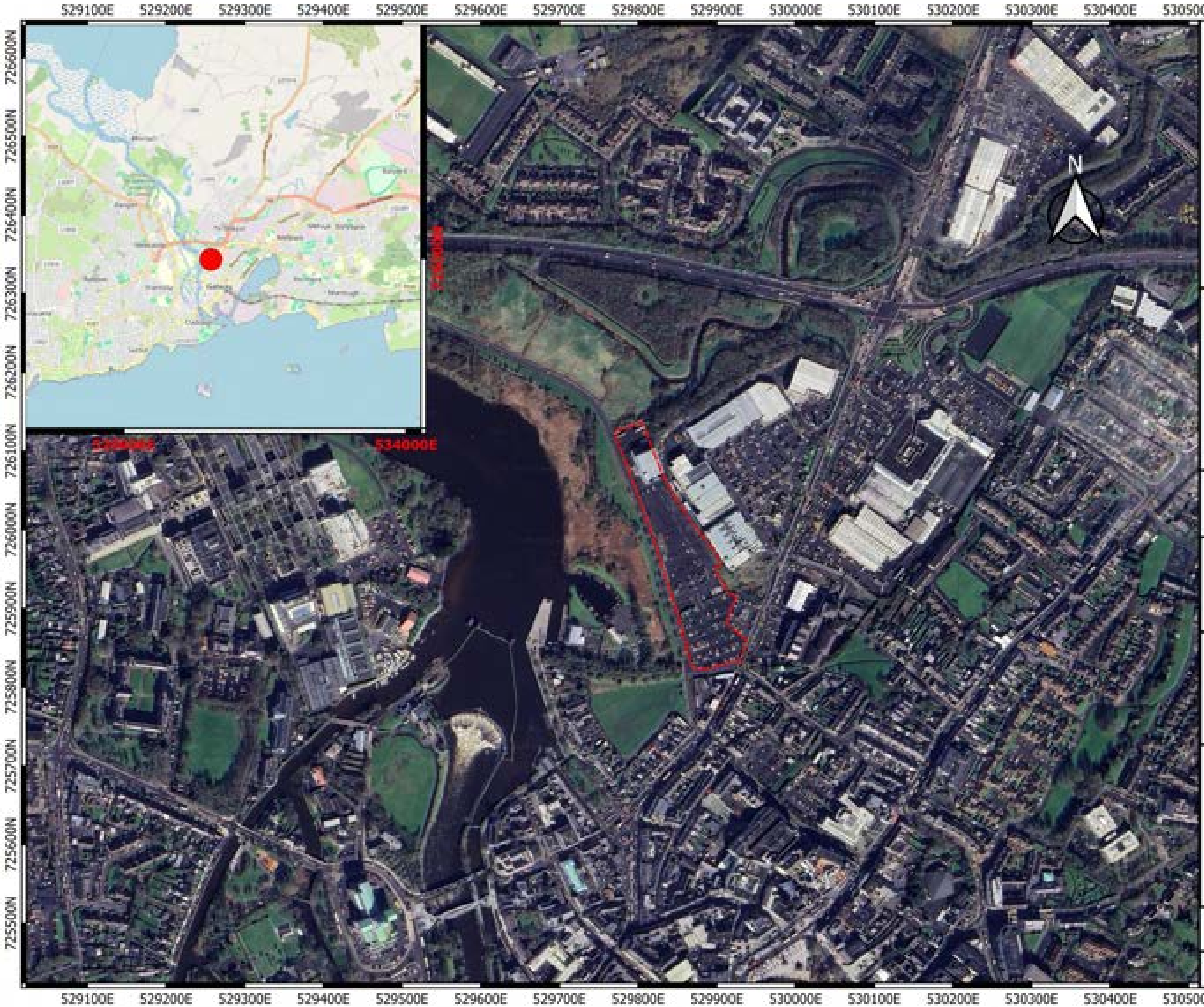
The environmental testing completed during the ground investigation is reported under the cover of a separate GII Waste Classification/Subsoil Assessment Report.

5.5. Soakaway Design

At the locations of IT01 and IT02 the water level dropped too slowly to allow calculation of ‘f’ the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan



● Site Location

▭ Indicative Site Boundary

Client:

LDA

Project Code:

12158-08-22

Project Title:

Dyke Road Galway

Drawing Title:

Site Location

GROUND INVESTIGATIONS IRELAND

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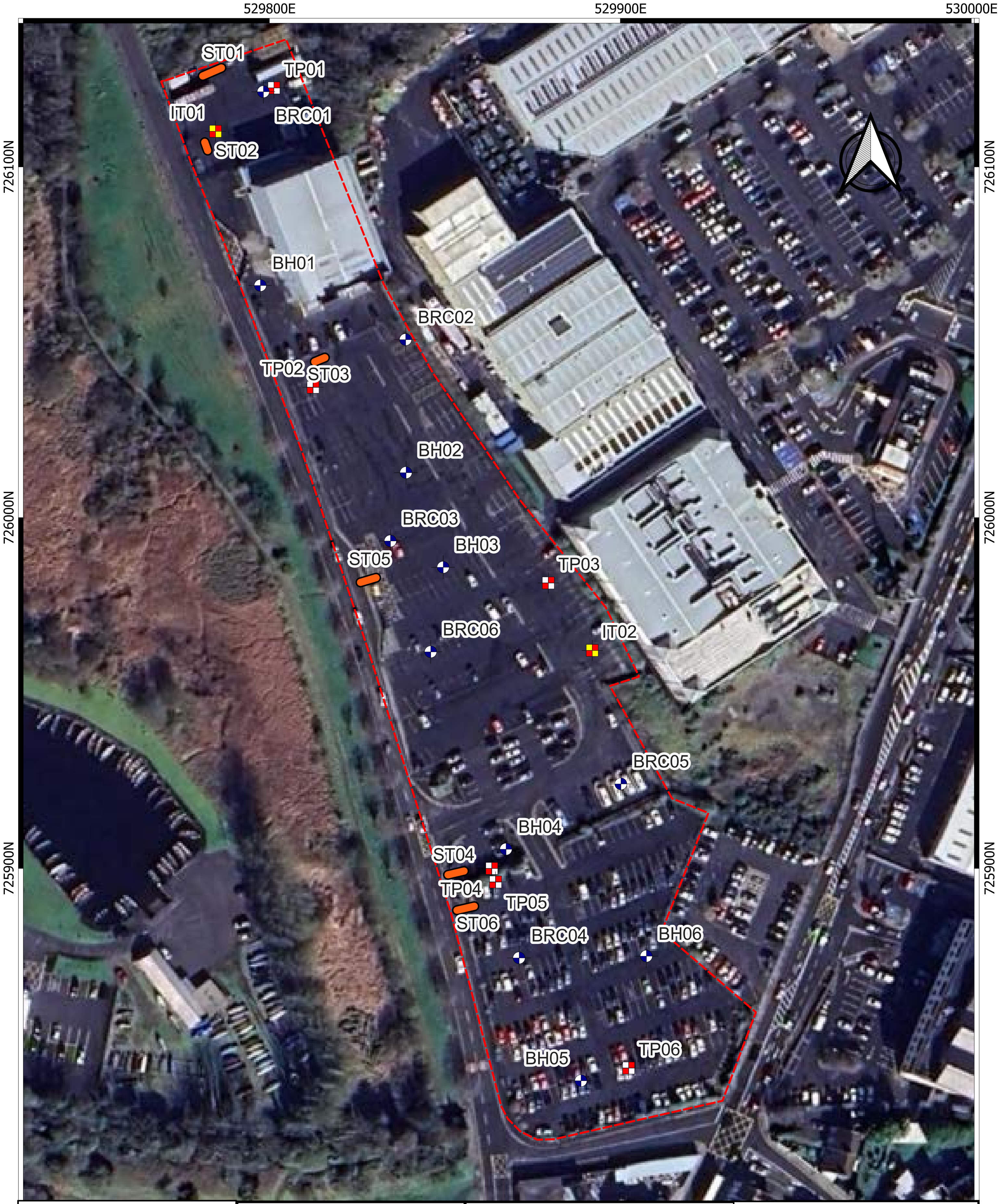
0123450 m

Drawn By:	Date:
MS	24-06-2024



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Client:

LDA

0 11 22 33 44 55 m

Project Title:
Dyke Road Galway

Drawing Title:
Investigation Locations

GII Project Reference:
13614-02-24

Drawn By:
MS

Date:
24-06-24

- 🟥 Trial Pits
- ▬ Slit Trench Locations
- ⊕ Borehole
- 🟨 Infiltration Test

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Dyke Road Galway				**Trial Pit Number** TP01
Machine : 3T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.20 x 0.87 x 2.20m	**Ground Level (mOD)** 4.27	**Client** Aecom	**Job Number** 13614-02-24
	Location 529801.3 E 726122.3 N	**Dates** 17/04/2024	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				4.20	(0.07) 0.07	TARMACADAM		
					(0.67)	MADE GROUND: Grey sandy angular to subrounded fine to coarse Gravel		
0.50	B							
				3.53	0.74	MADE GROUND: Black plastic net membrane		
				3.52	0.75	Brown fibrous PEAT		
1.00	HV 34kPa		44,38,20/Av. 34.00					
1.00	B							
					(1.45)			
				2.07	2.20	Complete at 2.20m		

Plan

Remarks

No groundwater encountered during excavation
Trial pit sidewalls stable
DCP carried out at 0.8m BGL.
Trial pit backfilled upon completion

Scale (approx)	**Logged By**	**Figure No.**
1:25	LB	13614-02-24.TP01

Ground Investigations Ireland Ltd

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Site Dyke Road Galway

Trial Pit Number TP02

Machine : 3T Tracked Excavator

Method : Trial Pit

Dimensions 2.10 x 0.88 x 2.20m

Ground Level (mOD) 5.01

Client Aecom

Job Number 13614-02-24

Location 529812.4 E 726036.9 N

Dates 17/04/2024

Engineer

Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				4.94	(0.07) 0.07	TARMACADAM	▨	
					(0.52)	MADE GROUND: Grey sandy subangular to subrounded fine to coarse Gravel with medium angular to subangular cobble content	▨	
0.50	B							
				4.42	0.59	MADE GROUND: Black plastic net membrane		
				4.41	0.60	MADE GROUND: Brown fibrous Peat with frequent wood fragments and occasional plastic glass and wire fragments	▨	
0.70	HV 14kPa		10,16,16/Av. 14.00					
1.00	B							
					(1.20)			∇1
			Slow(1) at 1.30m.					
				3.21	1.80	Very soft cream clayey SILT with frequent shell fragments	×	
					(0.40)			
2.00	HV 9kPa		10,10,8/Av. 9.33					
2.00	B							
				2.81	2.20	Complete at 2.20m		

Plan

Remarks

Groundwater encountered at 1.30m BGL. Slow
Trial pit sidewalls stable
DCP carried out at 0.7m BGL
Trail pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	LB	13614-02-24.TP02

Ground Investigations Ireland Ltd
www.gii.ie

Machine : 3T Tracked Excavator **Method :** Trial Pit	**Dimensions** 1.80 x 0.63 x 2.30m	**Ground Level (mOD)** 5.06	**Site** Dyke Road Galway **Client** Aecom	**Trial Pit Number** TP03 **Job Number** 13614-02-24
	Location 529879.9 E 725980.6 N	**Dates** 15/04/2024	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				4.96	(0.10) 0.10	TARMACADAM		
					(0.50)	MADE GROUND: Grey sandy angular to subrounded fine to coarse Gravel		
0.50	B							
				4.46	0.60	MADE GROUND: Membrane		
0.65	HV 53kPa		50,60,50/Av. 53.33	4.45	0.61	Dark brown fibrous PEAT with occasional rootlets		
					(0.49)			
1.00	B							
				3.96	1.10	Very soft cream clayey SILT with frequent shell fragments		
1.50	HV 9kPa		10,10,6/Av. 8.67					
					(1.20)			
2.00	B							
				2.76	2.30	Complete at 2.30m		

Plan

Remarks

No groundwater encountered during excavation
Trial pit sidewalls stable
Plate baering test carried out at 0.20m BGL
DCP carried out at 0.7m BGL
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	LB	13614-02-24.TP03

Ground Investigations Ireland Ltd
www.gii.ie

Site	Dyke Road Galway			**Trial Pit Number**	**TP04**
Machine : 3T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.40 x 1.00 x 1.20m	**Ground Level (mOD)** 6.24	**Client** Aecom	**Job Number** 13614-02-24	
	Location 529863.4 E 725899.1 N	**Dates** 15/04/2024	**Engineer**	**Sheet** 1/1	

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				6.17	(0.07) 0.07	TARMACADAM	▨	
						MADE GROUND: Grey slightly clayey sandy angular to subrounded fine to coarse Gravel with medium cobble and boulder content	▨	
0.50	B				(0.93)		▨	
1.00	B			5.24	1.00	MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional red brick fragments	▨	
					(0.20)		▨	
				5.04	1.20	Complete at 1.20m		

Plan

Remarks

No groundwater encountered during excavation
Trial pit sidewalls collapsing
DCP carried out at 0.9m BGL.
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	LB	13614-02-24.TP04

Ground Investigations Ireland Ltd
www.gii.ie

Site
Dyke Road Galway

Trial Pit Number
TP05

Machine : 3T Tracked Excavator
Method : Trial Pit

Dimensions
1.80 x 0.60 x 1.35m

Ground Level (mOD)
6.24

Client
Aecom

Job Number
13614-02-24

Location
529863.4 E 725899.1 N

Dates
15/04/2024

Engineer

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				6.17	(0.07) 0.07	TARMACADAM	▨	
					(0.48)	MADE GROUND: Grey slightly sandy angular to subrounded fine to coarse Gravel	▨	
0.50	B			5.69	0.55	MADE GROUND: Light brown slightly clayey slightly gravelly fine to coarse Sand with medium angular to subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse.	▨	
					(0.80)			
1.00	B							
				4.89	1.35	Complete at 1.35m		

Plan

Remarks

No groundwater encountered during excavation
Trial pit sidewalls stable
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	LB	13614-02-24.TP05

Ground Investigations Ireland Ltd www.gii.ie			**Site** Dyke Road Galway	**Trial Pit Number** **TP06**
Machine : 3T Tracked Excavator **Method :** Trial Pit	**Dimensions** 2.30 x 0.80 x 0.80m	**Ground Level (mOD)** 7.16	**Client** Aecom	**Job Number** 13614-02-24
	Location 529902.4 E 725842.8 N	**Dates** 17/04/2024	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				7.06	(0.10) 0.10	TARMACADAM	▨	
					(0.50)	MADE GROUND: Grey slightly sandy angular to subrounded fine to coarse Gravel with high angular to subangular cobble content and an old wire	▨	
0.50	B			6.56	0.60			
0.70	B				(0.20)	POSSIBLE MADE GROUND: Brown clayey slightly gravelly fine to coarse Sand	▨	
				6.36	0.80	Complete at 0.80m		

Plan

Remarks

No groundwater encountered during excavation
Trial pit sidewalls stable
Trial pit backfilled upon completion

Scale (approx)	**Logged By**	**Figure No.**
1:25	LB	13614-02-24.TP06

Dyke Road Galway – Trial Pit Photographs

TP01

TP01

TP01

TP01

Dyke Road Galway – Trial Pit Photographs

TP02

TP02

Dyke Road Galway – Trial Pit Photographs

TP02

TP02

Dyke Road Galway – Trial Pit Photographs

TP03

TP03

TP03

TP03

Dyke Road Galway – Trial Pit Photographs

TP04

TP04

TP04

TP04

Dyke Road Galway – Trial Pit Photographs

TP05

TP05

Dyke Road Galway – Trial Pit Photographs

TP05

TP05

Dyke Road Galway – Trial Pit Photographs

TP06

TP06

Dyke Road Galway – Trial Pit Photographs

TP06

TP06

APPENDIX 3 – Slit Trench Records

Dyke Road Galway – Slit Trench Photographs

ST01

ST01

Dyke Road Galway – Slit Trench Photographs

ST01

ST01

Dyke Road Galway – Slit Trench Photographs

ST02

ST02

Dyke Road Galway – Slit Trench Photographs

ST02

ST02

Dyke Road Galway – Slit Trench Photographs

ST03

ST03

Dyke Road Galway – Slit Trench Photographs

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Dyke Road Galway – Slit Trench Photographs

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Dyke Road Galway – Slit Trench Photographs

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Dyke Road Galway – Slit Trench Photographs

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ST05

Dyke Road Galway – Slit Trench Photographs

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ST05

Dyke Road Galway – Slit Trench Photographs

ST06

ST06

Dyke Road Galway – Slit Trench Photographs

ST06

ST06

Dyke Road Galway – Slit Trench Photographs

ST06

ST06

Dyke Road Galway – Slit Trench Photographs

ST06

APPENDIX 4 – Soakaway Records

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

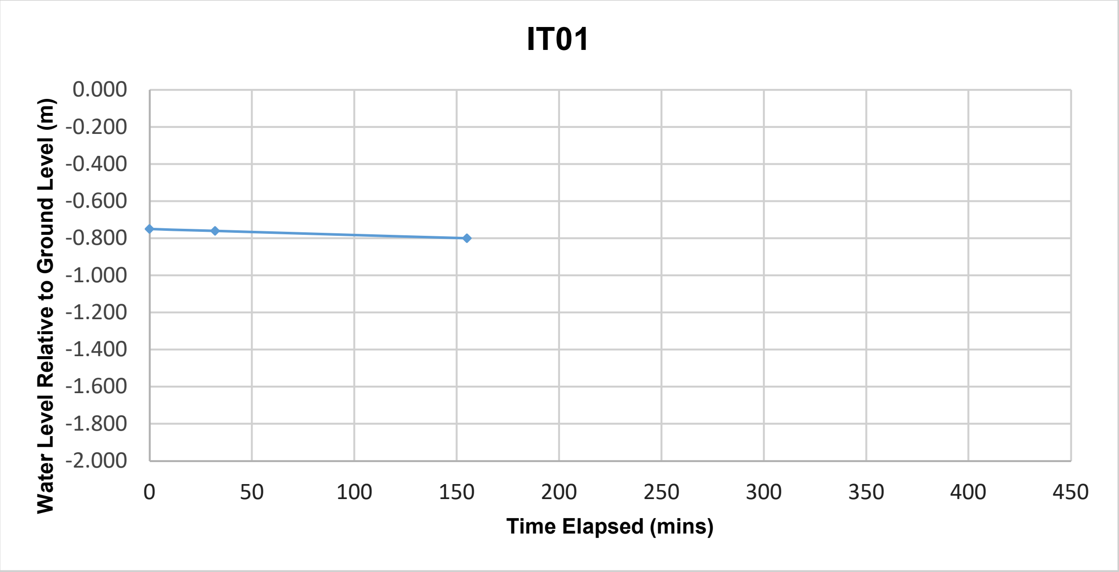
IT01

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 1.60m x 0.60m x 0.85m (L x W x D)

Date	Time	Water level (m bgl)
15/04/2024	Groundwater at 0.75m BGL	
15/04/2024	0	-0.750
15/04/2024	32	-0.760
15/04/2024	155	-0.800

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.75	**0.850**	**0.100**	**0.775**	**0.825**



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D22 YD52

Tel: 01 601 5175 / 5176
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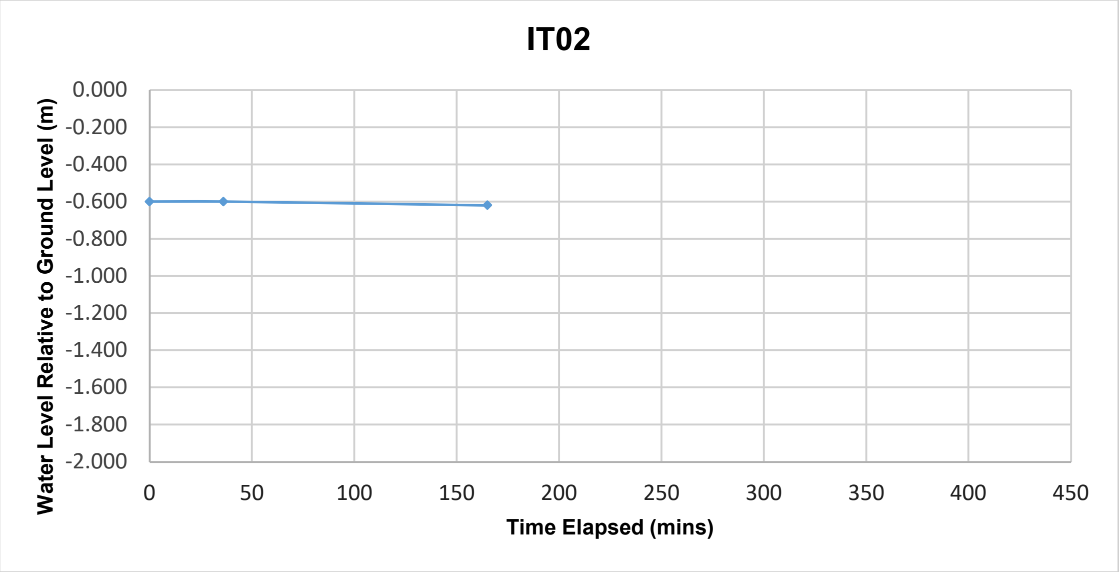
IT02

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 1.70m x 0.75m x 1.60m (L x W x D)

Date	Time	Water level (m bgl)
15/04/2024	0	-0.600
15/04/2024	36	-0.600
15/04/2024	165	-0.620

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.60	1.600	1.000	0.85	1.35



APPENDIX 5 – Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Machine : Dando 2000 & Beretta T-44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 10.50m 96mm cased to 16.30m	**Ground Level (mOD)** 4.73	**Site** Dyke Road Galway	**Borehole Number** **BH01**
	Location 529797.4 E 726065.9 N	**Dates** 26/04/2024- 22/05/2024	**Client** Aecom	**Job Number** 13614-02-24
			Engineer	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					4.67	0.06	TARMACADAM		
0.25	ES					(0.44)	MADE GROUND: Grey slightly clayey sandy angular to subrounded fine to coarse Gravel		
0.50	ES				4.23	0.50	MADE GROUND: Brownish black slightly clayey slightly sandy gravelly Peat with occasional red brick and ceramic fragments. Gravel is subangular to subrounded fine to coarse		
1.00-1.45 1.00	SPT(C) N=2 B			2,2/1,0,0,1		(1.00)			
1.50	ES				3.23	1.50	MADE GROUND: Brownish black clayey slightly sandy slightly gravelly Peat with occasional ceramic and red brick fragments and rubbish. Gravel is subangular to subround fine to coarse		
2.00-2.45 2.00	SPT(C) N=0 B			1,0/0,0,0,0		(1.00)			
2.50	B				2.23	2.50	Very soft beige clayey SILT and brown CLAY with frequent shell fragments		
3.00-3.45	UT 100					(1.00)			
3.50	B				1.23	3.50	Very soft beige clayey SILT with frequent shell fragments		
4.00-4.45	SPT(C) N=0			0,0/0,0,0,0					▼1
4.50	B					(2.20)			
5.00-5.45	UT 0								
5.70	B				-0.97	5.70	Very soft dark grey silty CLAY with occasional shell fragments		
6.00-6.45	SPT(C) N=2			1,1/1,0,1,0					
6.70	B								
7.50-7.95	SPT(C) N=1			0,1/0,0,0,1		(3.80)			
7.70	B								
8.70	B								
9.00-9.45	SPT(C) N=2			1,0/0,1,1,0					
9.50	B			Water strike(1) at 9.50m, rose to 4.00m in 20 mins.	-4.77	9.50	Grey slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse		∇1
10.00-10.45	SPT(C) N=1			0,0/0,1,0,0					

Remarks
Cable percussion drilling completed at 10.50m BGL, Rotary drilling completed at 16.30m BGL.
Groundwater encountered at 9.50m BGL
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	AM

Figure No.
13614-02-24.BH01

Ground Investigations Ireland Ltd
www.gii.ie

Site Dyke Road Galway

Borehole Number BH01

Machine : Dando 2000 & Beretta T-44

Method : Cable Percussion with Rotary follow on

Casing Diameter 200mm cased to 10.50m
96mm cased to 16.30m

Ground Level (mOD) 4.73

Client Aecom

Job Number 13614-02-24

Location 529797.4 E 726065.9 N

Dates 26/04/2024-22/05/2024

Engineer

Sheet 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description
							(1.00)	
10.50	74					-5.77	10.50	Very dense grey subangular to subrounded fine to coarse GRAVEL with low cobble content
11.00-11.16 11.00					1,10/50 SPT(C) 50/5		(0.70)	
11.20	100	87	61	6		-6.47	11.20	Strong thinly to medium bedded grey finely to medium grained fossiliferous LIMESTONE. Fresh (11.20 - 16.30m BGL) 1 fracture set. 10-30 degrees, closely to medium spaced, undulating, rough with occasional Clay staining
12.50	100	88	72					
							(5.10)	
14.00	100	87	69					
15.50	100	100	84					
16.30						-11.57	16.30	Complete at 16.30m

Remarks

Scale (approx) 1:50

Logged By AM

Figure No. 13614-02-24.BH01

Ground Investigations Ireland Ltd
www.gii.ie

Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 9.70m	**Ground Level (mOD)** 5.08	**Client** Aecom	**Job Number** 13614-02-24
	Location 529838.9 E 726012.6 N	**Dates** 10/04/2024- 11/04/2024	**Engineer**	**Sheet** 1/1

Site Dyke Road Galway

Borehole Number BH02

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					5.03	0.05	TARMACADAM		
						(0.45)	Light grey slightly sandy subangular to subrounded fine to coarse gravel FILL		
					4.58	0.50	Brownish black mottled light brown slightly clayey slightly sandy slightly gravelly PEAT. Gravel is subangular to subrounded fine to coarse		
0.50	ES								
						(1.00)			
1.00 1.00 1.00-1.45	B ES UT 60%			2 blows					
					3.58	1.50	Very soft greyish light brown slightly sandy clayey SILT		
1.50	B								
2.00-2.45	SPT(C) N=1			0,0/0,0,1,0					
						(1.50)			
2.50	B								
									▼1
					2.08	3.00	Grey slightly sandy slightly gravelly clayey SILT. Gravel is subangular to subrounded fine to coarse		
3.00 3.00-3.45	B UT 100%			3 blows					
						(0.60)			
					1.48	3.60	Soft to firm grey slightly sandy slightly gravelly clayey SILT with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
3.60	B								
4.00-4.45	SPT(C) N=7			0,1/1,0,2,4					
4.60	B								
						(2.40)			
5.00-5.45	SPT(C) N=12			2,2/1,3,2,6					
5.60	B								
					-0.92	6.00	Stiff to very stiff grey slightly sandy slightly gravelly CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
6.00-6.45 6.00	SPT(C) N=27 B			9,6/5,6,8,8					
7.00	B								
7.50-7.78	SPT(C) 50/125			9,15/37,13					
						(3.40)			
8.00	B								
9.00-9.45 9.00	SPT(C) N=32 B			14,15/13,3,2,14					
					-4.32	9.40	Grey slightly clayey very sandy subangular to subrounded fine to coarse GRAVEL with occasional cobbles		▽1
9.40	B								
				Water strike(1) at 9.50m, rose to 2.80m in 20 mins.		(0.30)			
					-4.62	9.70	Complete at 9.70m		

Remarks
Cable percussion drilling refused at 9.70m BGL
Groundwater encountered at 9.50m BGL
Borehole backfilled upon completion
Chiselling from 7.50m to 8.00m for 0.5 hours.

Scale (approx) 1:50	**Logged By** AM
Figure No. 13614-02-24.BH02	

Ground Investigations Ireland Ltd
www.gii.ie

Site	Dyke Road Galway			**Borehole Number**	**BH03**
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 9.10m	**Ground Level (mOD)** 5.21	**Client** Aecom	**Job Number** 13614-02-24	
	Location 529849.5 E 725985.6 N	**Dates** 12/04/2024- 15/04/2024	**Engineer**	**Sheet** 1/1	

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					5.15	0.06	TARMACADAM		
						(0.94)	Grey sandy angular to subrounded fine to coarse gravel FILL		
1.00 1.00-1.45	B UT 100			2 blows	4.21	1.00	Greyish brown and beige slightly sandy slightly gravelly clayey SILT with pockets of brownish black Peat. Gravel is subangular to subrounded fine to coarse		
						(1.00)			
2.00-2.45 2.00	SPT(C) N=1 B			0,0/0,0,0,1	3.21	2.00	Very soft greyish beige clayey SILT with occasional shell fragments		
						(1.00)			
3.00 3.00-3.45	B UT 100			3 blows	2.21	3.00 (0.40)	Brownish grey peaty silty CLAY with frequent organics		
3.40	B				1.81	3.40	Very soft to soft light grey slightly sandy slightly gravelly clayey SILT with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
4.00-4.45	SPT(C) N=4			0,1/0,0,1,3		(1.60)			
4.40	B								
5.00-5.45	SPT(C) N=12			2,5/4,4,3,1	0.21	5.00	Firm light grey slightly sandy slightly gravelly clayey SILT with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
5.40	B					(1.00)			
6.00-6.45 6.00	SPT(C) N=32 B			3,5/9,7,8,8	-0.79	6.00	Stiff to very stiff light grey slightly sandy slightly gravelly CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
7.00	B					(2.00)			
7.50-7.95	SPT(C) N=41			2,8/10,8,9,14					
8.00	B				-2.79	8.00	Very stiff light grey sandy gravelly CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
						(1.10)			
9.00-9.08	SPT(C) 25*/75 50/0			25/50	-3.89	9.10	Complete at 9.10m		

Remarks
Cable percussion drilling refused at 9.10m BGL
No groundwater encountered during drilling
Borehole backfilled upon completion
Chiselling from 9.10m to 9.10m for 1 hour.

Scale (approx) 1:50	**Logged By** AM
Figure No. 13614-02-24.BH03	

Ground Investigations Ireland Ltd
www.gii.ie

Site
Dyke Road Galway

Borehole Number
BH04

Machine : Dando 2000
Method : Cable Percussion

Casing Diameter
200mm cased to 2.80m

Ground Level (mOD)
6.09

Client
Aecom

Job Number
13614-02-24

Location
529867.4 E 725905.2 N

Dates
19/04/2024

Engineer

Sheet
1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					6.03	0.06	TARMACADAM		
						(0.24)			
0.30	B				5.79	0.30	Grey Sand and Gravel FILL. Gravel is subangular to subrounded fine to coarse		
0.50	ES					(0.50)	Brownish black slightly gravelly PEAT. Gravel is subangular to subrounded fine to coarse		
0.80	B				5.29	0.80			
1.00-1.45	SPT(C) N=38			14,11/18,8,5,7			Very stiff greenish grey mottled brown sandy gravelly CLAY with occasional cobbles. Possible residual soil. Gravel is subangular to subrounded fine to coarse		
						(1.00)			
1.50	ES								
1.80	B				4.29	1.80	Dense greenish grey sandy angular to subrounded fine to coarse GRAVEL. Possible weathered rock		
2.30-2.68	SPT(C) 50/230			5,7/9,10,18,13		(1.00)			
					3.29	2.80	Complete at 2.80m		

Remarks
Cable percussion drilling refused at 2.80m BGL
No groundwater encountered during drillling
Borehole backfilled upon completion
Chiselling from 0.80m to 1.00m for 0.25 hours. Chiselling from 1.00m to 2.30m for 1 hour. Chiselling from 2.80m to 2.80m for 1 hour.

Scale (approx)
1:50

Logged By
AM

Figure No.
13614-02-24.BH04

Ground Investigations Ireland Ltd
www.gii.ie

Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 4.50m	**Ground Level (mOD)** 7.05	**Site** Dyke Road Galway **Client** Aecom	**Borehole Number** BH05 **Job Number** 13614-02-24
	Location 529888.8 E 725839.2 N	**Dates** 25/04/2024	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					6.99	0.06	TARMACADAM		
0.25	ES				6.65	(0.34) 0.40	Grey Sand and Gravel FILL. Gravel is subangular to subrounded fine to coarse		
0.50	ES						MADE GROUND: Greyish light brown slightly sandy slightly gravelly CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
1.00-1.30 1.00	SPT(C) 50/145 B			14,11/24,26		(1.60)			
1.50	ES								
2.00-2.45 2.00	SPT(C) N=7 B			10,8/3,2,1,1	5.05	2.00 (0.40)	Soft greyish light brown slightly sandy slightly gravelly CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
2.40	B				4.65	2.40 (0.60)	Soft brownish black slightly clayey slightly gravelly PEAT. Gravel is subangular to subrounded fine to coarse		
3.00-3.45	SPT(C) N=43			7,10/6,5,15,17	4.05	3.00 (0.50)	Brownish black slightly clayey slightly gravelly PEAT. Gravel is subangular to subrounded fine to coarse		
3.50	B			Water strike(1) at 3.50m.	3.55	3.50	Dense bluish grey very sandy angular to subrounded fine to coarse GRAVEL		∇1
4.00-4.24 4.00	SPT(C) 50/85 B			17,8/31,19		(1.00)			
					2.55	4.50	Terminated on possible bedrock or large boulder		
							Complete at 4.50m		

Remarks
Cable percussion drilling refused at 4.50m BGL
Groundwater encountered at 3.50m BGL
Borehole backfilled upon completion
Chiselling from 1.00m to 2.00m for 1 hour. Chiselling from 4.50m to 4.50m for 1 hour.

Scale (approx) 1:50	**Logged By** AM
Figure No. 13614-02-24.BH05	

Ground Investigations Ireland Ltd

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Site Dyke Road Galway				**Borehole Number** BH06
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 5.70m	**Ground Level (mOD)** 6.89	**Client** Aecom	**Job Number** 13614-02-24
	Location 529907.4 E 725874.7 N	**Dates** 24/04/2024	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					6.79	0.10	TARMACADAM		
						(0.50)	Grey sandy angular to subrounded fine to coarse Gravel FILL		
					6.29	0.60	MADE GROUND: Grey slightly sandy gravelly Clay with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
1.00-1.09	SPT(C) 25*/75 50/15			25/50					
1.00	B					(1.20)			
1.80	B				5.09	1.80	MADE GROUND: Greyish brown slightly sandy slightly gravelly Clay with occasional cobbles and occasional red brick and charcoal fragments. Gravel is subangular to subrounded fine to coarse		
2.00-2.45	SPT(C) N=9			17,8/2,3,2,2		(0.70)			
2.50	B				4.39	2.50 (0.20)	MADE GROUND: Brownish black slightly gravelly Peat with rare red brick fragments. Gravel is subangular to subrounded fine to coarse		
2.70	B				4.19	2.70	Brownish black PEAT		
3.00-3.45	UT 100			1 blows		(0.70)			▼1
3.40	B				3.49	3.40	Stiff to very stiff light grey slightly sandy slightly gravelly silty CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		▽1
				Water strike(1) at 3.50m, rose to 3.00m in 20 mins.					
4.00-4.45	SPT(C) N=32			4,6/8,7,8,9		(1.10)			
4.50	B				2.39	4.50	Very stiff light grey sandy slightly gravelly silty CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
5.00-5.25	SPT(C) 50/95			16,9/33,17		(1.20)			
					1.19	5.70	Complete at 5.70m		
5.70-5.70	SPT(C) 25*/0 50/0			25/50					

Remarks
Cable percussion drilling refused at 5.70m BGL
Groundwater encountered at 3.50m BGL
Borehole backfilled upon completion
Chiselling from 1.00m to 1.80m for 1 hour. Chiselling from 5.00m to 5.70m for 0.5 hours. Chiselling from 5.70m to 5.70m for 1 hour.

Scale (approx) 1:50

Logged By AM

Figure No. 13614-02-24.BH06

Ground Investigations Ireland Ltd
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Machine : Dando 2000 & Beretta T-44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 10.50m 96mm cased to 16.50m	**Ground Level (mOD)** 4.15	**Site** Dyke Road Galway	**Borehole Number** **BRC01**
	Location 529798.3 E 726121.2 N	**Dates** 25/04/2024- 21/05/2024	**Client** Aecom	**Job Number** 13614-02-24
			Engineer	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					4.09	0.06	TARMACADAM			
0.25	ES									
						(0.64)	Grey slightly clayey Sand and Gravel FILL with occasional tarmacadam fragments. Gravel is subangular to subrounded fine to coarse			
0.50	ES									
					3.45	0.70	Very soft brownish black slightly clayey slightly gravelly PEAT. Gravel is subangular to subrounded fine to coarse			
1.00	B									
1.00-1.45	UT 60			6 blows						
1.50	ES					(1.80)				
2.00-2.45	SPT(C) N=0			1,0/0,0,0,0						
2.00	B									
2.50	B				1.65	2.50	Beige clayey SILT and brownish black slightly clayey PEAT with frequent shell fragments			
						(1.00)				
3.00-3.45	UT 0			2 blows						
3.50	B				0.65	3.50	Very soft beige clayey SILT with occasional shell fragments			
4.00-4.45	SPT(C) N=1			0,0/0,1,0,0						
						(2.00)				
4.50	B									
5.30-5.75	UT 100			2 blows						
5.50	B				-1.35	5.50	Soft brownish dark grey silty CLAY and beige clayey SILT with occasional shell fragments and occasional pockets of Peat			
6.00-6.45	SPT(C) N=7			2,1/2,1,2,2						
						(2.00)				
6.50	B									
7.50	B				-3.35	7.50	Very soft greyish brown silty CLAY			
7.50-7.95	UT 100			2 blows						
									▼1	
						(1.50)				
8.50	B									
									▽1	
9.00	B			Water strike(1) at 9.00m, rose to 8.00m in 20 mins.	-4.85	9.00	Very soft to soft light grey slightly sandy slightly gravelly silty CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse			
9.00-9.45	SPT(C) N=0			1,0/0,0,0,0						
						(1.50)				
10.00-10.45	SPT(C) N=4			1,0/0,1,2,1						

Remarks
Cable percussion drilling completed at 10.50m BGL, Rotary drilling completed at 16.50m BGL
Groundwater encountered at 9.00m BGL
50mm standpipe installled to 10.00m BGL. Slotted standpipe installed from 10.00 - 1.00m BGL. Solid standpipe installed from 1.00m BGL - GL with gas tap and flush cover

Scale (approx) 1:50	**Logged By** AM
Figure No. 13614-02-24.BRC01	

Site	Dyke Road Galway
Borehole Number	BRC01
Machine :	Dando 2000 & Beretta T-44
Method :	Cable Percussion with Rotary follow on
Casing Diameter	200mm cased to 10.50m 96mm cased to 16.50m
Ground Level (mOD)	4.15
Client	Aecom
Job Number	13614-02-24
Location	529798.3 E 726121.2 N
Dates	25/04/2024- 21/05/2024
Engineer	
Sheet	2/2

Depth (m)	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Field Records
10.50	64						
11.00-11.45							0,0/0,1,4,3 SPT(C) N=8
11.00	80	50	45				
11.50				9			
12.50-12.60							C
12.50	100	97	77				
13.00				7			
14.00	100	97	77				
14.65-14.88							C
15.50	100	90	70				
16.05-16.15							C
16.50							

Level (mOD)	Depth (m) (Thickness)	Description
-6.35	10.50 (0.50)	Poor recovery. Recovery consists of grey peaty clayey SILT onto grey clayey silty subangular to subrounded fine to coarse GRAVEL
-6.85	11.00 (0.50)	Poor recovery. Recovery consists of slightly clayey slightly sandy subangular to subrounded fine to coarse GRAVEL.
-7.35	11.50 (1.50)	Strong thinly to medium bedded grey finely to medium grained fossiliferous LIMESTONE. Slightly weathered (11.50 - 13.00m BGL) 2 fracture sets. FS1: 10-30 degrees, closely to medium spaced, undulating, rough with occasional Clay staining. FS2: 70-80 degrees, widely spaced, undulating, rough with occasional Clay staining
-8.85	13.00 (3.50)	Strong thinly to medium bedded grey finely to medium grained fossiliferous LIMESTONE. Fresh (13.00 - 16.50m BGL) 3 fracture sets. FS1: 0-20 degrees, closely to medium spaced, undulating, rough with occasional Clay staining. FS2: 30-40 degrees, medium to widely spaced, undulating, rough. FS3: 70-80 degrees, undulating, rough with occasional Clay staining
-12.35	16.50	Complete at 16.50m

Remarks

Scale (approx)	1:50
Logged By	AM
Figure No.	13614-02-24.BRC01

Ground Investigations Ireland Ltd www.gii.ie	**Site** Dyke Road Galway	**Borehole Number** **BRC02**

Machine	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number**
Machine : Dando 2000 & Beretta T-44 **Method :** Cable Percussion with Rotary follow on	200mm cased to 10.10m 146mm cased to 12.40m 96mm cased to 18.60m	5.08	Aecom	13614-02-24
	Location 529838.8 E 726050.5 N	**Dates** 15/04/2024-15/05/2024	**Engineer**	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					5.02	0.06	TARMACADAM			
0.25	ES						Grey Sand and Gravel FILL with occasional tarmacadam fragments. Gravel is subangular to subrounded fine to coarse			
0.50	ES					(0.94)				
1.00	B				4.08	1.00	Very soft brownish black slightly gravelly PEAT with occasional pockets of beige clayey SILT. Gravel is subangular to subrounded fine to coarse			
1.50	ES									
1.60-2.05	UT 60			4 blows		(1.50)				
2.00-2.45	SPT N=0			0,0/0,0,0,0						
2.00	B									
2.50	B				2.58	2.50	Very soft beige clayey SILT with frequent shell fragments			
									▼1	
3.00-3.45	UT 100			3 blows						
3.50	B					(2.20)				
4.00-4.45	SPT N=0			1,0/0,0,0,0						
					0.38	4.70	Brownish dark grey peaty silty CLAY			
4.70	B									
5.00-5.45	UT 100			3 blows						
						(1.30)				
5.70	B									
6.00	B			Water strike(1) at 6.00m, rose to 3.00m in 20 mins.	-0.92	6.00	Very stiff light grey slightly sandy very gravelly silty CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse.		∇1	
6.00-6.45	SPT N=31			2,1/1,10,5,15						
7.00	B									
7.50-7.79	SPT(C) 50/135			21,4/32,18						
8.00	B					(4.10)				
9.00-9.31	SPT(C) 50/160			10,13/20,24,6						
9.00	B									
9.70-9.95	SPT(C) 50/95			25/31,19						

Remarks

Cable percussion drilling completed at 10.10m BGL, Rotary drilling completed at 18.60m BGL
Groundwater encountered at 6.00m BGL
50mm standpipe installed to 6.00m BGL. Slotted standpipe installed from 6.00 - 0.50m BGL. Solid standpipe installed from 0.50m BGL - GL with flush cover
Chiselling from 7.50m to 8.00m for 0.5 hours. Chiselling from 8.30m to 8.70m for 0.5 hours. Chiselling from 9.50m to 9.70m for 0.5 hours.

Scale (approx)	Logged By
1:50	AM

Figure No.
13614-02-24.BRC02

Ground Investigations Ireland Ltd
www.gii.ie

Site	Dyke Road Galway
Borehole Number	BRC02
Machine :	Dando 2000 & Beretta T-44
Method :	Cable Percussion with Rotary follow on
Casing Diameter	200mm cased to 10.10m 146mm cased to 12.40m 96mm cased to 18.60m
Ground Level (mOD)	5.08
Client	Aecom
Job Number	13614-02-24
Location	529838.8 E 726050.5 N
Dates	15/04/2024- 15/05/2024
Engineer	
Sheet	2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description
10.10	11					-5.02	10.10 (0.90)	Poor recovery. Recovery consists of grey slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse.
11.00	29					-5.92	11.00 (1.40)	Poor recovery. Recovery consists of grey slightly sandy slightly gravelly silty CLAY with medium cobble content. Gravel is subangular to subrounded fine to coarse
12.40	25					-7.32	12.40 (1.10)	Grey subangular to subrounded fine to coarse GRAVEL
13.50	100	100	22	6		-8.42	13.50 (2.70)	Strong thinly to medium bedded grey fine to medium grained fossiliferous LIMESTONE with occasional calcite veins. Fresh (13.50 - 16.20m BGL) 3 fracture sets. FS1: 0-20 degrees, closely to medium spaced, undulating, rough with occasional Clay staining. FS2: 40-60 degrees, widely spaced, undulating, rough with occasional Clay staining. FS3: 80-90 degrees, undulating, rough with occasional Clay staining
14.00	100	91	50					
15.37-15.50					C			
15.50								
16.20	100	97	86	3		-11.12	16.20 (2.40)	Strong thinly to medium bedded grey fine to medium grained fossiliferous LIMESTONE with occasional calcite veins. Fresh (16.20 - 18.60m BGL) 1 fracture set. 0-20 degrees, medium to widely spaced, undulating, rough with occasional Clay staining
17.00	100	100	97					
18.20-18.35					C			
18.37-18.60					C			
18.60						-13.52	18.60	Complete at 18.60m

Remarks

Scale (approx)	1:50
Logged By	AM
Figure No.	13614-02-24.BRC02

Ground Investigations Ireland Ltd
www.gii.ie

Machine : Dando 2000 & Beretta T-44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 10.30m 96mm cased to 20.10m	**Ground Level (mOD)** 5.37	**Site** Dyke Road Galway **Client** Aecom	**Borehole Number** BRC03 **Job Number** 13614-02-24
	Location 529834.4 E 725993.1 N	**Dates** 17/04/2024- 16/05/2024	**Engineer**	**Sheet** 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					5.31	0.06	TARMACADAM		
0.25	ES						Grey very sandy subangular to subrounded fine to coarse Gravel FILL		
0.50	ES								
						(1.94)			
1.50	ES								
2.00-2.45 2.00	SPT(C) N=0 B			2,0/0,0,0,0	3.37	2.00	Very soft brownish grey slightly sandy slightly gravelly silty CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
						(1.00)			
3.00 3.00-3.45	B U4 100			2 blows	2.37	3.00	Very soft light grey slightly sandy slightly gravelly clayey SILT with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
						(2.00)			
4.00-4.45 4.00	SPT(C) N=3 B			1,1/2,1,0,0					
5.00-5.45 5.00	SPT(C) N=6 B			1,0/0,2,2,2	0.37	5.00	Soft to firm light grey slightly sandy slightly gravelly silty CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
						(1.00)			
6.00-6.45 6.00	SPT(C) N=16 B			1,1/2,4,5,5	-0.63	6.00	Firm to stiff light grey slightly sandy slightly gravelly silty CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
						(1.50)			
7.50-7.95 7.50	SPT(C) N=49 B			6,8/9,8,9,23	-2.13	7.50	Very stiff grey slightly sandy slightly gravelly CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse		
8.50	B								
						(2.80)			
9.00-9.23	SPT(C) 50/80			15,10/46,4					
9.50	B								
10.00-10.22	SPT(C) 50/70			23,2/50					

Remarks
Cable percussion drilling refused at 10.30m BGL, Rotary drilling completed at 20.10m BGL
No groundwater encountered during drilling
Borehole backfilled upon completion
Chiselling from 8.00m to 8.30m for 0.25 hours. Chiselling from 9.00m to 9.50m for 0.5 hours. Chiselling from 9.50m to 10.00m for 0.5 hours.

Scale (approx)	Logged By
1:50	AM

Figure No.
13614-02-24.BRC03

Ground Investigations Ireland Ltd www.gii.ie			**Site** Dyke Road Galway	**Borehole Number** BRC03
Machine : Dando 2000 & Beretta T-44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 10.30m 96mm cased to 20.10m	**Ground Level (mOD)** 5.37	**Client** Aecom	**Job Number** 13614-02-24
	Location 529834.4 E 725993.1 N	**Dates** 17/04/2024- 16/05/2024	**Engineer**	**Sheet** 2/3

Depth (m)	Sample / Tests		Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	TCR	SCR	RQD	FI						
10.30	100					-4.93	10.30	Very stiff to hard brownish grey slightly sandy slightly gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse		
11.00-11.08 11.00	100				25/50 SPT(C) 25*/75 50/0					
12.50-12.58 12.50	100				25/50 SPT(C) 25*/75 50/0		(5.00)			
14.00-14.08 14.00	100	12	7		25/50 SPT(C) 25*/75 50/0					
15.30				8		-9.93	15.30	Strong thinly to medium bedded grey finely to medium grained fossiliferous LIMESTONE with occasional calcite veins. Fresh (15.30 - 17.50m BGL) 1 fracture set. 0-30 degrees, closely spaced, undulating, rough with occasional Clay staining		
15.50	100	90	70							
16.40-16.50					C		(2.20)			
17.17-17.45 17.00	100	97	71		C					
17.50				7		-12.13	17.50	Strong thinly to medium bedded grey finely to medium grained fossiliferous LIMESTONE with occasional calcite veins. Fresh (17.50 - 20.10m BGL) 2 fracture sets. FS1: 0-30 degrees, closely to medium spaced, undulating, rough with occasional Clay staining. FS2: 60-70 degrees, widely spaced, undulating, rough with occasional Clay staining		
18.50	100	100	84				(2.60)			
19.95-20.05					C					

Remarks	**Scale (approx)** 1:50	**Logged By** AM
	Figure No. 13614-02-24.BRC03	

Ground Investigations Ireland Ltd www.gii.ie	Site Dyke Road Galway	Borehole Number **BRC03**

Machine : Dando 2000 & Beretta T-44 Flush : Water Core Dia : 63.5 mm Method : Cable Percussion with Rotary follow on	Casing Diameter 200mm cased to 10.30m 96mm cased to 20.10m	Ground Level (mOD) 5.37	Client Aecom	Job Number 13614-02-24
	Location 529834.4 E 725993.1 N	Dates 17/04/2024- 16/05/2024	Engineer	Sheet 3/3

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.10						-14.73	20.10	Complete at 20.10m		

Remarks

Scale (approx)	Logged By
1:50	AM

Figure No.
13614-02-24.BRC03

Ground Investigations Ireland Ltd
www.gii.ie

Site Dyke Road Galway				**Borehole Number** **BRC04**
Machine : Dando 2000 and Beretta T-44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 6.50m 96mm cased to 12.00m	**Ground Level (mOD)** 6.94	**Client** Aecom	**Job Number** 13614-02-24
	Location 529871.1 E 725874.2 N	**Dates** 22/04/2024- 16/05/2024	**Engineer**	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Water
					6.88	0.06	TARMACADAM	
0.25	ES						MADE GROUND: Grey Sand and Gravel. Gravel is angular to subangular fine to coarse	
0.50	ES					(0.94)		
					5.94	1.00	MADE GROUND: Brownish grey sandy slightly gravelly Clay with occasional glass wire and rubbish fragments and occasional cobbles. Gravel is subangular to subrounded fine to coarse	
1.00-1.45	SPT(C) N=15			5,4/6,4,2,3				
1.00	B							
1.50	ES							
						(1.60)		
2.00-2.45	SPT(C) N=11			3,2/2,3,3,3				
2.00	B							
					4.34	2.60	MADE GROUND: Brownish black slightly gravelly Peat. Gravel is subangular to subrounded fine to coarse	
2.60	B					(0.20)		
2.80	B				4.14	2.80		
3.00-3.45	UT 100			14 blows		(0.60)	MADE GROUND: Beige slightly gravelly clayey SILT with pockets of brownish black Peat and wire fragments. Gravel is subangular to subrounded fine to coarse	
3.40	B				3.54	3.40	Light grey slightly sandy gravelly silty CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse.	▼1
						(0.60)		
4.00	B			Water strike(1) at 4.00m, rose to 3.50m in 20 mins.	2.94	4.00	Medium dense to dense greenish grey very sandy subangular to subrounded fine to coarse GRAVEL with occasional cobbles	∇1
4.00-4.45	SPT(C) N=17			19,6/5,4,4,4				
5.00-5.38	SPT(C) 50/226			8,12/14,14,21,1				
5.00	B					(2.50)		
6.00-6.30	SPT(C) 50/151			10,15/19,29,2				
	TCR / SCR	RQD	FI					
6.40	100							
6.50					0.44	6.50	Dark green angular to subangular fine to coarse GRAVEL. Possible weathered bedrock	
6.60					0.34	6.60	Strong to very strong thinly to thickly banded dark green medium to coarsely crystalline METAGABBRO with occasional calcite veins. Fresh (6.60 - 12.00m BGL) 2 fracture sets. FS1: 10-30 degrees, closely to medium spaced, planar to undulating, rough to striated. FS2: 30-40 degrees, widely spaced, planar to undulating, rough	
	100 / 93	87						
8.00								
8.40-8.57				C				
	100 / 93	89						
9.50-9.60			5	C		(5.40)		
9.50								

Remarks
Cable percussion drilling refused at 6.50m BGL on bedrock, Rotary drilling completed at 12.00m BGL
Groundwater encountered at 4.00m BGL
50mm standpipe installed to 6.00m BGL. Slotted standpipe installed from 6.00 - 0.50m BGL. Solid standpipe installed from 0.5m BGL - GL with flush cover
Chiselling from 4.00m to 4.50m for 0.5 hours. Chiselling from 6.50m to 6.50m for 1 hour.

Scale (approx)	Logged By
1:50	AM

Figure No.
13614-02-24.BRC04

Ground Investigations Ireland Ltd www.gii.ie	Site Dyke Road Galway	Borehole Number **BRC04**

Machine : Dando 2000 and Beretta T-44 **Flush :** Water **Core Dia :** 63.5 mm **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 6.50m 96mm cased to 12.00m	**Ground Level (mOD)** 6.94	**Client** Aecom	**Job Number** 13614-02-24
	Location 529871.1 E 725874.2 N	**Dates** 22/04/2024- 16/05/2024	**Engineer**	**Sheet** 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.11-10.30	100	93	75		C						
11.00	100	100	83								
12.00						-5.06	12.00	Complete at 12.00m			

Remarks

Scale (approx)	Logged By
1:50	AM

Figure No.
13614-02-24.BRC04

Ground Investigations Ireland Ltd www.gii.ie	**Site** Dyke Road Galway	**Borehole Number** **BRC05**

Machine : Dando 2000 & Beretta T-44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 6.10m 96mm cased to 11.00m	**Ground Level (mOD)** 5.53	**Client** Aecom	**Job Number** 13614-02-24
	Location 529900.1 E 725923.8 N	**Dates** 18/04/2024- 20/05/2024	**Engineer**	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records
0.50	ES			
0.80	B			
1.00-1.45	UT 80			3 blows
1.50	B			
1.50	ES			
2.00-2.45	SPT N=0			0,0/0,0,0,0
2.40	B			
2.60	B			
3.00-3.45	UT 0			Water strike(1) at 3.00m, rose to 2.90m in 20 mins. 8 blows
3.50	B			
4.00-4.45	SPT(C) N=39			7,8/9,9,11,10
4.50	B			
5.00-5.45	SPT(C) N=40			Water strike(2) at 5.00m, rose to 3.00m in 20 mins. 6,11/9,14,7,10
5.80	B			
5.80-6.09	SPT(C) 50/135			8,12/10,40

Depth (m)	TCR	SCR	RQD	FI	Field Records
6.10	100	85	27	15	
6.50	100	82	56		
7.20					
7.71-7.80					C
8.00	100	97	38		
9.25-9.36				8	C
9.65-9.88					C
9.50					

Level (mOD)	Depth (m) (Thickness)	Description	Water
5.47	0.06	TARMACADAM	
4.73	(0.74) 0.80	MADE GROUND: Grey slightly clayey Sand and Gravel. Gravel is subangular to subrounded fine to coarse	
4.03	(0.70) 1.50	Brownish black slightly clayey slightly gravelly PEAT. Gravel is subangular to subrounded fine to coarse	
3.13	(0.90) 2.40	Very soft beige clayey SILT with occasional shell fragments	
2.93	(0.20) 2.60	Dark brown peaty CLAY	
2.03	(0.90) 3.50	Light grey slightly gravelly clayey SILT with occasional cobbles. Gravel is subangular to subrounded fine to coarse	▼1
-0.27	(2.30) 5.80	Very stiff light grey slightly sandy slightly gravelly silty CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse	∇2
-0.57	(0.30) 6.10	Dense bluish grey sandy angular to subangular fine to coarse GRAVEL with occasional cobbles. Gravel is subangular to subrounded fine to coarse	
-1.67	(1.10) 7.20	Strong thinly to medium bedded grey finely to medium grained fossiliferous LIMESTONE with occasional calcite veins. Slightly weathered (6.10 - 7.20m BGL) 1 fracture set. 10-30 degrees, very closely to closely spaced, undulating, rough with occasional Clay staining	
	(3.80)	Strong thinly to medium bedded grey finely to medium grained fossiliferous LIMESTONE with occasional calcite veins. Fresh (7.20 - 11.00m BGL) 1 fracture set. 10-30 degrees, closely to medium spaced, undulating, rough with occasional Clay staining	

Remarks
Cable percussion drilling refused at 6.10m BGL, Rotary drilling completed at 11.00m BGL
Groundwater encountered at 3.00m and 5.00m BGL
50mm standpipe installed to 11.00m BGL. Slotted standpipe installed from 11.00 - 1.00m BGL. Solid standpipe installed from 1.00m BGL - GL with gas tap and flush cover
Chiselling from 5.50m to 5.80m for 0.5 hours. Chiselling from 6.10m to 6.10m for 1 hour.

Scale (approx)	Logged By
1:50	AM

Figure No.
13614-02-24.BRC05

Ground Investigations Ireland Ltd
www.gii.ie

Site: Dyke Road Galway

Borehole Number: BRC05

Machine : Dando 2000 & Beretta T-44
Flush : Water
Core Dia : 63.50 mm
Method : Cable Percussion with Rotary follow on

Casing Diameter: 200mm cased to 6.10m
96mm cased to 11.00m

Ground Level (mOD): 5.53

Client: Aecom

Job Number: 13614-02-24

Location: 529900.1 E 725923.8 N

Dates: 18/04/2024-20/05/2024

Engineer:

Sheet: 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	100	97	73						▦		▨
11.00						-5.47	11.00	Complete at 11.00m			

Remarks

Scale (approx): 1:50

Logged By: AM

Figure No. 13614-02-24.BRC05

Ground Investigations Ireland Ltd
www.gii.ie

Site	Dyke Road Galway
Borehole Number	BRC06
Machine	Beretta T-44
Flush	Water
Core Dia	63.5 mm
Method	Rotary Cored
Casing Diameter	96mm cased to 14.40m
Ground Level (mOD)	5.43
Client	Aecom
Job Number	13614-02-24
Location	529845.9 E 725961.5 N
Dates	22/05/2024
Engineer	
Sheet	1/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						5.40	0.03	TARMACADAM		
	33						(1.97)	Possible MADEGROUND: Poor recovery. Recovery consists of grey slightly clayey subangular to subrounded fine to coarse GRAVEL		
2.00 2.00-2.45	10				1,0/0,0,0,0 SPT(C) N=0	3.43	2.00	Poor recovery. Recovery consists of grey sandy slightly gravelly silty CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse. Driller notes: Grey silts (Very soft)		
3.50 3.50-3.95	13				0,0/0,0,0,0 SPT(C) N=0		(4.50)			
5.00 5.00-5.45	27				0,0/1,0,0,0 SPT(C) N=1					
6.50 6.50-6.95	100				3,4/4,5,4,7 SPT(C) N=20	-1.07	6.50 (0.90)	Grey clayey sandy subangular to subrounded fine to course GRAVEL with low cobble content. Driller notes: sandy gravelly Cay (Stiff)		
						-1.97	7.40 (0.60)	Grey gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to medium		
8.00 8.00-8.45	37	7	0		0,5/7,8,8,12 SPT(C) N=35	-2.57	8.00 (1.40)	Poor recovery. Recovery consists of grey slightly clayey subangular to rounded fine to coarse GRAVEL with low cobble content (Dense)		
9.40 9.50						-3.97	9.40	Medium strong to strong thinly to medium bedded grey finely to medium grained fossiliferous LIMESTONE with occasional calcite veins. Slightly weathered		

Remarks
Rotary drilling completed at 14.40m BGL
Borehole backfilled upon completion

Scale (approx)	1:50
Logged By	AM
Figure No.	13614-02-24.BRC06

Ground Investigations Ireland Ltd www.gii.ie	**Site** Dyke Road Galway		**Borehole Number** **BRC06**
Machine : Beretta T-44 **Flush :** Water **Core Dia :** 63.5 mm **Method :** Rotary Cored	**Casing Diameter** 96mm cased to 14.40m	**Ground Level (mOD)** 5.43	**Client** Aecom
	Location 529845.9 E 725961.5 N	**Dates** 22/05/2024	**Engineer**
Job Number 13614-02-24	**Sheet** 2/2		

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100	83	67	6			(1.30)	(9.40 - 10.70m BGL) 1 fracture set. 10-30 degrees, closely to medium spaced, undulating, rough with occasional Clay staining		
10.70						-5.27	10.70	Medium strong to strong thinly to medium bedded grey and dark grey finely grained argillaceous LIMESTONE with frequent mudstone laminations and occasional calcite veins. Fresh		
11.00 11.00-11.17					C					
	100	80	43					(10.70 - 14.40m BGL) 3 fracture sets. FS1: 0-20 degrees, closely to medium spaced, planar to undulating, rough with occasional Clay staining. FS2: 40-50 degrees, medium to widely spaced, planar to undulating, rough with occasional Clay staining. FS3: 60-70 degrees, widely spaced, undulating, rough		
12.50				11			(3.70)			
	100	93	20							
13.34-13.44					C					
14.00	100	100	75							
14.40						-8.97	14.40	Complete at 14.40m		

Remarks

Scale (approx)	**Logged By**
1:50	AM

Figure No.
13614-02-24.BRC06

Dyke Road Galway – Rotary Core Photographs

BRC01

Client: Aecom
Site: Dyke Road Galway
Borehole ref: BRC-01
Box No: 1 of 2
Job Ref: 13614-02-24
Date: 21/05/24
Depth: From 10.50 to 13.70 mBGL

Client: Aecom
Site: Dyke Road Galway
Borehole ref: BRC-01
Box No: 2 of 2
Job Ref: 13614-02-24
Date: 21/05/24
Depth: From 13.70 to 16.50 mBGL

Dyke Road Galway – Rotary Core Photographs

BRC02

Dyke Road Galway – Rotary Core Photographs

BRC02

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Client: Aecom
Site: Dyke Rd Galway
Borehole ref: BRC02
Box No: 4 of 4
Job Ref: 13614-02-24
Date: 15-05-24
Depth: From 16.07 to 18.60 mBGL

Dyke Road Galway – Rotary Core Photographs

BRC03

Client: Aecom
Site: Dyke Road Galway
Borehole ref: BRC03
Box No: 1 of 4
Job Ref: 13614-02-24
Date: 16/05/24
Depth: From 10.30 to 13.10 mBGL

Client: Aecom
Site: Dyke Road Galway
Borehole ref: BRC03
Box No: 2 of 4
Job Ref: 13614-02-24
Date: 16/05/24
Depth: From 13.10 to 16.00 mBGL

Dyke Road Galway – Rotary Core Photographs

BRC03

Client: Aecom
Site: Dyke Road Galway
Borehole ref: BRC03
Box No: 3 of 4
Job Ref: 13614-02-24
Date: 16/05/24
Depth: From 16.00 to 19.00 mBGL

Client: Aecom
Site: Dyke Road Galway
Borehole ref: BRC03
Box No: 4 of 4
Job Ref: 13614-02-24
Date: 16/05/24
Depth: From 19.00 to 20.10 mBGL

Dyke Road Galway – Rotary Core Photographs

BRC04

GROUND INVESTIGATIONS IRELAND

Client: Aecom

Site: Dyke Road Galway

Borehole ref: BRC04

Box No: 1 of 2

Job Ref: 13614-02-24

Date: 16/05/24

Depth: From 6.40 to 9.10 m BGL

GROUND INVESTIGATIONS IRELAND

Client: Aecom

Site: Dyke Road Galway

Borehole ref: BRC04

Box No: 2 of 2

Job Ref: 13614-02-24

Date: 16/05/24

Depth: From 9.10 to 12.00 m BGL

Dyke Road Galway – Rotary Core Photographs

BRC05

Client: Aecom
Site: Dyke Road Galway
Borehole ref: BRC-05
Box No: 1 of 2
Job Ref: 13614-02-24
Date: 17/05/24
Depth: From 6.10 to 8.95 mBGL

Client: Aecom
Site: Dyke Road Galway
Borehole ref: BRC-05
Box No: 2 of 2
Job Ref: 13614-02-24
Date: 17/05/24
Depth: From 8.45 to 11.00 mBGL

Dyke Road Galway – Rotary Core Photographs

BRC06

Client: Aecom
Site: Dyke Road Galway
Borehole ref: BRC06
Box No: 1 of 3
Job Ref: 13614-02-24
Date: 22/05/24
Depth: From 0.00 to 8.00 m BGL

Client: Aecom
Site: Dyke Road Galway
Borehole ref: BRC06
Box No: 2 of 3
Job Ref: 13614-02-24
Date: 22/05/24
Depth: From 8.00 to 11.90 m BGL

Dyke Road Galway – Rotary Core Photographs

BRC06

Client: Aecom
Job Ref: 13614-02-24
Site: Dyke Road Galway
Date: 22/05/24
Borehole ref: BRC06
Depth: From 11.90 to 14.40 m BGL
Box No: 3 of 3

Dyke Road Galway – Rotary Core Photographs

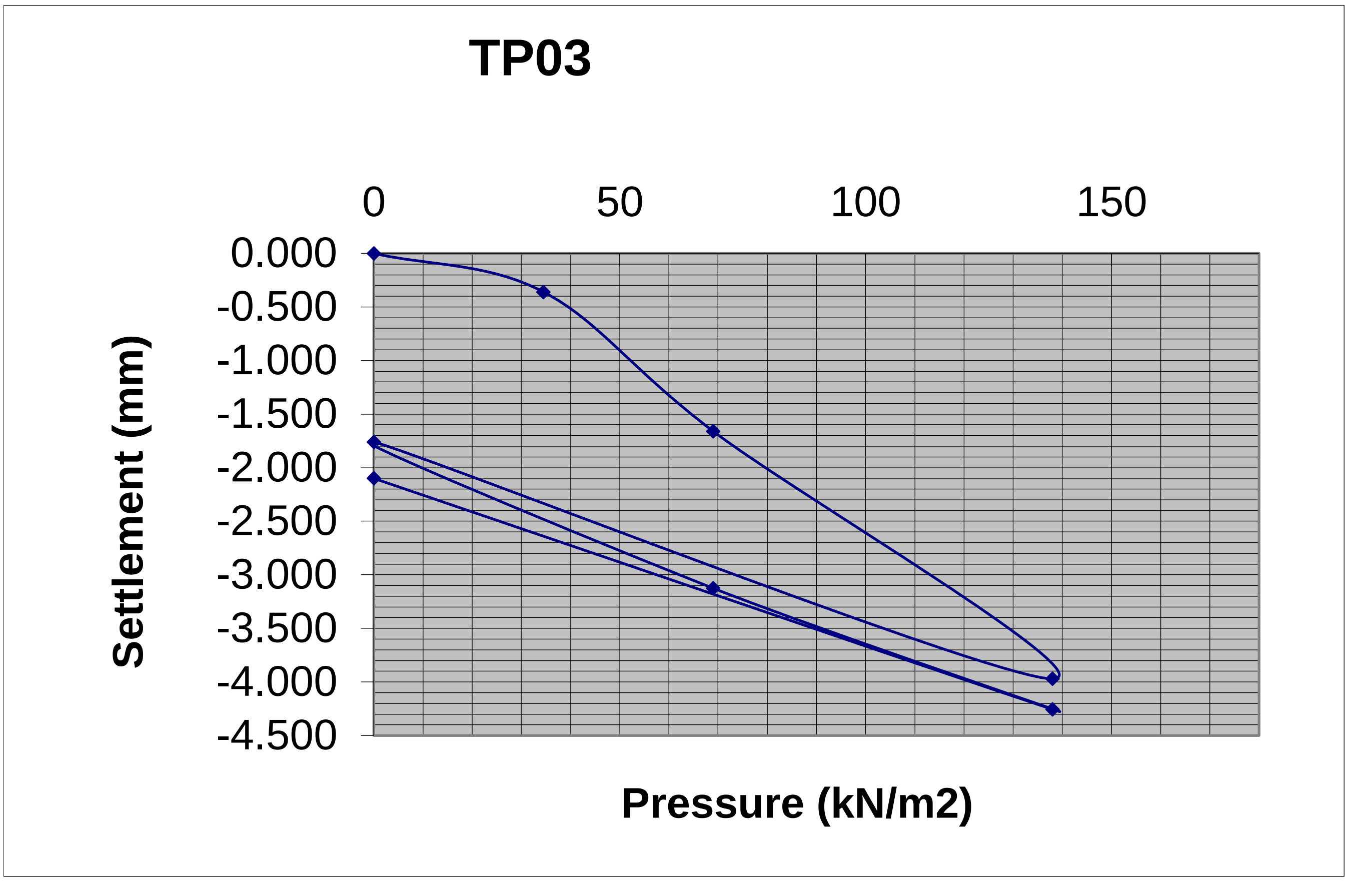
BH01

APPENDIX 6 – Insitu Plate Bearing Test Records

Applied Load	Gauge settlement
0	**0.000**
34.5	-0.36
69	-1.66
138	-3.97
0	-1.76
69	-3.125
138	-4.255
0	-2.1

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Dyke Road, Galway	**MATERIAL**	MADE GROUND: Grey sandy angular to subrounded fine to coarse Gravel
CONTRACT NO.	13614-02-24		
DATE	15/04/2024		
CLIENT	Aecom	**DEPTH**	0.20m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	TP03	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) =	**28.09 MN/m2/m**
Modulus of subgrade reaction, K (Reload) =	**34.16 MN/m2/m**

Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	**3.12 %**
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 =	**4.38 %**

APPENDIX 7 - TRL Dynamic Cone Penetrometer Records

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Email: info@gii.ie
Web: www.gii.ie

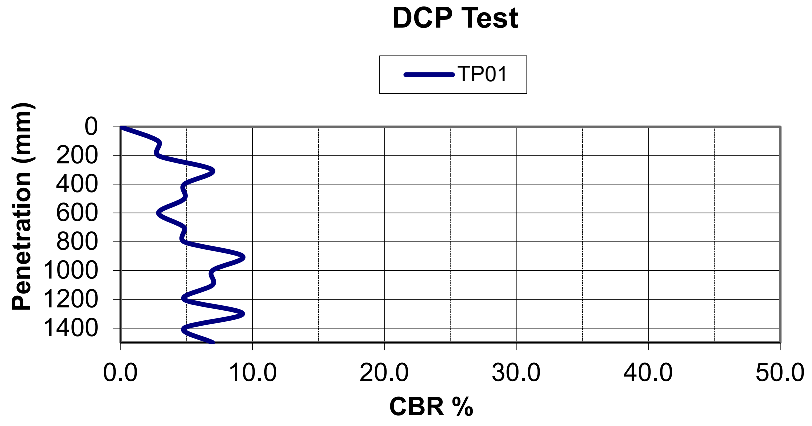
Job Name Dyke Road Galway
Job No. 13614-02-24
Client Aecom

Test Type Dynamic Cone Penetration Test
Test Reference TP01
By LB
Date 17/04/2024

Initial Depth 0.8

Depth below start depth (mm)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	2	50.0	2.9
200	2	50.0	2.9
300	4	25.0	7.0
400	3	33.3	4.8
500	3	33.3	4.8
600	2	50.0	2.9
700	3	33.3	4.8
800	3	33.3	4.8
900	5	20.0	9.3
1000	4	25.0	7.0
1100	4	25.0	7.0
1200	3	33.3	4.8
1300	5	20.0	9.3
1400	3	33.3	4.8
1500	4	25.0	7.0

Reference **Kleyn and Van Heerden (60^{o} Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



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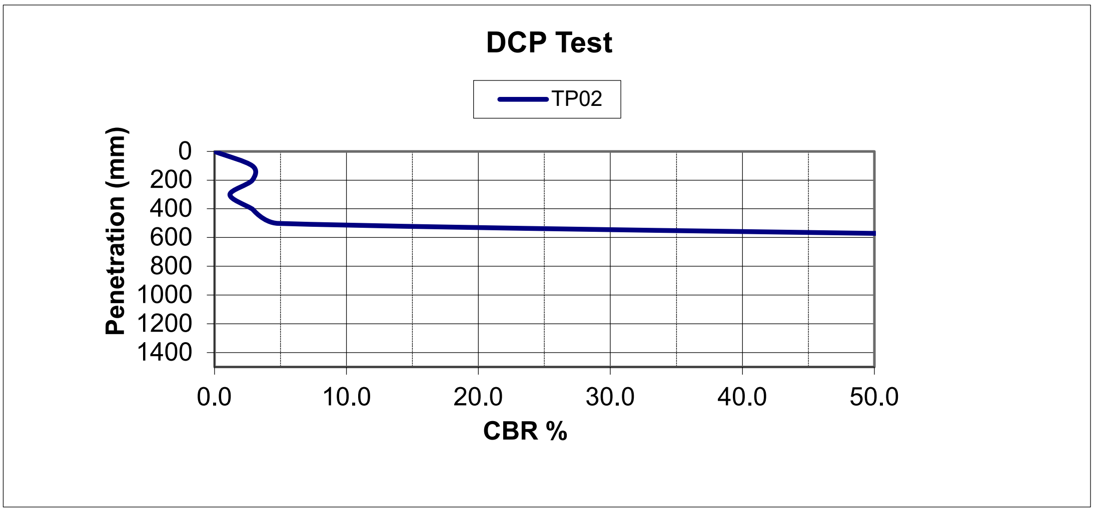
Web: www.gii.ie

Job Name	Dyke Road Galway	**Test Type**	Dynamic Cone Penetration Test
Job No.	13614-02-24	**Test Reference**	TP02
Client	Aecom	**By**	LB
		Date	17/04/2024
Initial Depth	0.7		

Depth below start depth (mm)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	2	50.0	2.9
200	2	50.0	2.9
300	1	100.0	1.2
400	2	50.0	2.9
500	3	33.3	4.8
600	25	4.0	72.7
700			
800			
900			
1000			
1100			
1200			
1300			
1400			
1500			

Reference **Kleyn and Van Heerden (60° Cone)**

Formula $\text{Log10 (CBR)} = 2.632 - 1.28 \text{ Log10 (mm/blow)}$



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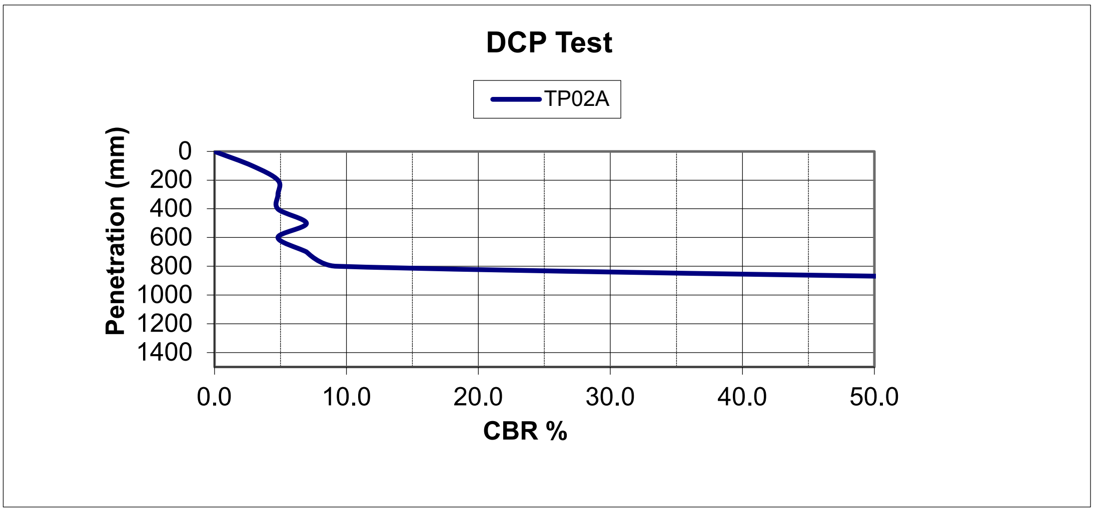
Job Name	Dyke Road Galway	**Test Type**	Dynamic Cone Penetration Test
Job No.	13614-02-24	**Test Reference**	TP02A
Client	Aecom	**By**	LB
		Date	17/04/2024
Initial Depth	0.7		

Depth below start depth (mm)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	2	50.0	2.9
200	3	33.3	4.8
300	3	33.3	4.8
400	3	33.3	4.8
500	4	25.0	7.0
600	3	33.3	4.8
700	4	25.0	7.0
800	5	20.0	9.3
900	25	4.0	72.7
1000			
1100			
1200			
1300			
1400			
1500			

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



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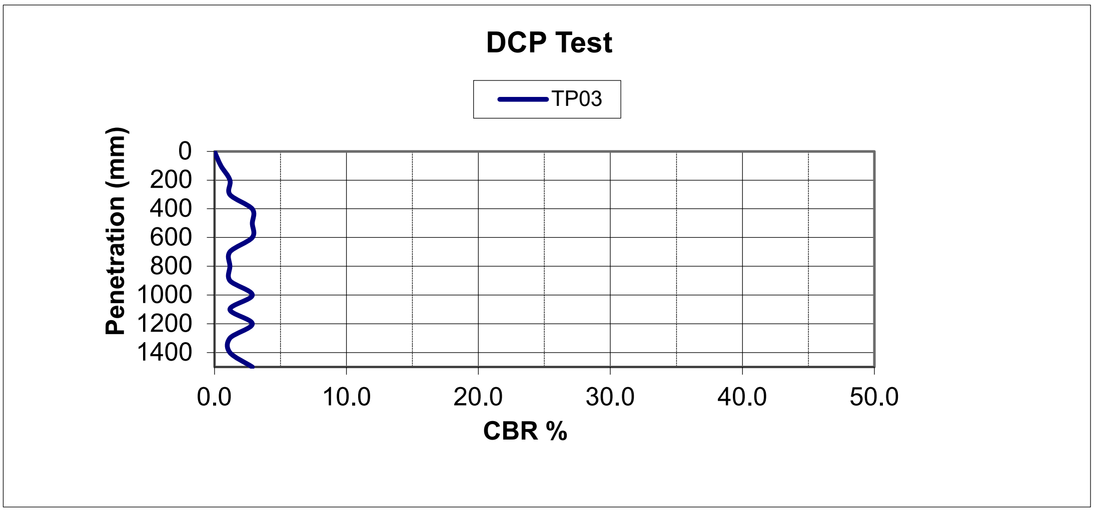
Job Name	Dyke Road Galway	**Test Type**	Dynamic Cone Penetration Test
Job No.	13614-02-24	**Test Reference**	TP03
Client	Aecom	**By**	LB
		Date	15/04/2024
Initial Depth	0.7		

Depth below start depth (mm)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	0	200.0	0.5
200	1	100.0	1.2
300	1	100.0	1.2
400	2	50.0	2.9
500	2	50.0	2.9
600	2	50.0	2.9
700	1	100.0	1.2
800	1	100.0	1.2
900	1	100.0	1.2
1000	2	50.0	2.9
1100	1	100.0	1.2
1200	2	50.0	2.9
1300	1	100.0	1.2
1400	1	100.0	1.2
1500	2	50.0	2.9

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



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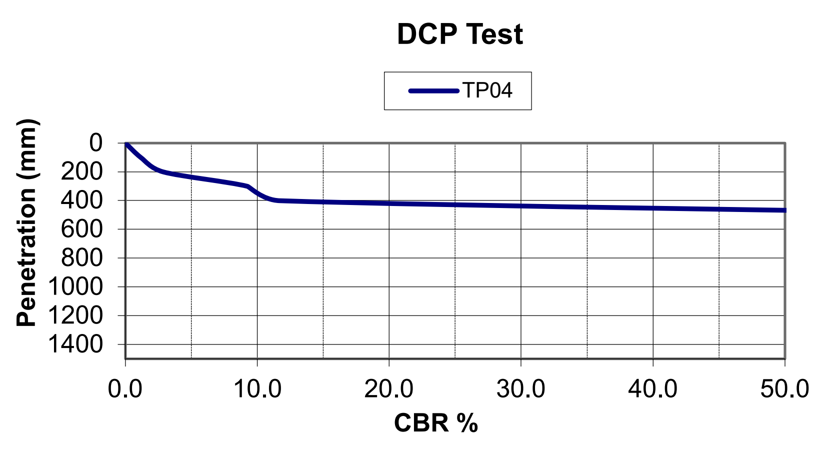
Job Name Dyke Road Galway
Job No. 13614-02-24
Client Aecom

Test Type Dynamic Cone Penetration Test
Test Reference TP04
By LB
Date 15/04/2024

Initial Depth 0.9

Depth below start depth (mm)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	4	100.0	1.2
200	2	50.0	2.9
300	5	20.0	9.3
400	6	16.7	11.7
500	25	4.0	72.7
600			
700			
800			
900			
1000			
1100			
1200			
1300			
1400			
1500			

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



APPENDIX 8 – Laboratory Results

Element Materials Technology
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Deeside
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Ground Investigations Ireland
Catherinestown House
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D22 K5P8

4225

Attention :	Mike Sutton
Date :	30th April, 2024
Your reference :	13614-02-24
Our reference :	Test Report 24/6265 Batch 1
Location :	Dyke Road Galway
Date samples received :	12th April, 2024
Status :	Final Report
Issue :	202404301446

Two samples were received for analysis on 12th April, 2024 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 9.412 kg of CO2

Scope 1&2&3 emissions - 22.243 kg of CO2

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Client Name:	Ground Investigations Ireland	**Report :**	**Solid**
Reference:	13614-02-24		
Location:	Dyke Road Galway	**Solids:**	V=60g VOC jar, J=250g glass jar, T=plastic tub
Contact:	Mike Sutton		
EMT Job No:	24/6265		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8											
Sample ID	BH02	BH02											
Depth	0.50	1.00											
COC No / misc													
Containers	V J T	V J T											
Sample Date	10/04/2024	10/04/2024											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	12/04/2024	12/04/2024										LOD/LOR	Units	Method No.
Antimony	3	2									<1	mg/kg	TM30/PM15
Arsenic#	13.7	9.6									<0.5	mg/kg	TM30/PM15
Barium#	197	138									<1	mg/kg	TM30/PM15
Cadmium#	1.2	0.8									<0.1	mg/kg	TM30/PM15
Chromium#	40.3	23.7									<0.5	mg/kg	TM30/PM15
Copper#	81	67									<1	mg/kg	TM30/PM15
Lead#	175	106									<5	mg/kg	TM30/PM15
Mercury#	0.7	0.4									<0.1	mg/kg	TM30/PM15
Molybdenum#	3.4	1.9									<0.1	mg/kg	TM30/PM15
Nickel#	21.6	15.3									<0.7	mg/kg	TM30/PM15
Selenium#	3	4									<1	mg/kg	TM30/PM15
Zinc#	250	146									<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.06	<0.03									<0.03	mg/kg	TM4/PM8
Acenaphthene#	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Phenanthrene#	0.17	<0.03									<0.03	mg/kg	TM4/PM8
Anthracene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Fluoranthene#	0.44	<0.03									<0.03	mg/kg	TM4/PM8
Pyrene#	0.46	<0.03									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene#	0.34	<0.06									<0.06	mg/kg	TM4/PM8
Chrysene#	0.38	<0.02									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene#	0.63	<0.07									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene#	0.34	<0.04									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene#	0.27	<0.04									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene#	0.25	<0.04									<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
PAH 6 Total#	1.93	<0.22									<0.22	mg/kg	TM4/PM8
PAH 17 Total	3.34	<0.64									<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.45	<0.05									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.18	<0.02									<0.02	mg/kg	TM4/PM8
Benzo(j)fluoranthene	<1	<1									<1	mg/kg	TM4/PM8
PAH Surrogate % Recovery	99	99									<0	%	TM4/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	<30	<30									<30	mg/kg	TM5/PM8/PM16

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road Galway
Contact: Mike Sutton
EMT Job No: 24/6265

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8									LOD/LOR	Units	Method No.
Sample ID	BH02	BH02											
Depth	0.50	1.00											
COC No / misc													
Containers	V J T	V J T											
Sample Date	10/04/2024	10/04/2024											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	12/04/2024	12/04/2024											
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) #	$<0.1^{SV}$	$<0.1^{SV}$									<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) #	$<0.1^{SV}$	$<0.1^{SV}$									<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	$<0.1^{SV}$	$<0.1^{SV}$									<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) #	<0.2	<0.2									<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) #	<4	<4									<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) #	<7	<7									<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) #	<7	<7									<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_CU_1D_AL)	<7	<7									<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH_CU+HS_1D_AL)	<26	<26									<26	mg/kg	TM5/TM36/PM8/PM12/PM16
>C6-C10 (HS_1D_AL)	$<0.1^{SV}$	$<0.1^{SV}$									<0.1	mg/kg	TM36/PM12
>C10-C25 (EH_CU_1D_AL)	<10	<10									<10	mg/kg	TM5/PM8/PM16
>C25-C35 (EH_CU_1D_AL)	<10	<10									<10	mg/kg	TM5/PM8/PM16
Aromatics													
>C5-EC7 (HS_1D_AR) #	$<0.1^{SV}$	$<0.1^{SV}$									<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) #	$<0.1^{SV}$	$<0.1^{SV}$									<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR) #	$<0.1^{SV}$	$<0.1^{SV}$									<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR) #	<0.2	<0.2									<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR) #	<4	<4									<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) #	23	<7									<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) #	369	168									<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_CU_1D_AR)	48	25									<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH_CU+HS_1D_AR)	440	193									<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	440	193									<52	mg/kg	TM5/TM36/PM8/PM12/PM16
>EC6-EC10 (HS_1D_AR) #	$<0.1^{SV}$	$<0.1^{SV}$									<0.1	mg/kg	TM36/PM12
>EC10-EC25 (EH_CU_1D_AR)	67	39									<10	mg/kg	TM5/PM8/PM16
>EC25-EC35 (EH_CU_1D_AR)	394	211									<10	mg/kg	TM5/PM8/PM16
MTBE #	$<5^{SV}$	$<5^{SV}$									<5	ug/kg	TM36/PM12
Benzene #	$<5^{SV}$	$<5^{SV}$									<5	ug/kg	TM36/PM12
Toluene #	$<5^{SV}$	$<5^{SV}$									<5	ug/kg	TM36/PM12
Ethylbenzene #	$<5^{SV}$	$<5^{SV}$									<5	ug/kg	TM36/PM12
m/p-Xylene #	$<5^{SV}$	$<5^{SV}$									<5	ug/kg	TM36/PM12
o-Xylene #	$<5^{SV}$	$<5^{SV}$									<5	ug/kg	TM36/PM12
PCB 28 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 52 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 101 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 118 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 138 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 153 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 180 #	<5	<5									<5	ug/kg	TM17/PM8
Total 7 PCBs #	<35	<35									<35	ug/kg	TM17/PM8

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road Galway
Contact: Mike Sutton
EMT Job No: 24/6265

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8											
Sample ID	BH02	BH02											
Depth	0.50	1.00											
COC No / misc													
Containers	V J T	V J T											
Sample Date	10/04/2024	10/04/2024											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	12/04/2024	12/04/2024									LOD/LOR	Units	Method No.
Natural Moisture Content	109.7	129.7									<0.1	%	PM4/PM0
Moisture Content (% Wet Weight)	52.3	56.5									<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3									<0.3	mg/kg	TM38/PM20
Chromium III	40.3	23.7									<0.5	mg/kg	NONE/NONE
Total Organic Carbon #	13.75	13.99									<0.02	%	TM21/PM24
pH #	7.49	7.43									<0.01	pH units	TM73/PM11

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road Galway
Contact: Mike Sutton
EMT Job No: 24/6265

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8									LOD/LOR	Units	Method No.
Sample ID	BH02	BH02											
Depth	0.50	1.00											
COC No / misc													
Containers	V J T	V J T											
Sample Date	10/04/2024	10/04/2024											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	12/04/2024	12/04/2024											
Dissolved Antimony #	0.010	0.005									<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	0.10	0.05									<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	0.0039	0.0055									<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	0.039	0.055									<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.035	0.020									<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.35	0.20									<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005									<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005									<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015									<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015									<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007									<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07									<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005									<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05									<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.009	0.010									<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.09	0.10									<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	<0.002	<0.002									<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	<0.02	<0.02									<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003									<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03									<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	0.007	0.004									<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	0.07	0.04									<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	<0.00001	<0.00001									<0.00001	mg/l	TM61/PM0
Mercury Dissolved by CVAF #	<0.0001	<0.0001									<0.0001	mg/kg	TM61/PM0
Phenol	<0.01	<0.01									<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1									<0.1	mg/kg	TM26/PM0
Fluoride	<0.3	0.3									<0.3	mg/l	TM173/PM0
Fluoride	<3	<3									<3	mg/kg	TM173/PM0
Sulphate as SO4 #	37.6	9.5									<0.5	mg/l	TM38/PM0
Sulphate as SO4 #	376	95									<5	mg/kg	TM38/PM0
Mass of raw test portion	0.1295	0.1342										kg	NONE/PM17
Chloride #	2.9	3.1									<0.3	mg/l	TM38/PM0
Chloride #	29	31									<3	mg/kg	TM38/PM0
Mass of dried test portion	0.09	0.09										kg	NONE/PM17
Dissolved Organic Carbon	8	13									<2	mg/l	TM60/PM0
Dissolved Organic Carbon	80	130									<20	mg/kg	TM60/PM0
pH	8.26	8.34									<0.01	pH units	TM73/PM0

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road Galway
Contact: Mike Sutton
EMT Job No: 24/6265

Report : **CEN 10:1 1 Batch**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8										
Sample ID	BH02	BH02										
Depth	0.50	1.00										
COC No / misc												
Containers	V J T	V J T										
Sample Date	10/04/2024	10/04/2024										
Sample Type	Soil	Soil										
Batch Number	1	1										
Date of Receipt	12/04/2024	12/04/2024								LOD/LOR	Units	Method No.
Total Dissolved Solids #	200	147								<35	mg/l	TM20/PM0
Total Dissolved Solids #	2000	1469								<350	mg/kg	TM20/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road Galway
Contact: Mike Sutton
EMT Job No: 24/6265

Report : **EN12457_2**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8														
Sample ID	BH02	BH02														
Depth	0.50	1.00														
COC No / misc																
Containers	V J T	V J T														
Sample Date	10/04/2024	10/04/2024														
Sample Type	Soil	Soil														
Batch Number	1	1														
Date of Receipt	12/04/2024	12/04/2024									Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.
Solid Waste Analysis																
Total Organic Carbon #	13.75	13.99									3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.025^{SV}	<0.025^{SV}									6	-	-	<0.025	mg/kg	TM36/PM12
Sum of 7 PCBs #	<0.035	<0.035									1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	<30	<30									500	-	-	<30	mg/kg	TM5/PM8/PM16
PAH Sum of 6 #	1.93	<0.22									-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	3.34	<0.64									100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic #	0.039	0.055									0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium #	0.35	0.20									20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium #	<0.005	<0.005									0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium #	<0.015	<0.015									0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper #	<0.07	<0.07									2	50	100	<0.07	mg/kg	TM30/PM17
Mercury #	<0.0001	<0.0001									0.01	0.2	2	<0.0001	mg/kg	TM61/PM0
Molybdenum #	0.09	0.10									0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel #	<0.02	<0.02									0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead #	<0.05	<0.05									0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony #	0.10	0.05									0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium #	<0.03	<0.03									0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc #	0.07	0.04									4	50	200	<0.03	mg/kg	TM30/PM17
Total Dissolved Solids #	2000	1469									4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	80	130									500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.1295	0.1342									-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	69.3	66.9									-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.86	0.855									-	-	-		l	NONE/PM17
Moisture Content 105C (% Dry Weight)	44.4	49.5									-	-	-	<0.1	%	PM4/PM0
pH #	7.49	7.43									-	-	-	<0.01	pH units	TM73/PM11
Phenol	<0.1	<0.1									1	-	-	<0.1	mg/kg	TM26/PM0
Fluoride	<3	<3									10	150	500	<3	mg/kg	TM173/PM0
Sulphate as SO4 #	376	95									1000	20000	50000	<5	mg/kg	TM38/PM0
Chloride #	29	31									800	15000	25000	<3	mg/kg	TM38/PM0

Client Name: Ground Investigations Ireland

Reference: 13614-02-24

Location: Dyke Road Galway

Contact: Mike Sutton

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
24/6265	1	BH02	0.50	1-4	Trace of PAHs & Naturally occurring compounds
24/6265	1	BH02	1.00	5-8	Trace of PAHs & Naturally occurring compounds

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road Galway
Contact: Mike Sutton

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
24/6265	1	BH02	0.50	4	Catherine Coles	22/04/2024	**General Description (Bulk Analysis)**	brown soil
					Catherine Coles	22/04/2024	**Asbestos Fibres**	NAD
					Catherine Coles	22/04/2024	**Asbestos ACM**	NAD
					Catherine Coles	22/04/2024	**Asbestos Type**	NAD
24/6265	1	BH02	1.00	8	Catherine Coles	22/04/2024	**General Description (Bulk Analysis)**	chalk,peat, vegitation
					Catherine Coles	22/04/2024	**Asbestos Fibres**	NAD
					Catherine Coles	22/04/2024	**Asbestos ACM**	NAD
					Catherine Coles	22/04/2024	**Asbestos Type**	NAD

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road Galway
Contact: Mike Sutton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 24/6265						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 24/6265

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 35°C ±5°C.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

Tentatively Identified Compounds (TICs)

Where Tentatively Identified Compounds (TICs) are reported, up to 10 Tentatively Identified Compounds will be listed where there is found to be a greater than 80% match with the NIST library. The reported concentration is determined semi-quantitively, with a matrix specific limit of detection. Note, other compounds may be present but are not reported.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 24/6265

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes

EMT Job No: 24/6265

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM61	Determination of Mercury by Cold Vapour Atomic Fluorescence - WATERS: Modified USEPA Method 245.7, Rev 2, Feb 2005. SOILS: Modified USEPA Method 7471B, Rev.2, Feb 2007	PM0	No preparation is required.	Yes		AR	Yes

EMT Job No: 24/6265

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	

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Hazelhatch Road
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Ireland
D22 K5P8

Attention :	Mike Sutton
Date :	30th April, 2024
Your reference :	13614-02-24
Our reference :	Test Report 24/6663 Batch 1
Location :	Dyke Road Galway
Date samples received :	18th April, 2024
Status :	Final Report
Issue :	202404301121

Two samples were received for analysis on 18th April, 2024 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 6.371 kg of CO2

Scope 1&2&3 emissions - 15.057 kg of CO2

Authorised By:

Bruce Leslie
Project Manager

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road Galway
Contact: Mike Sutton
EMT Job No: 24/6663

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8											
Sample ID	BRC-02	BRC-02											
Depth	0.25	1.50											
COC No / misc													
Containers	V J T	V J T											
Sample Date	16/04/2024	16/04/2024											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	18/04/2024	18/04/2024									LOD/LOR	Units	Method No.
Arsenic#	1.6	1.6									<0.5	mg/kg	TM30/PM15
Cadmium#	0.4	0.4									<0.1	mg/kg	TM30/PM15
Chromium#	13.0	11.6									<0.5	mg/kg	TM30/PM15
Copper#	6	6									<1	mg/kg	TM30/PM15
Lead#	<5	<5									<5	mg/kg	TM30/PM15
Mercury#	<0.1	<0.1									<0.1	mg/kg	TM30/PM15
Nickel#	8.5	7.7									<0.7	mg/kg	TM30/PM15
Selenium#	<1	<1									<1	mg/kg	TM30/PM15
Water Soluble Boron#	0.3	0.3									<0.1	mg/kg	TM74/PM32
Zinc#	11	10									<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Acenaphthene#	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Phenanthrene#	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Anthracene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Fluoranthene#	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Pyrene#	0.05	<0.03									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene#	<0.06	<0.06									<0.06	mg/kg	TM4/PM8
Chrysene#	<0.02	<0.02									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene#	<0.07	<0.07									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene#	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
PAH 17 Total	<0.64	<0.64									<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	90	89									<0	%	TM4/PM8
EPH (C8-C40) (EH_1D_Total)#	877	1033									<30	mg/kg	TM5/PM8
Phenol#	<0.01	<0.01									<0.01	mg/kg	TM26/PM21B
Natural Moisture Content	3.9	187.8									<0.1	%	PM4/PM0
Sulphate as SO4 (2:1 Ext)#	0.0158	0.0387									<0.0015	g/l	TM38/PM20
Total Cyanide#	<0.5	<0.5									<0.5	mg/kg	TM89/PM45
Organic Matter	0.8	1.1									<0.2	%	TM21/PM24

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name:	Ground Investigations Ireland	**Report :**	**Solid**
Reference:	13614-02-24		
Location:	Dyke Road Galway	**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub	
Contact:	Mike Sutton		
EMT Job No:	24/6663		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8											
Sample ID	BRC-02	BRC-02											
Depth	0.25	1.50											
COC No / misc													
Containers	V J T	V J T											
Sample Date	16/04/2024	16/04/2024											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	18/04/2024	18/04/2024									LOD/LOR	Units	Method No.
pH #	9.16	7.97									<0.01	pH units	TM73/PM11

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name:	Ground Investigations Ireland
Reference:	13614-02-24
Location:	Dyke Road Galway
Contact:	Mike Sutton

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
24/6663	1	BRC-02	0.25	4	Bart Kuznicki	26/04/2024	**General Description (Bulk Analysis)**	Brown soil with stones
					Bart Kuznicki	26/04/2024	**Asbestos Fibres**	NAD
					Bart Kuznicki	26/04/2024	**Asbestos ACM**	NAD
					Bart Kuznicki	26/04/2024	**Asbestos Type**	NAD
24/6663	1	BRC-02	1.50	8	Kieran Hunt	26/04/2024	**General Description (Bulk Analysis)**	Brown soil / debris
					Kieran Hunt	26/04/2024	**Asbestos Fibres**	NAD
					Kieran Hunt	26/04/2024	**Asbestos ACM**	NAD
					Kieran Hunt	26/04/2024	**Asbestos Type**	NAD

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road Galway
Contact: Mike Sutton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 24/6663						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 24/6663

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 35°C ±5°C.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

Tentatively Identified Compounds (TICs)

Where Tentatively Identified Compounds (TICs) are reported, up to 10 Tentatively Identified Compounds will be listed where there is found to be a greater than 80% match with the NIST library. The reported concentration is determined semi-quantitively, with a matrix specific limit of detection. Note, other compounds may be present but are not reported.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
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+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
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CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 24/6663

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.			AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.	Yes		AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

EMT Job No: 24/6663

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes

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Attention :	Mike Sutton
Date :	16th May, 2024
Your reference :	13614-02-24
Our reference :	Test Report 24/6996 Batch 1
Location :	Dyke Road, Galway
Date samples received :	24th April, 2024
Status :	Final Report
Issue :	202405161600

Twenty samples were received for analysis on 24th April, 2024 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 43.223 kg of CO2

Scope 1&2&3 emissions - 102.147 kg of CO2

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road, Galway
Contact: Mike Sutton
EMT Job No: 24/6996

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	33-36	37-40	41-44	45-48	49-52	57-60				
Sample ID	ST01	ST02	ST03	TP03	TP03	TP03	TP04	TP04	TP05				
Depth	0.20-0.80	0.15-0.80	0.07-1.40	0.10-0.60	0.61-1.10	1.10-2.30	0.07-1.00	1.00-1.20	0.55-1.35				
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T				
Sample Date	11/04/2024	11/04/2024	12/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1		LOD/LOR	Units	Method No.
Date of Receipt	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024				
Antimony	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	mg/kg	TM30/PM15
Arsenic#	<0.5	2.4	1.6	1.3	7.7	1.3	1.7	2.6	1.7		<0.5	mg/kg	TM30/PM15
Barium#	8	12	7	7	34	99	13	12	10		<1	mg/kg	TM30/PM15
Cadmium#	0.2	0.4	0.4	0.3	0.6	0.2	0.4	0.4	0.9		<0.1	mg/kg	TM30/PM15
Chromium#	13.3	16.2	11.7	4.1	11.6	17.9	23.0	10.2	24.5		<0.5	mg/kg	TM30/PM15
Copper#	4	9	5	3	26	6	5	6	5		<1	mg/kg	TM30/PM15
Lead#	<5	9	<5	<5	30	<5	<5	7	<5		<5	mg/kg	TM30/PM15
Mercury#	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM30/PM15
Molybdenum#	0.7	1.5	0.9	0.4	1.0	1.3	1.4	0.9	1.5		<0.1	mg/kg	TM30/PM15
Nickel#	3.4	9.4	7.2	2.8	8.7	3.0	6.3	7.6	7.0		<0.7	mg/kg	TM30/PM15
Selenium#	<1	<1	<1	<1	3	<1	<1	<1	<1		<1	mg/kg	TM30/PM15
Sulphur as S	-	-	-	-	0.52	0.13	-	0.07	-		<0.01	%	TM30/PM15
Total Sulphate as SO4 BRE	-	-	-	-	0.58	0.10	-	0.03	-		<0.01	%	TM50/PM29
Zinc#	6	16	11	<5	29	6	11	10	16		<5	mg/kg	TM30/PM15
Magnesium	-	-	-	-	0.0106	0.0035	-	0.0019	-		<0.0001	g/l	TM30/PM20
PAH MS													
Naphthalene#	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	mg/kg	TM4/PM8
Acenaphthene#	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05	mg/kg	TM4/PM8
Fluorene#	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Phenanthrene#	<0.03	<0.03	<0.03	<0.03	0.12	<0.03	<0.03	<0.03	<0.03		<0.03	mg/kg	TM4/PM8
Anthracene#	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Fluoranthene#	<0.03	<0.03	<0.03	<0.03	0.21	<0.03	<0.03	0.05	0.07		<0.03	mg/kg	TM4/PM8
Pyrene#	<0.03	<0.03	<0.03	<0.03	0.18	<0.03	<0.03	0.04	0.08		<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene#	<0.06	<0.06	<0.06	<0.06	0.21	<0.06	<0.06	<0.06	0.08		<0.06	mg/kg	TM4/PM8
Chrysene#	<0.02	<0.02	<0.02	<0.02	0.15	<0.02	<0.02	<0.02	0.07		<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene#	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	0.15		<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene#	<0.04	<0.04	<0.04	<0.04	0.12	<0.04	<0.04	<0.04	0.10		<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene#	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.06		<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene#	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene#	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.06		<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
PAH 6 Total#	<0.22	<0.22	<0.22	<0.22	0.33	<0.22	<0.22	<0.22	0.44		<0.22	mg/kg	TM4/PM8
PAH 17 Total	<0.64	<0.64	<0.64	<0.64	0.99	<0.64	<0.64	<0.64	0.67		<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11		<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04		<0.02	mg/kg	TM4/PM8
Benzo(j)fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	mg/kg	TM4/PM8
PAH Surrogate % Recovery	95	94	97	97	94	96	95	94	96		<0	%	TM4/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	<30	<30	69	<30	124	173	<30	<30	<30		<30	mg/kg	TM5/PM8/PM16

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Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road, Galway
Contact: Mike Sutton
EMT Job No: 24/6996

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	33-36	37-40	41-44	45-48	49-52	57-60				
Sample ID	ST01	ST02	ST03	TP03	TP03	TP03	TP04	TP04	TP05				
Depth	0.20-0.80	0.15-0.80	0.07-1.40	0.10-0.60	0.61-1.10	1.10-2.30	0.07-1.00	1.00-1.20	0.55-1.35				
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T				
Sample Date	11/04/2024	11/04/2024	12/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1		LOD/LOR	Units	Method No.
Date of Receipt	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024				
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)$^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)$^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)$^{\#}$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)$^{\#}$	<4	<4	<4	<4	<4	<4	<4	<4	<4		<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)$^{\#}$	<7	<7	<7	<7	21	71	<7	<7	<7		<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)$^{\#}$	<7	<7	69	<7	103	102	19	<7	<7		<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_CU_1D_AL)	<7	<7	<7	<7	<7	<7	<7	<7	<7		<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH_CU+HS_1D_AL)	<26	<26	69	<26	124	173	<26	<26	<26		<26	mg/kg	TM5/TM36/PM8/PM12/PM16
>C6-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>C10-C25 (EH_CU_1D_AL)	<10	<10	<10	<10	35	112	<10	<10	<10		<10	mg/kg	TM5/PM8/PM16
>C25-C35 (EH_CU_1D_AL)	<10	<10	56	<10	73	61	19	<10	<10		<10	mg/kg	TM5/PM8/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)$^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)$^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)$^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)$^{\#}$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)$^{\#}$	<4	<4	<4	<4	<4	<4	<4	<4	<4		<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)$^{\#}$	<7	<7	<7	<7	<7	<7	<7	<7	<7		<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)$^{\#}$	<7	<7	68	<7	237	156	56	<7	<7		<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_CU_1D_AR)	<7	<7	9	<7	21	<7	13	<7	<7		<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH_CU+HS_1D_AR)	<26	<26	77	<26	258	156	69	<26	<26		<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	<52	<52	146	<52	382	329	69	<52	<52		<52	mg/kg	TM5/TM36/PM8/PM12/PM16
>EC6-EC10 (HS_1D_AR)$^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>EC10-EC25 (EH_CU_1D_AR)	<10	<10	<10	<10	53	54	<10	<10	<10		<10	mg/kg	TM5/PM8/PM16
>EC25-EC35 (EH_CU_1D_AR)	<10	<10	68	<10	176	115	56	<10	<10		<10	mg/kg	TM5/PM8/PM16
MTBE$^{\#}$	<5	<5	<5	<5	<5^{SV}	<5	<5	<5	<5		<5	ug/kg	TM36/PM12
Benzene$^{\#}$	<5	<5	<5	<5	<5^{SV}	<5	<5	<5	<5		<5	ug/kg	TM36/PM12
Toluene$^{\#}$	<5	7	<5	<5	<5^{SV}	<5	<5	<5	<5		<5	ug/kg	TM36/PM12
Ethylbenzene$^{\#}$	<5	<5	<5	<5	<5^{SV}	<5	<5	<5	<5		<5	ug/kg	TM36/PM12
m/p-Xylene$^{\#}$	<5	7	<5	<5	<5^{SV}	<5	<5	<5	<5		<5	ug/kg	TM36/PM12
o-Xylene$^{\#}$	<5	<5	<5	<5	<5^{SV}	<5	<5	<5	<5		<5	ug/kg	TM36/PM12
PCB 28$^{\#}$	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/kg	TM17/PM8
PCB 52$^{\#}$	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/kg	TM17/PM8
PCB 101$^{\#}$	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/kg	TM17/PM8
PCB 118$^{\#}$	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/kg	TM17/PM8
PCB 138$^{\#}$	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/kg	TM17/PM8
PCB 153$^{\#}$	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/kg	TM17/PM8
PCB 180$^{\#}$	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/kg	TM17/PM8
Total 7 PCBs$^{\#}$	<35	<35	<35	<35	<35	<35	<35	<35	<35		<35	ug/kg	TM17/PM8

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road, Galway
Contact: Mike Sutton
EMT Job No: 24/6996

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	33-36	37-40	41-44	45-48	49-52	57-60		LOD/LOR	Units	Method No.
Sample ID	ST01	ST02	ST03	TP03	TP03	TP03	TP04	TP04	TP05				
Depth	0.20-0.80	0.15-0.80	0.07-1.40	0.10-0.60	0.61-1.10	1.10-2.30	0.07-1.00	1.00-1.20	0.55-1.35				
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T				
Sample Date	11/04/2024	11/04/2024	12/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024				
Natural Moisture Content	2.0	5.7	3.6	1.8	193.1	239.1	4.8	4.0	5.7		<0.1	%	PM4/PM0
Moisture Content (% Wet Weight)	1.9	5.4	3.5	1.8	65.9	70.5	4.6	3.8	5.4		<0.1	%	PM4/PM0
Chloride (2:1 Ext BRE)#	-	-	-	-	0.060	0.027	-	0.007	-		<0.002	g/l	TM38/PM20
Hexavalent Chromium#	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	mg/kg	TM38/PM20
Nitrate as NO3 (2:1 Ext BRE)	-	-	-	-	0.0064	<0.0025	-	<0.0025	-		<0.0025	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)#	-	-	-	-	0.4223	0.0352	-	0.0235	-		<0.0015	g/l	TM38/PM20
Chromium III	13.3	16.2	11.7	4.1	11.6	17.9	23.0	10.2	24.5		<0.5	mg/kg	NONE/NONE
Total Organic Carbon#	0.05	0.57	0.11	0.18	27.30	3.80	0.17	0.20	0.13		<0.02	%	TM21/PM24
pH#	9.43	8.81	8.92	8.19	7.14	8.41	9.59	8.82	8.82		<0.01	pH units	TM73/PM11
Asbestos Type*	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD			None	Subcontracted

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road, Galway
Contact: Mike Sutton
EMT Job No: 24/6996

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	33-36	37-40	41-44	45-48	49-52	57-60		LOD/LOR	Units	Method No.
Sample ID	ST01	ST02	ST03	TP03	TP03	TP03	TP04	TP04	TP05				
Depth	0.20-0.80	0.15-0.80	0.07-1.40	0.10-0.60	0.61-1.10	1.10-2.30	0.07-1.00	1.00-1.20	0.55-1.35				
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T				
Sample Date	11/04/2024	11/04/2024	12/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024				
Dissolved Antimony #	<0.002	<0.002	<0.002	<0.002	0.007	0.002	<0.002	<0.002	<0.002		<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	<0.02	<0.02	<0.02	<0.02	0.07	<0.02	<0.02	<0.02	<0.02		<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	<0.0025	<0.0025	<0.0025	<0.0025	0.0068	0.0039	<0.0025	<0.0025	<0.0025		<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	<0.025	<0.025	<0.025	<0.025	0.068	0.039	<0.025	<0.025	<0.025		<0.025	mg/kg	TM30/PM17
Dissolved Barium #	<0.003	<0.003	<0.003	<0.003	0.021	0.008	<0.003	<0.003	<0.003		<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	<0.03	<0.03	<0.03	<0.03	0.21	0.08	<0.03	<0.03	<0.03		<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0036	<0.0015	<0.0015		<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.036	<0.015	<0.015		<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007		<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07		<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	<0.002	0.004	<0.002	<0.002	0.005	0.005	<0.002	<0.002	<0.002		<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	<0.02	0.04	<0.02	<0.02	0.05	0.05	<0.02	<0.02	<0.02		<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003		<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	0.003	<0.003	<0.003	<0.003	0.006	0.004	<0.003	0.003	0.003		<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	0.03	<0.03	<0.03	<0.03	0.06	0.04	<0.03	<0.03	0.03		<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001		<0.00001	mg/l	TM61/PM0
Mercury Dissolved by CVAF #	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001		<0.0001	mg/kg	TM61/PM0
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	mg/kg	TM26/PM0
Fluoride	<0.3	0.3	<0.3	0.4	0.4	<0.3	<0.3	<0.3	<0.3		<0.3	mg/l	TM173/PM0
Fluoride	<3	3	<3	4	4	<3	<3	<3	<3		<3	mg/kg	TM173/PM0
Sulphate as SO4 #	0.7	3.4	1.6	203.0	63.6	<0.5	11.6	0.9	<0.5		<0.5	mg/l	TM38/PM0
Sulphate as SO4 #	7	34	16	2031	636	<5	116	9	<5		<5	mg/kg	TM38/PM0
Mass of raw test portion	0.0914	0.0954	0.0942	0.0923	0.369	0.1394	0.0961	0.0922	0.096			kg	NONE/PM17
Chloride #	<0.3	<0.3	0.4	0.7	17.8	2.4	0.8	<0.3	0.3		<0.3	mg/l	TM38/PM0
Chloride #	<3	<3	4	7	178	24	8	<3	3		<3	mg/kg	TM38/PM0
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09			kg	NONE/PM17
Dissolved Organic Carbon	<2	<2	<2	<2	35	9	<2	<2	<2		<2	mg/l	TM60/PM0
Dissolved Organic Carbon	<20	<20	<20	<20	350	90	<20	<20	<20		<20	mg/kg	TM60/PM0
pH	7.88	7.93	7.50	8.23	8.21	8.17	10.43	8.13	8.09		<0.01	pH units	TM73/PM0

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road, Galway
Contact: Mike Sutton
EMT Job No: 24/6996

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	33-36	37-40	41-44	45-48	49-52	57-60				
Sample ID	ST01	ST02	ST03	TP03	TP03	TP03	TP04	TP04	TP05				
Depth	0.20-0.80	0.15-0.80	0.07-1.40	0.10-0.60	0.61-1.10	1.10-2.30	0.07-1.00	1.00-1.20	0.55-1.35				
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T				
Sample Date	11/04/2024	11/04/2024	12/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1		LOD/LOR	Units	Method No.
Date of Receipt	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024				
Total Dissolved Solids #	<35	<35	<35	356	276	103	79	37	44		<35	mg/l	TM20/PM0
Total Dissolved Solids #	<350	<350	<350	3562	2761	1030	790	370	440		<350	mg/kg	TM20/PM0

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road, Galway
Contact: Mike Sutton
EMT Job No: 24/6996

Report : **EN12457_2**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	33-36	37-40	41-44	45-48	49-52	57-60							
Sample ID	ST01	ST02	ST03	TP03	TP03	TP03	TP04	TP04	TP05							
Depth	0.20-0.80	0.15-0.80	0.07-1.40	0.10-0.60	0.61-1.10	1.10-2.30	0.07-1.00	1.00-1.20	0.55-1.35							
COC No / misc																
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	11/04/2024	11/04/2024	12/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024	15/04/2024							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1	1	1	1							
Date of Receipt	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024	24/04/2024		Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.
Solid Waste Analysis																
Total Organic Carbon#	0.05	0.57	0.11	0.18	27.30	3.80	0.17	0.20	0.13		3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.025	<0.025	<0.025	<0.025	<0.025[SV]	<0.025	<0.025	<0.025	<0.025		6	-	-	<0.025	mg/kg	TM36/PM12
Sum of 7 PCBs#	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035		1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	<30	<30	69	<30	124	173	<30	<30	<30		500	-	-	<30	mg/kg	TM5/PM8/PM16
PAH Sum of 6#	<0.22	<0.22	<0.22	<0.22	0.33	<0.22	<0.22	<0.22	0.44		-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	<0.64	<0.64	<0.64	<0.64	0.99	<0.64	<0.64	<0.64	0.67		100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic#	<0.025	<0.025	<0.025	<0.025	0.068	0.039	<0.025	<0.025	<0.025		0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium#	<0.03	<0.03	<0.03	<0.03	0.21	0.08	<0.03	<0.03	<0.03		20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium#	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium#	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.036	<0.015	<0.015		0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper#	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07		2	50	100	<0.07	mg/kg	TM30/PM17
Mercury#	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001		0.01	0.2	2	<0.0001	mg/kg	TM61/PM0
Molybdenum#	<0.02	0.04	<0.02	<0.02	0.05	0.05	<0.02	<0.02	<0.02		0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel#	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead#	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony#	<0.02	<0.02	<0.02	<0.02	0.07	<0.02	<0.02	<0.02	<0.02		0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium#	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc#	0.03	<0.03	<0.03	<0.03	0.06	0.04	<0.03	<0.03	0.03		4	50	200	<0.03	mg/kg	TM30/PM17
Total Dissolved Solids#	<350	<350	<350	3562	2761	1030	790	370	440		4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	<20	<20	<20	<20	350	90	<20	<20	<20		500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.0914	0.0954	0.0942	0.0923	0.369	0.1394	0.0961	0.0922	0.096		-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	98.6	94.4	95.6	97.4	24.4	64.4	93.7	97.3	93.4		-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.899	0.895	0.896	0.898	0.622	0.85	0.894	0.897	0.894		-	-	-		l	NONE/PM17
Moisture Content 105C (% Dry Weight)	1.4	5.9	4.6	2.7	309.2	55.4	6.8	2.8	7.0		-	-	-	<0.1	%	PM4/PM0
pH#	9.43	8.81	8.92	8.19	7.14	8.41	9.59	8.82	8.82		-	-	-	<0.01	pH units	TM73/PM11
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		1	-	-	<0.1	mg/kg	TM26/PM0
Fluoride	<3	3	<3	4	4	<3	<3	<3	<3		10	150	500	<3	mg/kg	TM173/PM0
Sulphate as SO4#	7	34	16	2031	636	<5	116	9	<5		1000	20000	50000	<5	mg/kg	TM38/PM0
Chloride#	<3	<3	4	7	178	24	8	<3	3		800	15000	25000	<3	mg/kg	TM38/PM0

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road, Galway
Contact: Mike Sutton

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
24/6996	1	ST01	0.20-0.80	1-4	No interpretation possible
24/6996	1	ST02	0.15-0.80	5-8	No interpretation possible
24/6996	1	ST03	0.07-1.40	9-12	Trace of lubricating oil
24/6996	1	TP03	0.10-0.60	33-36	No interpretation possible
24/6996	1	TP03	0.61-1.10	37-40	Trace of possible PAHs & Naturally occurring compounds
24/6996	1	TP03	1.10-2.30	41-44	Trace of possible PAHs, Possible fatty acids & Trace of naturally occurring compounds
24/6996	1	TP04	0.07-1.00	45-48	Trace of naturally occurring compounds
24/6996	1	TP04	1.00-1.20	49-52	No interpretation possible
24/6996	1	TP05	0.55-1.35	57-60	No interpretation possible

Notification of Deviating Samples

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dyke Road, Galway
Contact: Mike Sutton

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
24/6996	1	ST01	0.20-0.80	1-4	EPH	Sample holding time exceeded
24/6996	1	ST02	0.15-0.80	5-8	EPH, GRO	Sample holding time exceeded
24/6996	1	ST03	0.07-1.40	9-12	EPH	Sample holding time exceeded
24/6996	1	TP03	1.10-2.30	41-44	TOC	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 24/6996

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 35°C ±5°C.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

Tentatively Identified Compounds (TICs)

Where Tentatively Identified Compounds (TICs) are reported, up to 10 Tentatively Identified Compounds will be listed where there is found to be a greater than 80% match with the NIST library. The reported concentration is determined semi-quantitively, with a matrix specific limit of detection. Note, other compounds may be present but are not reported.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 24/6996

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes

EMT Job No: 24/6996

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes

EMT Job No: 24/6996

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM61	Determination of Mercury by Cold Vapour Atomic Fluorescence - WATERS: Modified USEPA Method 245.7, Rev 2, Feb 2005. SOILS: Modified USEPA Method 7471B, Rev.2, Feb 2007	PM0	No preparation is required.	Yes		AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	

EMT Job No: 24/6996

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
Subcontracted	See attached subcontractor report for accreditation status and provider.					AR	

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4225

Attention :	Mike Sutton
Date :	21st May, 2024
Your reference :	13614-02-24
Our reference :	Test Report 24/7795 Batch 1
Location :	Dykes Road Galway
Date samples received :	8th May, 2024
Status :	Final Report
Issue :	202405211146

Fifteen samples were received for analysis on 8th May, 2024 of which fifteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 69.721 kg of CO2

Scope 1&2&3 emissions - 164.769 kg of CO2

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	13-16	17-20	21-24	25-28	29-32	33-36	37-40			
Sample ID	BH01	BH01	BH04	BH05	BH05	BH05	BRC01	BRC01	BRC01	BRC02			
Depth	0.50	1.50	1.50	0.25	0.50	1.50	0.50	1.50	3.50	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024			
Antimony	2	4	3	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	TM30/PM15
Arsenic#	8.5	15.0	1.4	1.6	2.2	2.3	1.2	2.9	1.2	1.8	<0.5	mg/kg	TM30/PM15
Barium#	96	209	69	8	28	25	8	21	103	8	<1	mg/kg	TM30/PM15
Cadmium#	0.9	0.5	<0.1	0.2	0.6	0.5	0.2	0.5	0.2	0.4	<0.1	mg/kg	TM30/PM15
Chromium#	28.1	42.9	172.7	11.6	19.2	22.6	15.5	23.2	19.0	9.5	<0.5	mg/kg	TM30/PM15
Copper#	43	77	4	4	8	8	4	13	8	5	<1	mg/kg	TM30/PM15
Lead#	97	184	<5	<5	9	8	<5	14	<5	<5	<5	mg/kg	TM30/PM15
Mercury#	0.2	0.5	<0.1	<0.1	0.1	0.1	<0.1	0.3	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Molybdenum#	3.0	4.3	2.1	1.0	1.0	1.2	2.1	1.7	1.2	0.8	<0.1	mg/kg	TM30/PM15
Nickel#	15.1	31.3	75.3	5.9	8.3	8.3	6.9	9.9	5.3	8.7	<0.7	mg/kg	TM30/PM15
Selenium#	3	<1	2	<1	<1	<1	<1	1	<1	<1	<1	mg/kg	TM30/PM15
Zinc#	152	232	90	<5	21	19	6	20	12	9	<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene#	<0.04	0.27	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	0.55	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene#	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene#	<0.04	0.21	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene#	0.15	1.43	<0.03	0.08	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Anthracene#	<0.04	0.78	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene#	0.57	5.19	<0.03	<0.03	<0.03	<0.03	<0.03	0.18	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Pyrene#	0.64	4.73	<0.03	0.05	<0.03	<0.03	<0.03	0.14	<0.03	0.05	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene#	0.35	2.82	<0.06	<0.06	<0.06	<0.06	<0.06	0.14	<0.06	<0.06	<0.06	mg/kg	TM4/PM8
Chrysene#	0.38	3.01	<0.02	0.15	<0.02	<0.02	0.05	0.11	<0.02	0.08	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene#	0.92	5.80	<0.07	<0.07	<0.07	<0.07	<0.07	0.20	<0.07	<0.07	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene#	0.60	3.70	<0.04	<0.04	<0.04	<0.04	<0.04	0.11	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene#	0.46	2.50	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene#	0.08	0.60	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene#	0.49	2.49	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Coronene	0.10	0.39	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
PAH 6 Total#	3.04	19.68	<0.22	<0.22	<0.22	<0.22	<0.22	0.49	<0.22	<0.22	<0.22	mg/kg	TM4/PM8
PAH 17 Total	4.74	34.54	<0.64	<0.64	<0.64	<0.64	<0.64	0.88	<0.64	<0.64	<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.66	4.18	<0.05	<0.05	<0.05	<0.05	<0.05	0.14	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.26	1.62	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(j)fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	TM4/PM8
PAH Surrogate % Recovery	100	97	99	99	95	99	99	99	98	100	<0	%	TM4/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	88	344	<30	1047	<30	<30	129	52	<30	296	<30	mg/kg	TM5/PM8/PM16

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	13-16	17-20	21-24	25-28	29-32	33-36	37-40			
Sample ID	BH01	BH01	BH04	BH05	BH05	BH05	BRC01	BRC01	BRC01	BRC02			
Depth	0.50	1.50	1.50	0.25	0.50	1.50	0.50	1.50	3.50	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024			
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1^{SV}	<0.1^{SV}	<0.1	0.2^{SV}	<0.1	<0.1	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)#	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)#	<7	22	<7	61	<7	<7	<7	<7	16	21	<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	88	300	<7	887	19	29	118	52	<7	246	<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_CU_1D_AL)	<7	22	<7	99	<7	<7	11	<7	<7	29	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH_CU+HS_1D_AL)	88	344	<26	1047	<26	29	129	52	<26	296	<26	mg/kg	TM5/TM36/PM8/PM12/PM16
>C6-C10 (HS_1D_AL)	<0.1^{SV}	<0.1^{SV}	<0.1	0.2^{SV}	<0.1	<0.1	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C25 (EH_CU_1D_AL)	<10	76	<10	198	<10	<10	10	<10	23	58	<10	mg/kg	TM5/PM8/PM16
>C25-C35 (EH_CU_1D_AL)	76	246	<10	753	19	24	108	45	<10	209	<10	mg/kg	TM5/PM8/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	<7	64	<7	91	<7	<7	<7	<7	<7	28	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	256	917	<7	1788	<7	86	238	141	<7	562	<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_CU_1D_AR)	43	122	<7	266	<7	<7	39	20	<7	100	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH_CU+HS_1D_AR)	299	1103	<26	2145	<26	86	277	161	<26	690	<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	387	1447	<52	3192	<52	115	406	213	<52	986	<52	mg/kg	TM5/TM36/PM8/PM12/PM16
>EC6-EC10 (HS_1D_AR)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1	<0.1	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC25 (EH_CU_1D_AR)	40	224	<10	369	<10	24	36	<10	<10	115	<10	mg/kg	TM5/PM8/PM16
>EC25-EC35 (EH_CU_1D_AR)	224	757	<10	1512	<10	68	208	131	<10	477	<10	mg/kg	TM5/PM8/PM16
MTBE#	<5^{SV}	<5^{SV}	<5	<5^{SV}	<5	<5	<5^{SV}	<5^{SV}	<5	<5	<5	ug/kg	TM36/PM12
Benzene#	<5^{SV}	<5^{SV}	<5	<5^{SV}	<5	<5	<5^{SV}	<5^{SV}	<5	<5	<5	ug/kg	TM36/PM12
Toluene#	<5^{SV}	<5^{SV}	<5	<5^{SV}	<5	<5	<5^{SV}	<5^{SV}	<5	<5	<5	ug/kg	TM36/PM12
Ethylbenzene#	<5^{SV}	<5^{SV}	<5	<5^{SV}	<5	<5	<5^{SV}	<5^{SV}	<5	<5	<5	ug/kg	TM36/PM12
m/p-Xylene#	<5^{SV}	<5^{SV}	<5	7^{SV}	<5	<5	<5^{SV}	<5^{SV}	<5	<5	<5	ug/kg	TM36/PM12
o-Xylene#	<5^{SV}	<5^{SV}	<5	<5^{SV}	<5	<5	<5^{SV}	<5^{SV}	<5	<5	<5	ug/kg	TM36/PM12
PCB 28#	<5	<50$_{AA}$	<5	<50$_{AA}$	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 52#	<5	<50$_{AA}$	<5	<50$_{AA}$	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 101#	<5	<50$_{AA}$	<5	<50$_{AA}$	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 118#	<5	<50$_{AA}$	<5	<50$_{AA}$	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 138#	<5	<50$_{AA}$	<5	<50$_{AA}$	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 153#	<5	<50$_{AA}$	<5	<50$_{AA}$	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 180#	<5	<50$_{AA}$	<5	<50$_{AA}$	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
Total 7 PCBs#	<35	<350$_{AA}$	<35	<350$_{AA}$	<35	<35	<35	<35	<35	<35	<35	ug/kg	TM17/PM8

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	13-16	17-20	21-24	25-28	29-32	33-36	37-40			
Sample ID	BH01	BH01	BH04	BH05	BH05	BH05	BRC01	BRC01	BRC01	BRC02			
Depth	0.50	1.50	1.50	0.25	0.50	1.50	0.50	1.50	3.50	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024			
Natural Moisture Content	39.0	49.1	0.9	3.6	12.4	14.6	3.8	78.9	131.0	3.5	<0.1	%	PM4/PM0
Moisture Content (% Wet Weight)	28.1	33.0	0.9	3.4	11.1	12.7	3.7	44.1	56.7	3.4	<0.1	%	PM4/PM0
Hexavalent Chromium$^{\#}$	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<6.0$_{AB}$	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Chromium III	28.1	42.9	172.7	11.6	19.2	22.6	15.5	23.2	19.0	9.5	<0.5	mg/kg	NONE/NONE
Total Organic Carbon$^{\#}$	3.64	8.97	0.47	0.62	0.28	0.63	0.65	6.69	4.84	0.37	<0.02	%	TM21/PM24
pH$^{\#}$	7.66	7.71	8.78	9.09	8.67	8.51	9.03	7.83	8.17	9.11	<0.01	pH units	TM73/PM11
Asbestos Type*	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD		None	Subcontracted

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Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	41-44	45-48	49-52	53-56	57-60						LOD/LOR	Units	Method No.
Sample ID	BRC02	BRC04	BRC04	BRC05	BRC05								
Depth	1.50	0.50	1.50	0.50	3.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024								
Antimony	<1	<1	<1	<1	<1						<1	mg/kg	TM30/PM15
Arsenic#	3.5	1.0	3.3	2.2	1.8						<0.5	mg/kg	TM30/PM15
Barium#	39	6	68	12	45						<1	mg/kg	TM30/PM15
Cadmium#	0.6	0.2	0.6	0.2	0.4						<0.1	mg/kg	TM30/PM15
Chromium#	23.4	8.7	29.7	13.2	34.2						<0.5	mg/kg	TM30/PM15
Copper#	17	3	11	4	13						<1	mg/kg	TM30/PM15
Lead#	28	<5	38	<5	8						<5	mg/kg	TM30/PM15
Mercury#	0.2	<0.1	<0.1	<0.1	<0.1						<0.1	mg/kg	TM30/PM15
Molybdenum#	2.1	0.6	1.8	1.2	1.5						<0.1	mg/kg	TM30/PM15
Nickel#	11.7	4.1	8.9	6.4	10.0						<0.7	mg/kg	TM30/PM15
Selenium#	2	<1	<1	<1	<1						<1	mg/kg	TM30/PM15
Zinc#	34	<5	106	<5	28						<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene#	<0.04	<0.40$_{AA}$	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.30$_{AA}$	<0.03	<0.03	<0.03						<0.03	mg/kg	TM4/PM8
Acenaphthene#	<0.05	<0.50$_{AA}$	<0.05	<0.05	<0.05						<0.05	mg/kg	TM4/PM8
Fluorene#	<0.04	<0.40$_{AA}$	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Phenanthrene#	<0.03	<0.30$_{AA}$	0.28	<0.03	<0.03						<0.03	mg/kg	TM4/PM8
Anthracene#	<0.04	<0.40$_{AA}$	0.11	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Fluoranthene#	<0.03	<0.30$_{AA}$	0.70	<0.03	<0.03						<0.03	mg/kg	TM4/PM8
Pyrene#	<0.03	<0.30$_{AA}$	0.59	<0.03	<0.03						<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene#	<0.06	<0.60$_{AA}$	0.41	<0.06	<0.06						<0.06	mg/kg	TM4/PM8
Chrysene#	<0.02	<0.20$_{AA}$	0.38	<0.02	<0.02						<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene#	<0.07	<0.70$_{AA}$	0.70	<0.07	<0.07						<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene#	<0.04	<0.40$_{AA}$	0.44	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene#	<0.04	<0.40$_{AA}$	0.26	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene#	<0.04	<0.40$_{AA}$	0.06	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene#	<0.04	<0.40$_{AA}$	0.24	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.40$_{AA}$	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
PAH 6 Total#	<0.22	<2.20$_{AA}$	2.34	<0.22	<0.22						<0.22	mg/kg	TM4/PM8
PAH 17 Total	<0.64	<6.40$_{AA}$	4.17	<0.64	<0.64						<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.50$_{AA}$	0.50	<0.05	<0.05						<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.20$_{AA}$	0.20	<0.02	<0.02						<0.02	mg/kg	TM4/PM8
Benzo(j)fluoranthene	<1	<10$_{AA}$	<1	<1	<1						<1	mg/kg	TM4/PM8
PAH Surrogate % Recovery	99	98$_{AA}$	100	99	94						<0	%	TM4/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	117	613	<30	137	<30						<30	mg/kg	TM5/PM8/PM16

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Client Name:	Ground Investigations Ireland	**Report :**	**Solid**
Reference:	13614-02-24		
Location:	Dykes Road Galway	**Solids:**	V=60g VOC jar, J=250g glass jar, T=plastic tub
Contact:	Mike Sutton		
EMT Job No:	24/7795		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	41-44	45-48	49-52	53-56	57-60								
Sample ID	BRC02	BRC04	BRC04	BRC05	BRC05								
Depth	1.50	0.50	1.50	0.50	3.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1						LOD/LOR	Units	Method No.
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024								
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1						<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1						<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1^{SV}	<0.1^{SV}	<0.1	0.5^{SV}	1.0						<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	<0.2	<0.2	<0.2	<0.2						<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)#	<4	<4	<4	<4	<4						<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)#	<7	22	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	117	521	<7	123	<7						<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_CU_1D_AL)	<7	70	<7	14	<7						<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH_CU+HS_1D_AL)	117	613	<26	138	<26						<26	mg/kg	TM5/TM36/PM8/PM12/PM16
>C6-C10 (HS_1D_AL)	<0.1^{SV}	<0.1^{SV}	<0.1	0.5^{SV}	1.0						<0.1	mg/kg	TM36/PM12
>C10-C25 (EH_CU_1D_AL)	31	92	<10	14	<10						<10	mg/kg	TM5/PM8/PM16
>C25-C35 (EH_CU_1D_AL)	90	450	<10	110	<10						<10	mg/kg	TM5/PM8/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1						<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1						<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1						<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<0.2	<0.2	<0.2	<0.2	<0.2						<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	<4	5	<4	<4	<4						<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	<7	65	8	<7	<7						<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	263	1271	9	266	<7						<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_CU_1D_AR)	34	230	<7	47	<7						<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH_CU+HS_1D_AR)	297	1571	<26	313	<26						<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	414	2184	<52	451	<52						<52	mg/kg	TM5/TM36/PM8/PM12/PM16
>EC6-EC10 (HS_1D_AR)#	<0.1^{SV}	<0.1^{SV}	<0.1	<0.1^{SV}	<0.1						<0.1	mg/kg	TM36/PM12
>EC10-EC25 (EH_CU_1D_AR)	56	254	<10	42	<10						<10	mg/kg	TM5/PM8/PM16
>EC25-EC35 (EH_CU_1D_AR)	222	1087	<10	231	<10						<10	mg/kg	TM5/PM8/PM16
MTBE#	<5^{SV}	<5^{SV}	<5	<5^{SV}	<5						<5	ug/kg	TM36/PM12
Benzene#	<5^{SV}	<5^{SV}	<5	<5^{SV}	<5						<5	ug/kg	TM36/PM12
Toluene#	<5^{SV}	<5^{SV}	<5	<5^{SV}	<5						<5	ug/kg	TM36/PM12
Ethylbenzene#	<5^{SV}	<5^{SV}	<5	<5^{SV}	<5						<5	ug/kg	TM36/PM12
m/p-Xylene#	<5^{SV}	<5^{SV}	<5	<5^{SV}	<5						<5	ug/kg	TM36/PM12
o-Xylene#	<5^{SV}	<5^{SV}	<5	<5^{SV}	19						<5	ug/kg	TM36/PM12
PCB 28#	<5	<50$_{AA}$	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 52#	<5	<50$_{AA}$	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 101#	<5	<50$_{AA}$	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 118#	<5	<50$_{AA}$	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 138#	<5	<50$_{AA}$	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 153#	<5	<50$_{AA}$	<5	<5	<5						<5	ug/kg	TM17/PM8
PCB 180#	<5	<50$_{AA}$	<5	<5	<5						<5	ug/kg	TM17/PM8
Total 7 PCBs#	<35	<350$_{AA}$	<35	<35	<35						<35	ug/kg	TM17/PM8

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	41-44	45-48	49-52	53-56	57-60								
Sample ID	BRC02	BRC04	BRC04	BRC05	BRC05								
Depth	1.50	0.50	1.50	0.50	3.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1						LOD/LOR	Units	Method No.
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024								
Natural Moisture Content	124.5	1.5	8.1	4.5	11.8						<0.1	%	PM4/PM0
Moisture Content (% Wet Weight)	55.5	1.5	7.5	4.3	10.5						<0.1	%	PM4/PM0
Hexavalent Chromium #	<6.0$_{AB}$	<0.3	<0.3	<0.3	<0.3						<0.3	mg/kg	TM38/PM20
Chromium III	23.4	8.7	29.7	13.2	34.2						<0.5	mg/kg	NONE/NONE
Total Organic Carbon #	7.30	0.73	0.43	0.16	0.13						<0.02	%	TM21/PM24
pH #	7.91	9.09	8.67	8.27	8.55						<0.01	pH units	TM73/PM11
Asbestos Type*	NAD	NAD	NAD	NAD	NAD							None	Subcontracted

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : **CEN 10:1 1 Batch**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	13-16	17-20	21-24	25-28	29-32	33-36	37-40	LOD/LOR	Units	Method No.
Sample ID	BH01	BH01	BH04	BH05	BH05	BH05	BRC01	BRC01	BRC01	BRC02			
Depth	0.50	1.50	1.50	0.25	0.50	1.50	0.50	1.50	3.50	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024			
Dissolved Antimony #	0.009	0.013	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	0.09	0.13	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	0.0026	0.0051	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.0071	0.0035	<0.0025	<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	0.026	0.051	<0.025	<0.025	<0.025	<0.025	<0.025	0.071	0.035	<0.025	<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.055	0.068	0.010	<0.003	<0.003	<0.003	<0.003	0.011	0.021	<0.003	<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.55	0.68	0.10	<0.03	<0.03	<0.03	<0.03	0.11	0.21	<0.03	<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.015	0.023	<0.002	<0.002	<0.002	<0.002	0.004	0.005	0.003	<0.002	<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.15	0.23	<0.02	<0.02	<0.02	<0.02	0.04	0.05	0.03	<0.02	<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	<0.003	0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	mg/l	TM61/PM0
Mercury Dissolved by CVAF #	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	mg/kg	TM61/PM0
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM26/PM0
Fluoride	<0.3	<0.3	<0.3	0.3	0.6	0.6	0.5	<0.3	<0.3	<0.3	<0.3	mg/l	TM173/PM0
Fluoride	<3	<3	<3	<3	6	6	5	<3	<3	<3	<3	mg/kg	TM173/PM0
Sulphate as SO4 #	93.2	83.4	1.1	4.4	3.4	3.1	2.4	12.6	<0.5	2.5	<0.5	mg/l	TM38/PM0
Sulphate as SO4 #	933	834	11	44	34	31	24	126	<5	25	<5	mg/kg	TM38/PM0
Mass of raw test portion	0.1038	0.0984	0.0972	0.094	0.0974	0.0967	0.095	0.1067	0.1052	0.0943		kg	NONE/PM17
Chloride #	3.1	9.2	0.4	0.6	0.6	0.7	0.5	2.0	1.8	0.5	<0.3	mg/l	TM38/PM0
Chloride #	31	92	4	6	6	7	5	20	18	5	<3	mg/kg	TM38/PM0
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09		kg	NONE/PM17
Dissolved Organic Carbon	4	6	5	<2	<2	<2	<2	15	8	<2	<2	mg/l	TM60/PM0
Dissolved Organic Carbon	40	60	50	<20	<20	<20	<20	150	80	<20	<20	mg/kg	TM60/PM0
pH	8.09	8.22	8.17	8.06	7.93	8.02	8.03	8.34	8.19	8.10	<0.01	pH units	TM73/PM0

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : **CEN 10:1 1 Batch**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	13-16	17-20	21-24	25-28	29-32	33-36	37-40			
Sample ID	BH01	BH01	BH04	BH05	BH05	BH05	BRC01	BRC01	BRC01	BRC02			
Depth	0.50	1.50	1.50	0.25	0.50	1.50	0.50	1.50	3.50	0.50			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024			
Total Dissolved Solids #	244	252	54	<35	43	45	<35	196	102	<35	<35	mg/l	TM20/PM0
Total Dissolved Solids #	2441	2519	540	<350	430	450	<350	1959	1020	<350	<350	mg/kg	TM20/PM0

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : **CEN 10:1 1 Batch**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	41-44	45-48	49-52	53-56	57-60								
Sample ID	BRC02	BRC04	BRC04	BRC05	BRC05								
Depth	1.50	0.50	1.50	0.50	3.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024						LOD/LOR	Units	Method No.
Dissolved Antimony#	<0.002	<0.002	<0.002	<0.002	<0.002						<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10)#	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM30/PM17
Dissolved Arsenic#	0.0051	<0.0025	<0.0025	<0.0025	<0.0025						<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10)#	0.051	<0.025	<0.025	<0.025	<0.025						<0.025	mg/kg	TM30/PM17
Dissolved Barium#	0.015	<0.003	0.014	0.009	0.016						<0.003	mg/l	TM30/PM17
Dissolved Barium (A10)#	0.15	<0.03	0.14	0.09	0.16						<0.03	mg/kg	TM30/PM17
Dissolved Cadmium#	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005						<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10)#	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/kg	TM30/PM17
Dissolved Chromium#	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015						<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10)#	<0.015	<0.015	<0.015	<0.015	<0.015						<0.015	mg/kg	TM30/PM17
Dissolved Copper#	<0.007	<0.007	<0.007	<0.007	<0.007						<0.007	mg/l	TM30/PM17
Dissolved Copper (A10)#	<0.07	<0.07	<0.07	<0.07	<0.07						<0.07	mg/kg	TM30/PM17
Dissolved Lead#	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/l	TM30/PM17
Dissolved Lead (A10)#	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum#	0.008	<0.002	<0.002	<0.002	<0.002						<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10)#	0.08	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM30/PM17
Dissolved Nickel#	<0.002	<0.002	<0.002	<0.002	<0.002						<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10)#	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM30/PM17
Dissolved Selenium#	<0.003	<0.003	<0.003	<0.003	<0.003						<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10)#	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM30/PM17
Dissolved Zinc#	0.003	<0.003	<0.003	<0.003	<0.003						<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10)#	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF#	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001						<0.00001	mg/l	TM61/PM0
Mercury Dissolved by CVAF#	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						<0.0001	mg/kg	TM61/PM0
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	mg/kg	TM26/PM0
Fluoride	0.4	<0.3	0.4	0.7	0.4						<0.3	mg/l	TM173/PM0
Fluoride	4	<3	4	7	4						<3	mg/kg	TM173/PM0
Sulphate as SO4#	21.0	4.5	6.1	149.4	4.5						<0.5	mg/l	TM38/PM0
Sulphate as SO4#	210	45	61	1493	45						<5	mg/kg	TM38/PM0
Mass of raw test portion	0.1029	0.0936	0.0968	0.0958	0.0983							kg	NONE/PM17
Chloride#	1.7	0.8	0.6	0.9	0.7						<0.3	mg/l	TM38/PM0
Chloride#	17	8	6	9	7						<3	mg/kg	TM38/PM0
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09							kg	NONE/PM17
Dissolved Organic Carbon	10	<2	3	<2	<2						<2	mg/l	TM60/PM0
Dissolved Organic Carbon	100	<20	30	<20	<20						<20	mg/kg	TM60/PM0
pH	8.21	8.00	8.34	7.74	8.03						<0.01	pH units	TM73/PM0

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : **CEN 10:1 1 Batch**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	41-44	45-48	49-52	53-56	57-60								
Sample ID	BRC02	BRC04	BRC04	BRC05	BRC05								
Depth	1.50	0.50	1.50	0.50	3.50								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1						LOD/LOR	Units	Method No.
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024								
Total Dissolved Solids #	140	43	77	330	60						<35	mg/l	TM20/PM0
Total Dissolved Solids #	1400	430	770	3299	600						<350	mg/kg	TM20/PM0

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : **EN12457_2**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12	13-16	17-20	21-24	25-28	29-32	33-36	37-40						
Sample ID	BH01	BH01	BH04	BH05	BH05	BH05	BRC01	BRC01	BRC01	BRC02						
Depth	0.50	1.50	1.50	0.25	0.50	1.50	0.50	1.50	3.50	0.50						
COC No / misc																
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T						
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1	1	1	1	Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024						
Solid Waste Analysis																
Total Organic Carbon $^{\#}$	3.64	8.97	0.47	0.62	0.28	0.63	0.65	6.69	4.84	0.37	3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.025^{SV}	<0.025^{SV}	<0.025	<0.025^{SV}	<0.025	<0.025	<0.025^{SV}	<0.025^{SV}	<0.025	<0.025	6	-	-	<0.025	mg/kg	TM36/PM12
Sum of 7 PCBs $^{\#}$	<0.035	<0.350$_{BA}$	<0.035	<0.350$_{BA}$	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	88	344	<30	1047	<30	<30	129	52	<30	296	500	-	-	<30	mg/kg	TM5/PM8/PM16
PAH Sum of 6 $^{\#}$	3.04	19.68	<0.22	<0.22	<0.22	<0.22	<0.22	0.49	<0.22	<0.22	-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	4.74	34.54	<0.64	<0.64	<0.64	<0.64	<0.64	0.88	<0.64	<0.64	100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic $^{\#}$	0.026	0.051	<0.025	<0.025	<0.025	<0.025	<0.025	0.071	0.035	<0.025	0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium $^{\#}$	0.55	0.68	0.10	<0.03	<0.03	<0.03	<0.03	0.11	0.21	<0.03	20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium $^{\#}$	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium $^{\#}$	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper $^{\#}$	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	2	50	100	<0.07	mg/kg	TM30/PM17
Mercury $^{\#}$	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01	0.2	2	<0.0001	mg/kg	TM61/PM0
Molybdenum $^{\#}$	0.15	0.23	<0.02	<0.02	<0.02	<0.02	0.04	0.05	0.03	<0.02	0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel $^{\#}$	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead $^{\#}$	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony $^{\#}$	0.09	0.13	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium $^{\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc $^{\#}$	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	4	50	200	<0.03	mg/kg	TM30/PM17
Total Dissolved Solids $^{\#}$	2441	2519	540	<350	430	450	<350	1959	1020	<350	4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	40	60	50	<20	<20	<20	<20	150	80	<20	500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.1038	0.0984	0.0972	0.094	0.0974	0.0967	0.095	0.1067	0.1052	0.0943	-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	86.9	91.3	92.7	95.8	92.5	93.0	95.1	84.3	85.6	95.9	-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.887	0.891	0.893	0.896	0.893	0.893	0.895	0.883	0.885	0.896	-	-	-		l	NONE/PM17
Moisture Content 105C (% Dry Weight)	15.0	9.5	7.9	4.4	8.1	7.5	5.2	18.6	16.8	4.2	-	-	-	<0.1	%	PM4/PM0
pH $^{\#}$	7.66	7.71	8.78	9.09	8.67	8.51	9.03	7.83	8.17	9.11	-	-	-	<0.01	pH units	TM73/PM11
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	-	-	<0.1	mg/kg	TM26/PM0
Fluoride	<3	<3	<3	<3	6	6	5	<3	<3	<3	10	150	500	<3	mg/kg	TM173/PM0
Sulphate as SO4 $^{\#}$	933	834	11	44	34	31	24	126	<5	25	1000	20000	50000	<5	mg/kg	TM38/PM0
Chloride $^{\#}$	31	92	4	6	6	7	5	20	18	5	800	15000	25000	<3	mg/kg	TM38/PM0

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton
EMT Job No: 24/7795

Report : **EN12457_2**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	41-44	45-48	49-52	53-56	57-60						Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.
Sample ID	BRC02	BRC04	BRC04	BRC05	BRC05											
Depth	1.50	0.50	1.50	0.50	3.50											
COC No / misc																
Containers	V J T	V J T	V J T	V J T	V J T											
Sample Date	06/05/2024	06/05/2024	06/05/2024	06/05/2024	06/05/2024											
Sample Type	Soil	Soil	Soil	Soil	Soil											
Batch Number	1	1	1	1	1											
Date of Receipt	08/05/2024	08/05/2024	08/05/2024	08/05/2024	08/05/2024											
Solid Waste Analysis																
Total Organic Carbon $^{\#}$	7.30	0.73	0.43	0.16	0.13						3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.025^{SV}	<0.025^{SV}	<0.025	<0.025^{SV}	<0.025						6	-	-	<0.025	mg/kg	TM36/PM12
Sum of 7 PCBs $^{\#}$	<0.035	<0.350$_{BA}$	<0.035	<0.035	<0.035						1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	117	613	<30	137	<30						500	-	-	<30	mg/kg	TM5/PM8/PM16
PAH Sum of 6 $^{\#}$	<0.22	<2.20$_{BA}$	2.34	<0.22	<0.22						-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	<0.64	<6.40$_{BA}$	4.17	<0.64	<0.64						100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic $^{\#}$	0.051	<0.025	<0.025	<0.025	<0.025						0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium $^{\#}$	0.15	<0.03	0.14	0.09	0.16						20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium $^{\#}$	<0.005	<0.005	<0.005	<0.005	<0.005						0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium $^{\#}$	<0.015	<0.015	<0.015	<0.015	<0.015						0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper $^{\#}$	<0.07	<0.07	<0.07	<0.07	<0.07						2	50	100	<0.07	mg/kg	TM30/PM17
Mercury $^{\#}$	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						0.01	0.2	2	<0.0001	mg/kg	TM61/PM0
Molybdenum $^{\#}$	0.08	<0.02	<0.02	<0.02	<0.02						0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel $^{\#}$	<0.02	<0.02	<0.02	<0.02	<0.02						0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead $^{\#}$	<0.05	<0.05	<0.05	<0.05	<0.05						0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony $^{\#}$	<0.02	<0.02	<0.02	<0.02	<0.02						0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium $^{\#}$	<0.03	<0.03	<0.03	<0.03	<0.03						0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc $^{\#}$	<0.03	<0.03	<0.03	<0.03	<0.03						4	50	200	<0.03	mg/kg	TM30/PM17
Total Dissolved Solids $^{\#}$	1400	430	770	3299	600						4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	100	<20	30	<20	<20						500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.1029	0.0936	0.0968	0.0958	0.0983						-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	87.6	96.6	93.2	94.1	92.0						-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.887	0.897	0.893	0.894	0.892						-	-	-		l	NONE/PM17
Moisture Content 105C (% Dry Weight)	14.2	3.5	7.3	6.3	8.6						-	-	-	<0.1	%	PM4/PM0
pH $^{\#}$	7.91	9.09	8.67	8.27	8.55						-	-	-	<0.01	pH units	TM73/PM11
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1						1	-	-	<0.1	mg/kg	TM26/PM0
Fluoride	4	<3	4	7	4						10	150	500	<3	mg/kg	TM173/PM0
Sulphate as SO4 $^{\#}$	210	45	61	1493	45						1000	20000	50000	<5	mg/kg	TM38/PM0
Chloride $^{\#}$	17	8	6	9	7						800	15000	25000	<3	mg/kg	TM38/PM0

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Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
24/7795	1	BH01	0.50	1-4	possible Lubricating Oil, trace of possible PAHs, possible Naturally Occurring Compounds
24/7795	1	BH01	1.50	5-8	possible Lubricating Oil, trace of possible PAHs, possible Naturally Occurring Compounds
24/7795	1	BH04	1.50	9-12	No interpretation possible
24/7795	1	BH05	0.25	13-16	possible Lubricating Oil, trace of possible PAHs, possible Tarmac/Bitumen
24/7795	1	BH05	0.50	17-20	trace of possible Lubricating Oil
24/7795	1	BH05	1.50	21-24	trace of possible Lubricating Oil, trace of possible PAHs, possible Naturally Occurring Compounds
24/7795	1	BRC01	0.50	25-28	possible Lubricating Oil, trace of possible PAHs, possible Tarmac/Bitumen, possible Naturally Occurring Compounds
24/7795	1	BRC01	1.50	29-32	trace of possible Lubricating Oil, possible Naturally Occurring Compounds
24/7795	1	BRC01	3.50	33-36	trace of possible PAHs & Unknown Aliphatic Hydrocarbon Peaks at 6.5 mins
24/7795	1	BRC02	0.50	37-40	possible Lubricating Oil, trace of possible PAHs, possible Tarmac/Bitumen, possible Naturally Occurring Compounds
24/7795	1	BRC02	1.50	41-44	trace of PAHs, Trace of possible Lubricating Oil & Unknown Aliphatic Hydrocarbon Peaks at 6.5 mins
24/7795	1	BRC04	0.50	45-48	possible Lubricating Oil, trace of possible PAHs, possible Tarmac/Bitumen, possible Naturally Occurring Compounds
24/7795	1	BRC04	1.50	49-52	trace of possible PAHs
24/7795	1	BRC05	0.50	53-56	possible Lubricating Oil, trace of possible PAHs, possible Tarmac/Bitumen, possible Naturally Occurring Compounds
24/7795	1	BRC05	3.50	57-60	No interpretation possible

Client Name: Ground Investigations Ireland
Reference: 13614-02-24
Location: Dykes Road Galway
Contact: Mike Sutton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 24/7795						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 35°C ±5°C.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

Tentatively Identified Compounds (TICs)

Where Tentatively Identified Compounds (TICs) are reported, up to 10 Tentatively Identified Compounds will be listed where there is found to be a greater than 80% match with the NIST library. The reported concentration is determined semi-quantitively, with a matrix specific limit of detection. Note, other compounds may be present but are not reported.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution
AB	x20 Dilution
BA	x10 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 24/7795

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes

EMT Job No: 24/7795

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM61	Determination of Mercury by Cold Vapour Atomic Fluorescence - WATERS: Modified USEPA Method 245.7, Rev 2, Feb 2005. SOILS: Modified USEPA Method 7471B, Rev.2, Feb 2007	PM0	No preparation is required.	Yes		AR	Yes

EMT Job No: 24/7795

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	
Subcontracted	See attached subcontractor report for accreditation status and provider.					AR	

APPENDIX 9 – Groundwater Monitoring Records

Appendix 8-1

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Hydrological and Hydrogeological Risk Assessment Report

PRESENTED TO

Galway City Council
Phase 1 - Corrib Causeway - Dyke Road

DATE

March 2025

Environmental Consultancy Services

DOCUMENT CONTROL SHEET

Client	Galway City Council
Project Title	Phase 1 - Corrib Causeway - Dyke Road
Document Title	Hydrological and Hydrogeological Risk Assessment

Rev.	Status	Author(s)	Reviewed by	Approved by	Issue Date
01	DRAFT	Gareth Carroll *Principal Consultant*	Patrick Higgins *Technical Director*	Patrick Higgins *Technical Director*	01/05/2024
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04	ISSUE – Client Review	Warren Vokes *Senior Consultant*	Gareth Carroll *Principal Consultant*	Patrick Higgins *Technical Director*	30/01/2025
05	FINAL – Legal Review	Warren Vokes *Senior Consultant*	Gareth Carroll *Principal Consultant*	Patrick Higgins *Technical Director*	05/03/2025

REPORT LIMITATIONS

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The methodology adopted and the sources of information used by Enviroguide in providing its services are outlined in this Report.

The work described in this Report is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

All work carried out in preparing this report has used, and is based upon, Enviroguide’s professional knowledge and understanding of the current relevant national legislation. Future changes in applicable legislation may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, Enviroguide has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, Enviroguide will have no obligation to advise the client of any such changes, or of their repercussions.

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If the scope of work includes subsurface investigation such as boreholes, trial pits and laboratory testing of samples collected from the subsurface or other areas of the site, and environmental or engineering interpretation of such information, attention is drawn to the fact that special risks occur whenever engineering, environmental and related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with best practice and a professional standard of care may fail to detect certain conditions. Laboratory testing results are not independently verified by Enviroguide and have been assumed to be accurate. The environmental, ecological, geological, geotechnical, geochemical and hydrogeological conditions that Enviroguide interprets to exist between sampling points may differ from those that actually exist. Passage of time, natural occurrences and activities on and/or near the site may substantially alter encountered conditions.

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1 INTRODUCTION

Enviroguide Consulting (hereafter referred to as EGC) was appointed by the Land Development Agency (hereafter referred to as the LDA), on behalf of Galway City Council (hereafter referred to as GCC), to complete a hydrological and hydrogeological risk assessment for the first phase of the proposed residential-led mixed use development at Dyke Road, Terryland, Co. Galway (hereafter referred to as the 'Proposed Development' and 'Site').

1.1 Project Objective

The project objective was to establish the baseline hydrological and hydrogeological conditions at the site and to identify the potential for any impacts on receptors associated with the Site and the Proposed Development:

- Establish the hydrological and hydrogeological regime and Conceptual Site Model at the proposed development site.
- Determine if there are any potential impacts on the receiving water environmental receptors including those at the site and adjoining downgradient of the site.
- Determine if the proposed development could impact on any designated and protected Natura 2000 sites hydraulically connected with the site.
- Determine if the proposed development could impact on the water quality status assigned by the EPA of the receiving water bodies hydraulically connected with the site for the purposes of the Water Framework Directive.

This hydrological and hydrogeological risk assessment will be used to inform the Appropriate Assessment (AA) Screening Report (Scott Cawley Ltd., 2025a) and Stage Two Natura Impact Statement (NIS) (Scott Cawley Ltd., 2025b). These reports have been prepared and submitted as part of the planning application documentation to assist the competent authority in assessing potential impacts on European sites resulting from the Proposed Development, either alone or in combination with other plans/projects.

1.2 Project Scope of Work

The scope of the hydrological and hydrogeological assessment included the following tasks:

- A desk-based review of published information and information pertaining to the Site and Proposed Development provided by the LDA / GCC.
- Develop a hydrogeological Conceptual-Site-Model and identify any potential source-pathway-receptor linkages.
- Identify and assess any potential impacts associated with the Proposed Development on sensitive receptors associated with the receiving water environment.

The assessment is based on the available design information provided by the LDA / GCC and information provided in the following reports.

- AECOM, 2025a. Phase 1 - Corrib Causeway - Dyke Road Infrastructure Report.
- AECOM, 2025b. Phase 1 - Corrib Causeway - Dyke Road Site Specific Flood Risk Assessment.
- AECOM, 2025c. Phase 1 - Corrib Causeway - Dyke Road Outline Construction Environmental Management Plan.

- ARUP, 2025. Phase 1 - Corrib Causeway - Dyke Road Hydraulic Model Assessment of Proposed Development.
- Ground Investigations Ireland (GII), 2024. Dyke Road Galway Ground Investigation Report.
- Minerex Geophysics Limited (Minerex), 2024. GCC Dyke Road Galway Geophysical Survey.

1.3 Professional Competency

The report was prepared by Warren Vokes Ba MSc MCIWEM C.WEM a Senior Consultant of EGC. Warren is a Chartered Water and Environmental Manager with over 8 years' experience of preparing environmental and hydrological assessments. The report was reviewed by Gareth Carroll BA BEng MIEnvSc CEnv, a Principal Consultant of EGC. Gareth is a Chartered Environmentalist (CEnv) with the Institute of Environmental Sciences (IES) with over 12 years' experience of preparing environmental and hydrogeological assessments for a range of project types and geological and hydrogeological site settings. The report was approved by Patrick Higgins BSc, MSc, MIEnvSc, CEnv. Patrick is a Chartered Environmentalist (CEnv) with IES with over 19 years' experience of preparing environmental and hydrogeological assessments for a range of project types and geological and hydrogeological site settings and who is Technical Director with EGC, is professionally competent and accredited to undertake hydrogeological assessments.

2 METHODOLOGY

2.1 Standards and Regulations

The methodology adopted for this assessment takes cognisance of the relevant standards and regulations pertinent to undertaking a hydrological and hydrogeological assessment in particular the following:

- Council Directive 2006/118/EEC, 2006. On the protection of groundwater against pollution and deterioration. European Parliament and the Council of European Communities.
- Commission Directive 2014/80/EU of 20 June 2014 amending Annex II to Directive 2006/118/EC of the European Parliament and of the Council on the protection of groundwater against pollution and deterioration.
- EU Water Framework Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy with amendments 2455/2001/EC, 2008/32/EC and 2008/105/EC (Water Framework Directive (WFD)).
- European Commission, 2022. WFD Reporting Guidance 2022. Final Draft V4.
- Environmental Protection Agency, December 2011. Guidance on the Authorisation of Discharges to Groundwater.
- Department of the Environment, Heritage and Local Government, Environmental Protection Agency and Geological Survey of Ireland, 1999. Groundwater Protection Schemes (Groundwater Protection Schemes, 1999).
- Local Government (Water Pollution (Amendment) Act 1977 (as amended).
- Water Services Act 2007 (as amended)
- European Communities (Water Policy) Regulations 2003 (as amended).
- European communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011.
- European Communities (Assessment and Management of flood Risks) Regulations 2010 (as amended).
- European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended).
- European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended).

2.2 Desk-based Study

A desk-based study was undertaken including a review of relevant information from the following publicly available sources and information provided by GCC:

- Ordnance Survey Ireland Online mapping (OSI, 2025).
- Geological Survey of Ireland Online mapping (GSI, 2025).
- Environmental Protection Agency Online mapping (EPA, 2025).
- National Parks & Wildlife Services, Protected Sites Webmapping (NPWS, 2025).
- Relevant drawings and design reports for the Proposed Development provided by GCC.

2.3 Risk Based Impact Assessment

A risk-based and receptor-focussed approach was adopted to include an assessment of any impact to the receiving hydrological and hydrogeological (water) environment associated with the Proposed Development.

The basis for a risk assessment is the Conceptual Site Model (CSM) or Source-Pathway-Receptor (SPR) model which underpins the Directive 2000/60/EC (Water Framework Directive) amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU that has been transposed to Irish legislation as European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) as amended, as well as EPA guidelines on the protection of groundwater and surface water resources including associated aquatic ecosystems and human health receptors (e.g., groundwater supply users), the EPA Guidance on the Authorisation of Discharges to Groundwater (EPA, 2011) and the EPA Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA, 2013) on the protection of groundwater and surface water resources including associated aquatic ecosystems and human health receptors (e.g., groundwater supply users).

A risk assessment is undertaken to provide an understanding of the risk associated with the presence of any potentially contaminating materials and/or activities on a site. This is informed by the assessment of potential for viable pollutant linkage(s) to be present. A pollutant linkage is established when there is a viable or potentially viable **S**ource, a **P**athway and a **R**eceptor (refer to Section 2.4 below).If one or more of the three elements are missing, the exposure pathway is considered incomplete and there is no risk associated with the activity or contaminant source (i.e., a viable means of exposure is not considered to be present or is unlikely to be present).

The objective of the Water Framework Directive (WFD) is no deterioration of the water quality status, and the “prevent or limit” objective is a key element of achieving that WFD status for all water bodies regardless of the water quality status of the water body. The ‘prevent or limit’ objective is a key element to achieving the WFD status and water quality objectives and in principle, prevent or limit measures (i.e., avoidance and mitigation) are the first line of defence in restricting inputs of pollutants from a development (i.e., ‘source’ removal) and any potential impact or deterioration of water quality status or WFD status of the receiving water body.

In this assessment all three elements of the Source-Pathway-Receptor model will be identified to develop a Conceptual Site Model (CSM), and any potential linkages evaluated and assessed to determine if the development could potentially impact upon any identified receptors including Natura 2000 sites as well as the WFD Status of the water bodies associated with the Site.

2.4 Conceptual Site Model

A CSM represents the characteristics of the Site and identifies the possible relationship and potential risk between contaminant sources (i.e., characteristics of the Proposed Development), pathways and receptors (receiving environment). These three essential elements of the CSM are described as:

- A **source –** a substance that is in, on or under the land and has the potential to cause harm or pollution.

- A **pathway** – a transport route or means by which a receptor can be exposed to, or affected by, a contaminant source; and
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.

The term pollutant linkage is used to describe a particular combination of source-pathway-receptor. Each of these elements can exist independently, but they create a risk only where they are linked together so that a particular contaminant affects a particular receptor through a particular pathway (i.e., a pollutant linkage).

The preliminary CSM for the Site of the Proposed Development is initially defined and this is then revised throughout the risk-based assessment process.

3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The Proposed Development forms part of an overall three phase Development Framework, in the form of the Corrib Causeway Development Framework. The overall Development Framework site extends to 1.78 hectares and is located to the northeast of the city centre, within walking distance from Eyre Square and is within the Headford Road area. The development frameworks aims to deliver a residential-led, mixed-use development. Phase 1, relates to the current, subject proposal; Phase 2, an existing car park south of the site, is intended to be redeveloped for a mix of uses such as civic, commercial, and cultural uses; and Phase 3 is intended to provide additional residential units. The current Phase 1 development, subject of this planning application, has the potential to act as a catalyst to kick-start the regeneration of this three phase development framework but also the redevelopment of the wider area. This particular site has been brought forward for the first phase of development on the basis that the Draft Headford Road Framework Plan (2009) envisioned residential development at this particular location with the more civic and commercial uses to be located further south on the Phase 2 site. The current Development Framework has been prepared to align with this vision.

The Proposed Development (i.e., the Phase 1 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 new raised pedestrian boardwalk along the western elevation of the building.
c) Open Space (approx. 2,778 sqm) is proposed in the form of (a) public open space (approx. 1,183 sqm) 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 sqm) 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 sqm) with dedicated external play area (approx. 60 sqm) at ground floor level.
e) A total of 33 no. car parking spaces at surface level to include 2 no. accessible spaces and 2 no. set down / drop off spaces to serve the childcare facility.
f) A total of 455 no. bicycle parking spaces to include 330 no. standard spaces, 100 no. visitor spaces and 25 no. cargo bicycle spaces all at surface / lower ground floor level.
g) Vehicular access is proposed via Dyke Road at 2 no. locations (to the north west and south west of the site). Pedestrian and Cyclist access is also delivered throughout the site via Dyke Road and includes a pedestrian crossing at Dyke Road. Pedestrian / cyclist connections to adjoining development to the north east and south east are also delivered.
h) The Proposed Development also provides for a further vehicular access point to the south of the main development site to facilitate new access to the existing southern

car park. A total of 12 no. car parking spaces will be removed with 161 no. car parking spaces remaining at this location.

i) 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 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 and providing a new pumping station complete with emergency storage, all boundary treatment, public lighting, internal roads and pathways, ESB substations, switch room, water tank rooms, storage room, meter rooms, sprinkler tank room, parcel stores, comms room, bin storage, bicycle stores, hard and soft landscaping, play equipment, below ground attenuation tanks, nature based SUDs features, green roofs, roof plant, site services and connections for foul drainage, surface water drainage and water supply.

The layout of the Proposed Development is presented in Figure 3-1.

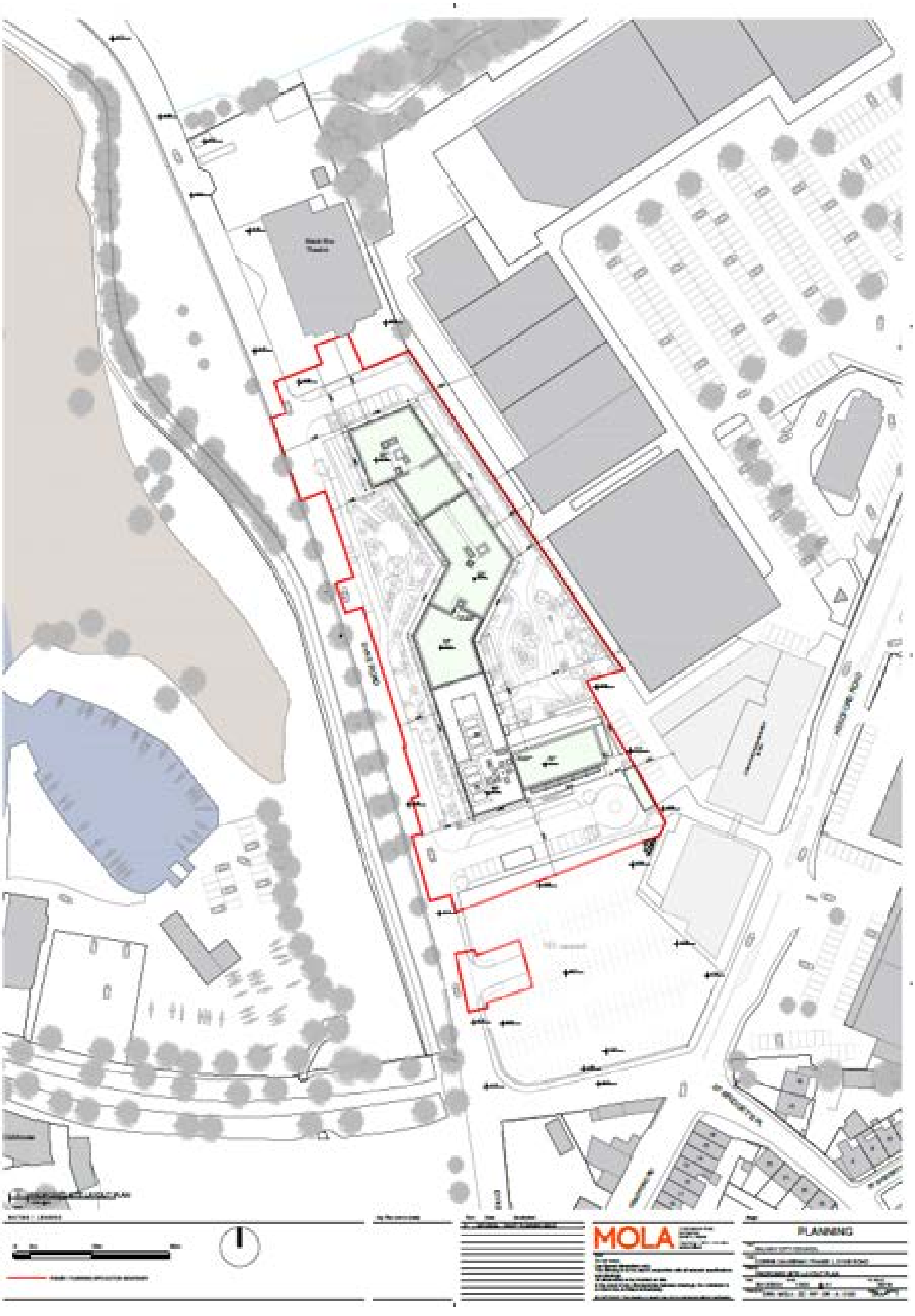

Figure 3-1. Proposed Development Site Layout (MOLA, 2024)

3.1 Construction Phase

The Construction Phase of the Proposed Development will include:

- It is understood that the foundation design will consist of 640mm diameter ODEX piles with reinforced in-situ concrete ground beams between pile caps and suspended slab.
- Stripping of existing macadam layers and road buildup (approximately 3,3037m^3).
- Excavation of soil and subsoil to formation level with the excavation of approximately 2,219m^3 of soils
- Excavation of soil and subsoil for the construction of building foundations, drainage and other infrastructure with excavation of 7,500m^3 of soils.
- It is anticipated that there will be no requirement for the excavation of bedrock during the construction phase of the Proposed Development.
- Where possible, it is intended to reuse suitable excavated soil and subsoil for landscaping and engineering use. However, where required, surplus materials will require removal offsite in accordance with all statutory legislation.
- Temporary stockpiling of excavated material pending re-use onsite or export offsite.
- The importation of 3,750m^3 of aggregate fill materials will be required for the construction of the piling matt.
- The importation of 3,072m^3 of aggregate fill materials will also be required for the construction of the Proposed Development (e.g., granular material beneath road pavement, under floor slabs and for drainage and utility bedding / surrounds etc.).
- Based on the findings of the ground investigation (GII, 2024) and the design requirements for the Proposed Development, it is anticipated that granular deposits may be encountered during excavations for building foundations, drainage and other infrastructure. Any excavations which penetrate the granular deposits will be required to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages.
- There may be a requirement for management of surface water (rainwater) and shallow groundwater (recorded at levels ranging between 0.17mbGL and 2.25mbGL), where encountered during groundworks.
- Construction of new foul and mains water connections in accordance with UE Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03), UE's Code of Practice for Water Infrastructure (IW-CDS-5020-03).
- Construction of new surface water drainage designed in accordance with the principles and objectives of Sustainable Drainage Systems (SuDS) and the requirements of Galway City Council (GCC).
- Diversion of existing surface water pipes within the Site from the footprint of proposed buildings.

3.2 Operational Phase

3.2.1 Surface Water Drainage

As documented in the Infrastructure Report (AECOM, 2025a), the proposed surface water drainage network, which will accommodate surface water runoff from impermeable surfaces in the Proposed Development (including roadways, roofs, and parking areas), will be managed in accordance with the policy requirements of Galway City Council Development Plan 2023-

2029 and the principles and objectives of SuDS and the Greater Dublin Strategic Drainage Study (GDSDS) to treat and attenuate surface water prior to discharging offsite as follows:

- It is proposed to install a new surface water piped gravity network which will discharge, at a restricted rate agreed with GCC of 25l/s, to the existing 600mm diameter concrete pipe which runs from south to north along the western boundary of the site and ultimately discharges to the Terryland Stream located approximately 0.13km north of the site at its closest point.
- As part of the Proposed Development, the LDA on behalf of GCC proposes to install a new separate gravity surface water drainage network to service the Proposed Development, which will discharge into the existing GCC 600mm Ø surface water concrete pipe. GCC confirms this pipe runs south-north along the western boundary of the Proposed Development, and discharges into the Terryland Stream. Preliminary investigations undertaken by LDA and GCC indicate sections of the pipe north of the Proposed Development (i.e., on Phase 3 development lands) may require repairs. GCC advises it will consider any potential future repairs in conjunction with LDA contribution from Phase 1, to ensure the Phase Proposed Development can connect to the existing surface water infrastructure.

The proposed surface water drainage network has been designed to convey run-off associated with a 1 in 5-year return period event without surcharge and a 1 in 100-year return period event without flooding. An additional 20% has been allowed for climate change in relation to rainfall intensities.

As detailed in the Infrastructure Report (AECOM, 2025a), the following attenuation and SuDS measures will be incorporated into the Proposed Development:

- Intensive green roof, providing a maximum storage volume of 131.2m^3.
- Exfiltration permeable paving car parking spaces
- Extensive linear rain gardens / swales (incorporating impermeable liner).
- Two (2No.) shallow reinforcement concrete attenuation tanks (providing a combined storage of 72.8m^3) with a hydrobrake installed at the outfall manhole.
- Class I By-Pass hydrocarbon separator.

The proposed surface water drainage layout and SuDS design are presented Figure 3-2.

Figure 3-2. Proposed Drainage Layout (AECOM, 2025a)

3.2.2 Foul Drainage

As documented in the Infrastructure Report (AECOM, 2025a), the estimated peak wastewater loading generated by the Proposed Development is estimated at 2.97 l/s.

Uisce Éireann (UE) have confirmed that the existing wastewater pumping station (WWPS) was designed to cater only for the Black Box Theatre and that it doesn't have capacity to cater for any additional flows. Therefore, it is proposed to relay the gravity foul sewer serving the Black Box Theatre and install a new gravity sewer network to serve the Proposed Development. The existing wastewater pumping station (WWPS) that serves the Black Box Theatre is to be decommissioned and a new WWPS constructed (AECOM, 2025a). The new WWPS has been positioned based on the flood extents within the site and to maximize the separation from buildings. The pumping station is located so that it is above the 1 in 100-year return period event water level and as far away from all buildings as possible. In addition, the above ground elements (kiosk and control room) are located above the 1:200-year return period. UE's minimum separation distance to be provided between pumping stations and habitable buildings is 15m which can be achieved within the site. An emergency tank with 24-hour storage capacity at Dry Weather Flow (DWF) has been provided to serve the Proposed Development and the Black Box Theatre (AECOM, 2025a).

As documented in the Infrastructure Report (AECOM, 2025a), the UE Confirmation of Feasibility (CoF) letter states that the proposed foul water connection is feasible subject to upgrades.

The existing 150mm rising main serving the existing WWPS is to be retained and reused. UE have confirmed that a 20m upgrade of a 150mm diameter sewer from Dyke Road to Wood Quay will be required. These works will be funded by the Applicant (AECOM, 2025a). Furthermore, the Applicant will also investigate the separation of storm water and foul water within the site of the Proposed Development and ensure that any existing storm water which is entering into the UE combined system is eliminated. The Applicant will ensure that there is no storm water discharge to the UE network.

A Statement of Design Acceptance (SoDA) has been issued by UE (AECOM, 2025a).

The proposed foul drainage will be designed in accordance with the Technical Guidance Document – Part H of the Building Regulations, UE's Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03), BS EN 752 – Drains and sewer systems outside buildings, Sewers for Adoption, 6th Edition and Micro Drainage Software Pipeline Design (AECOM, 2025a).

It is understood that foul water from the Proposed Development will be treated in the Galway Wastewater Treatment Plant (WWTP) (Discharge Licence No. D0050-01) before ultimately discharging to the Corrib Estuary transitional waterbody (EU Code: IE_WE_170_0700).

3.2.3 Water Supply

As documented in the Infrastructure Report (AECOM, 2025a), it is proposed to take a connection off the existing 300mm watermain on the Headford Road. The new watermain will pass through the Phase 2 lands and loop around all 4 sides of the Proposed Development.

The internal water supply network is based on the requirements of the Uisce Éireann Code of Practice for Water Supply (IW-CDS-5030-02) and the Technical Guidance Document – Part B of the Building Regulations.

Firefighting water supplies and fire hydrants will be provided as required in accordance with the Building Regulations and the requirement of Galway City Fire Service.

The UE CoF letter states that the proposed water supply connection is feasible without infrastructure upgrade from UE (AECOM, 2025a).

A SoDA has been issued by UE (AECOM, 2025a).

4 SITE SETTING

4.1 Site Location and Description

The site of the Proposed Development is located at Dyke Road, Terryland, Co. Galway. The site, which extends to 1.144 hectares (Ha), is accessed by the Dyke Road and is located within the Headford Road area, to the northeast of the city centre and approximately 0.65km walking distance from Eyre Square.

The current land use at the site of the Proposed Development comprises a surface car park of approximately 311No. car parking spaces.

The site of the Proposed Development is bound to the north by the Black Box Theatre (i.e., Phase 3 of the overall Development Framework) which adjoins Terryland Forest Park to the south by Dyke Road Car Park comprising approximately 243No. car parking spaces (i.e., Phase 2 of the overall Development Framework) which adjoins local road Bóthar Na Dige, to the east by Galway Retail Park, and to the west by Dyke Road which adjoins the future greenway that intends to re-establish the old Clifden Railway Bridge and provide a greenway running from Galway City to Moycullen.

The surrounding lands are mainly comprised of low density, low grade commercial buildings with extensive surface car parking.

The site location is presented in Figure 4-1 and the current layout of the site is presented in Figure 4-2.

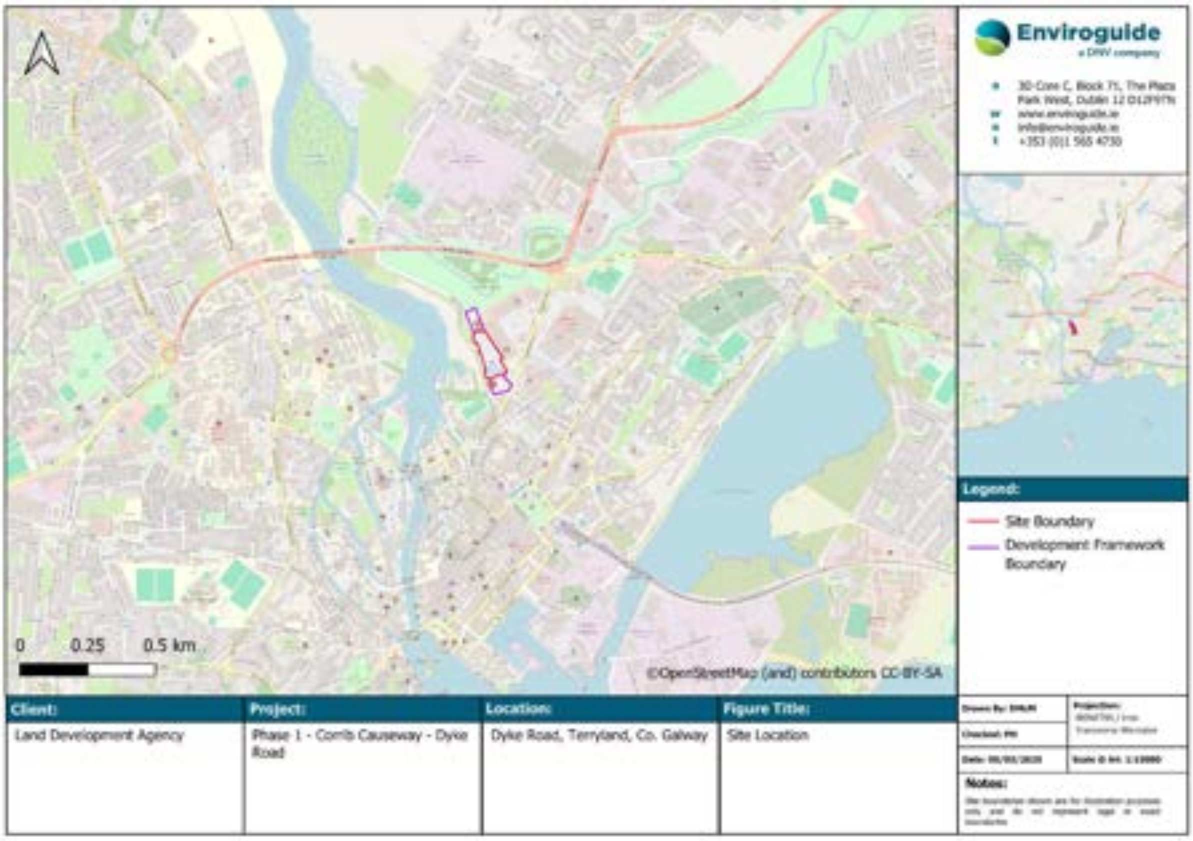

Figure 4-1. Site Location

Figure 4-2. Current Site Layout

4.2 Topography

As detailed in the Infrastructure Report (AECOM, 2025a), a topographical survey undertaken by Apex Surveys in October 2023 of the overall Development Framework site indicates that ground levels range from 3.84 meters above Ordnance Datum (mOD) at the northern end of the site to 7.12mOD 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 6.0mOD to approximately 7.0mOD.

The ground levels at the site of the Proposed Development typically range from 4.8mOD to 5.9mOD with the level in the centre of the site typically being around 5.3mOD.

4.3 Soil and Subsoil

The soils beneath the site of the Proposed Development are mapped by Teagasc (Teagasc, 2025) as made ground (IFS Soil Code: Made). It is noted that the soils beneath the existing Black Box Theatre adjoining the northern boundary of the site are mapped as mineral alluvium (IFS Soil Code: AlluvMIN). As documented in the Infrastructure Report (AECOM, 2025a), it is possible that the site was partially filled in the 1970s and 1980s with rubble from Galway’s inner city, which may include medieval and late medieval architecture fragments.

The subsoil or quaternary sediments beneath the site of the Proposed Development are mapped by the GSI (GSI, 2025) as urban. It is noted that the soils beneath the existing Black Box Theatre adjoining the northern boundary of the site are mapped by the GSI (GSI, 2025) as Fen Peat (FenPt).

The GSI (GSI, 2025) mapped soils and quaternary geology at the Site are presented in Figure 4-3 and Figure 4-4.

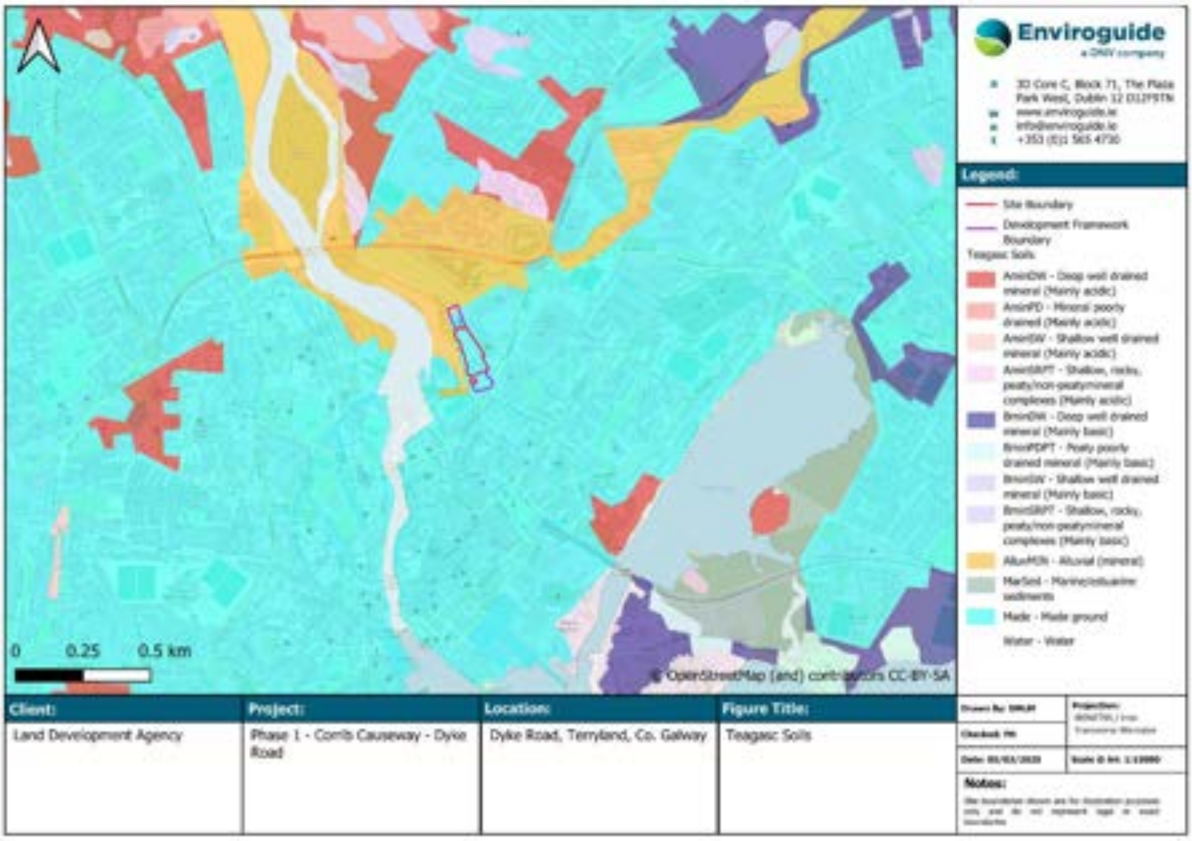

Figure 4-3. Soils

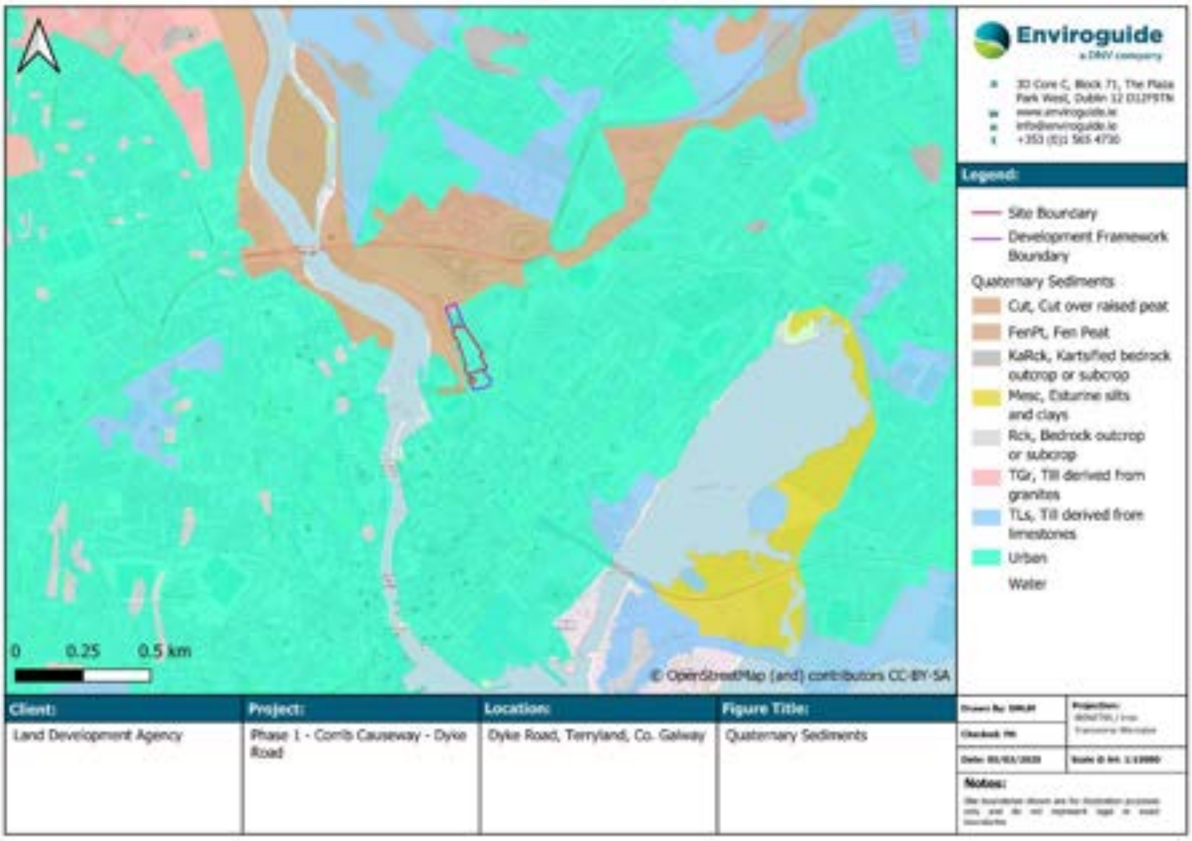

Figure 4-4. Quaternary Soils

4.4 Bedrock Geology

The bedrock beneath the site is mapped by the GSI (GSI, 2025) as the Burren Formation (New Code: CDBURR) described as pale grey packstones and wackestones, but also contains intervals of dark cherty limestones, often associated with oolitic grainstones.

While there are no bedrock outcrops mapped within the site boundary there are a number of bedrock outcrops mapped by the GSI (GSI, 2025) within a 2km radius of the site. The closest bedrock outcrop recorded by the GSI (GSI, 2025) is located approximately 0.36km west of the site. Additional outcropping is recorded approximately 0.87km north of the site.

The bedrock geology is presented in Figure 4-5.

4.4.1 Karst

Galway City and its surrounding areas exhibit a distinctive karst landscape characterised by its unique geological features and limestone formations. Karst weathering is a gradual process occurring over thousands of years, initiated by CO2-enriched rainwater percolating through carbonate bedrock. This slightly acidic water dissolves the rock, forming voids. Over time, these voids can become filled with sub-soils through drop-out subsidence. The region's abundant rainfall, coupled with the presence of carbonate-rich bedrock, has facilitated the development of numerous karst features, including sinkholes, caves, and underground rivers.

There are no karst features mapped by the GSI (GSI, 2025) at the site or within a 2km radius of the site. However, it is noted that the closest karst features to the site, which include two swallow holes (Karst Feature Unique ID: IE_GSI_Karst_40K_890 and IE_GSI_Karst_40K_942) and a cave (Karst Feature Unique ID: IE_GSI_Karst_40K_1048), are located approximately 2.18km northeast of the site at their closest point (refer to Figure 4-5).

As documented in the Galway City County Geological Site Report (GSI, 2020), the two (2No.) swallow holes, described as estavelles, are hydraulically connected to the Terryland Stream (River Waterbody Code: IE_WE_30C020600), located approximately 0.13km north of the site at its closest point, when they act as springs and to the Corrib Estuary transitional waterbody (EU Code: IE_WE_170_0700) via an underground conduit system when they act as sinks. The precise discharge locations of the estavelles are unknown.

As discussed in Section 4.5, Minerex Geophysics Ltd. (MGX) carried out a geophysical survey (Minerex, 2024) at the Site consisting of 2D-Resistivity (ERT), seismic refraction (p-wave) and MASW (s-wave) surveying for the Site. Some high resistivities at depth indicated that there is clean limestone present that is liable to karstification, but it does not have to be karstified. It is noted that the Ground Investigation Report (GII, 2024) did not identify any karst features at the site.

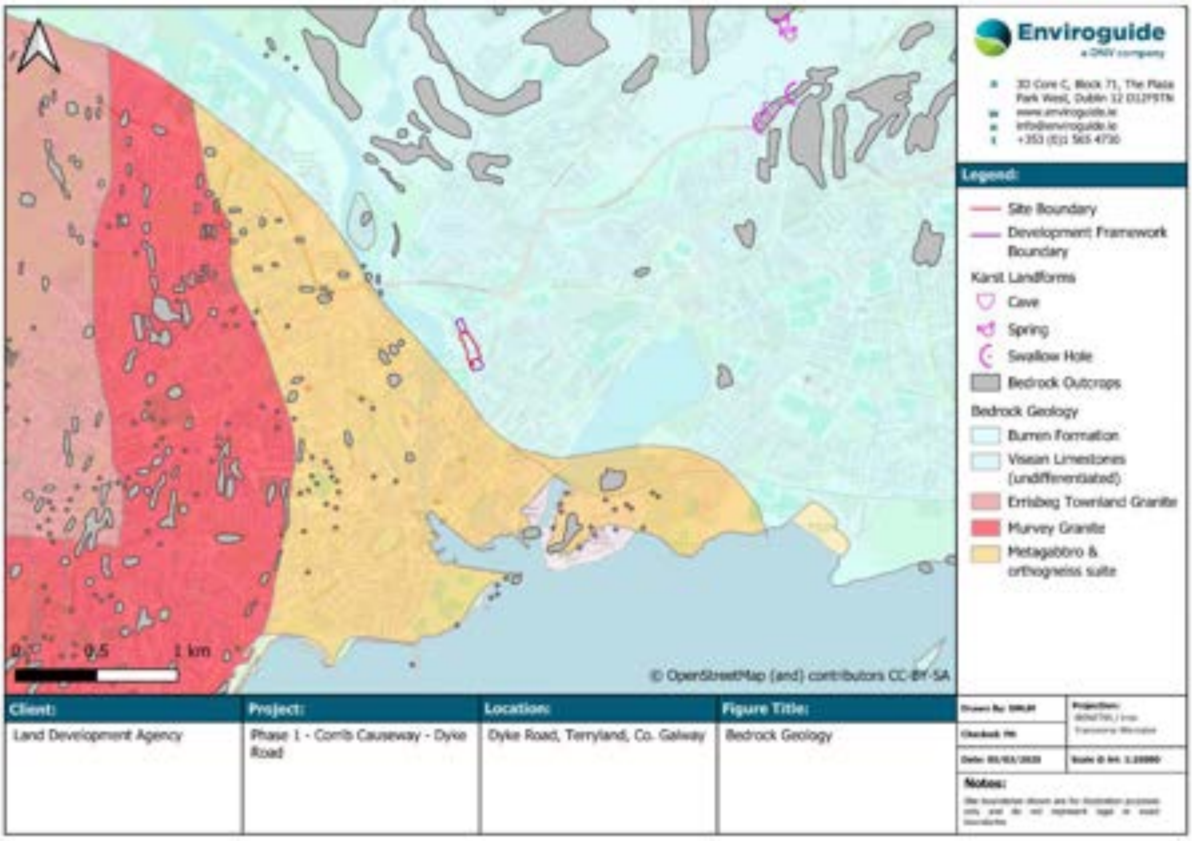

Figure 4-5. Bedrock Geology

4.5 Site Investigation Results

4.5.1 Intrusive Ground Investigations

As documented in the Ground Investigation Report (GII, 2024), the ground conditions across the stie comprise the following:

- SURFACING: Tarmac surfacing was present typically to a depth of 0.06 meters below ground level (mbGL).
- MADE GROUND: Made Ground deposits were encountered beneath the surfacing and were generally present to depths of between 0.5mbGL and 1.0mbGL and a maximum of 3.4mbGL in BRC04. These deposits were described generally as grey Sand and Gravel FILL and contained occasional fragments of tarmacadam occasionally overlying grey slightly sandy gravelly Clay and brownish black gravelly Peat with occasional red brick, ceramic and rubbish fragments.
- ORGANIC DEPOSITS: Organic deposits were generally encountered beneath the Made Ground and were described typically as brownish black slightly clayey slightly gravelly PEAT. The secondary constituents varied across the site, with silt and clay lenses occasionally present in the peat. The strength of the deposits was typically very soft based on SPT N values.
- SOFT COHESIVE DEPOSITS: Soft Cohesive deposits were encountered beneath the organic deposits and were generally described as beige or cream clayey SILT with frequent shell fragments occasionally onto light grey slightly sandy slightly gravelly clayey SILT with occasional cobbles. The secondary sand and gravel constituents

varied across the site and with depth, and peat lenses were occasionally present within the deposits. The strength of the soft cohesive deposits was typically very soft to soft.
- COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the soft cohesive deposits at some locations and were described typically as light grey to grey slightly sandy slightly gravelly silty CLAY with occasional cobbles. The secondary sand and gravel constituents varied across the site and with depth. The strength of the cohesive deposits typically increased with depth and was stiff or very stiff below 6.0m BGL in the majority of the exploratory holes. These deposits had some occasional cobble content, where noted on the exploratory hole logs.
- GRANULAR DEPOSITS: Granular deposits were occasionally encountered at the base of the cohesive deposits and were typically described as grey very sandy subangular to subrounded fine to coarse GRAVEL with occasional cobbles. The secondary sand constituents varied across the site while occasional cobble content was also present were noted on the exploratory hole logs. Based on the SPT N values the deposits are typically medium dense to dense and become dense with depth. Groundwater strikes were occasionally noted in the boreholes on encountering the granular deposits.
- BEDROCK: The rotary core boreholes recovered strong thinly to medium bedded grey fine to medium grained fossiliferous LIMESTONE, with the exception of BRC04 which recovered strong to very strong thinly to thickly banded dark green medium to coarsely crystalline METAGABBRO. Occasional calcite veins were noted during logging. The depth to rock increases to the southeast from 11.2mbGL in BH01 in the north-western corner of the site to a maximum depth of 15.3mbGL in BRC03 in the centre. The depth to rock decreases to 9.4mbGL in BRC06, and further decreases to between 6.6mbGL and 6.1mbGL respectively in BRC04 and BRC05 in the southeastern portion of the site.

As documented in the Ground Investigation Report (GII, 2024), groundwater strikes were recorded between 1.30mbGL and 9.5mGL during borehole drilling. Four (4No.) groundwater monitoring wells were installed at the site (BRC1, BRC02, BRC04 and BRC05) to allow the equilibrium groundwater level to be determined. Groundwater level measurements ranged from 0.17mbGL to 2.25mbGL.

It is noted that the Ground Investigation Report (GII, 2024) did not identify any karst features at the site.

4.5.2 Geophysical Survey Results

Minerex Geophysics Ltd. (MGX) carried out a geophysical survey (Minerex, 2024) consisting of 2D-Resistivity (ERT), seismic refraction (p-wave) and MASW (s-wave) surveying for the site. The findings of the geophysical survey are summarised as follows:

- The seismic refraction survey was modelled with a total of four layers:
  - Layer 1 is mainly affected by the road construction. High resistivities near the surface indicate road construction material such as gravel and tarmac. This layer would also contain urban made ground and peat.
  - Layer 2 is interpreted as soft to firm clay and silt or urban made ground or peat. This layer extends down to an elevation of approximately 0mOD across much of the site but extends deeper in the northwest.

  - Layer 3 is described as very stiff or very dense overburden. This layer is only present in the northwest of the site. It may contain some very weathered rock.
  - Layer 4 is interpreted as rock. The depth to the top of this layer is between 4mbGL to 9mbGL across most of the site but 11mbGL to 12mbGL in the northwest in RC BRC01 and BH01. Due to the interference the seismic modelling depth was limited here to around 10m.
- Some high resistivities at depth indicate that there is clean limestone present that is liable to karstification, but it does not have to be karstified (refer to Figure 4-6).

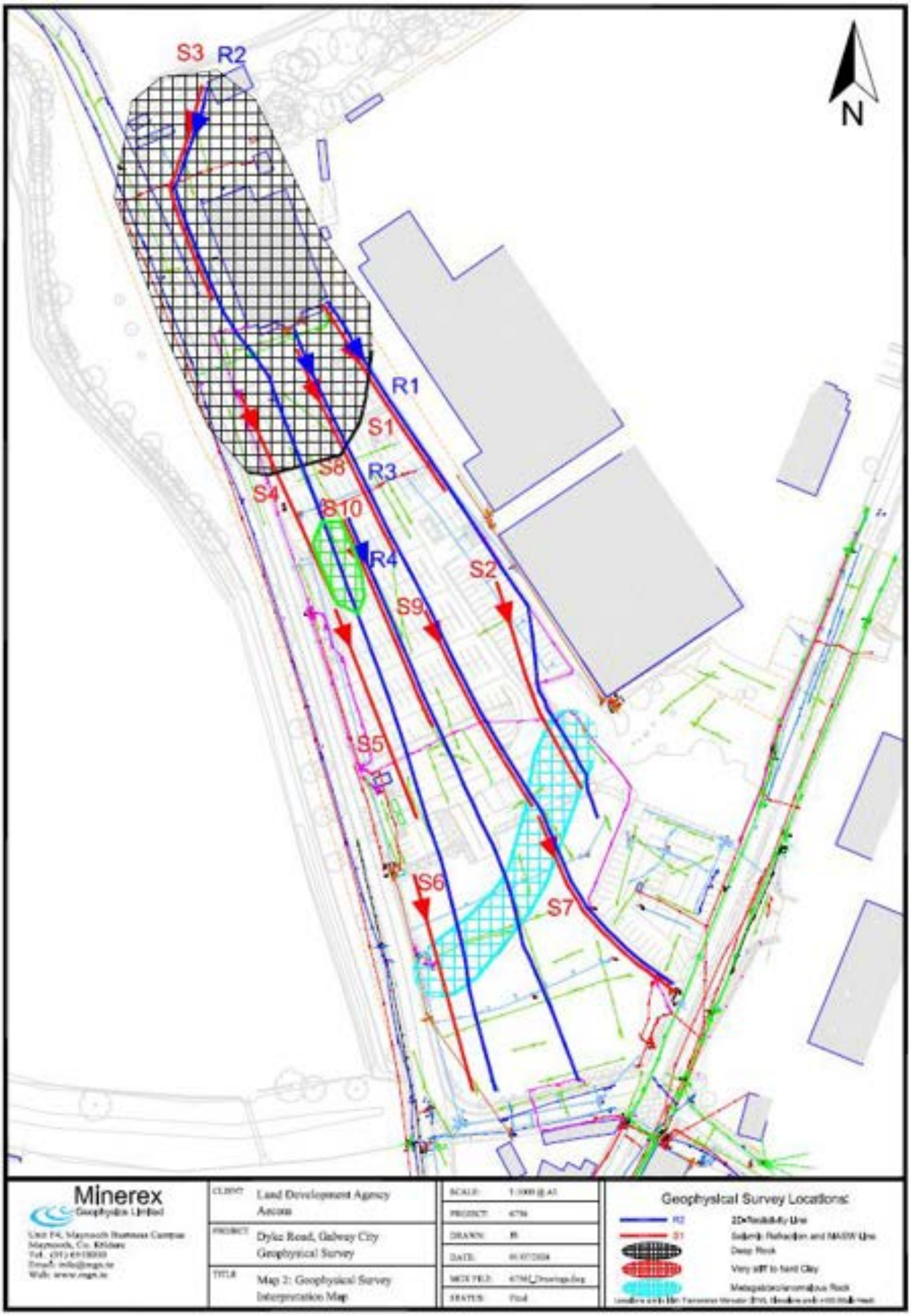

Figure 4-6. Geophysical Survey Interpretation Map (Minerex, 2024)

4.5.3 Soil Quality

Soil analytical data for soil samples collected across the site are provided in the ground investigation report (GII, 2024).

As documented in the ground investigation report (GII, 2024), a total of twenty-eight (28No.) soil samples collected were analysed for a suite of parameters suitable to determine the suitability of soils for disposal to a landfill. Soil analytical data for soil samples collected across the site are provided in the ground investigation report (GII, 2024). It is noted that a waste classification assessment was not included within the ground investigation report (GII, 2024).

Based on a review of the results, there is evidence of low-level anthropogenic contamination in sampled soils across the site:

- Detectable concentrations of Polycyclic Aromatic Hydrocarbons (PAHs), ranging from 0.67mg/kg to 34.54mg/kg, were reported for ten (10No.) samples collected. The reported concentrations of PAHs at remaining sample locations were below the laboratory limit of detection (LOD).
- Detectable concentrations of Total Petroleum Hydrocarbons (TPH), ranging from 69mg/kg to 3192mg/kg, were reported for fifteen (15No.) samples collected. The reported concentrations of TPH at remaining sample locations were below the LOD.
- Detectable concentrations of Extractable Petroleum Hydrocarbons (EPH), ranging from 877mg/kg to 1033mg/kg, were reported for three (3No.) samples collected. The reported concentrations of EPH at remaining sample locations were below the LOD.
- Detectable concentrations of Mineral Oil, ranging from 52mg/kg to 1047mg/kg, were reported for twelve (12No.) samples collected. The reported concentrations of mineral oil at remaining sample locations were below the LOD.
- Detectable concentrations of toluene and/or m/p xylene, of 7ug/kg, were reported for two (2No.) samples collected. The reported concentrations of toluene and m/p xylene at remaining sample locations were below the LOD.
- The reported concentration of Polychlorinated Biphenyl (PCBs) were reported below the LOD.
- The reported concentration of benzene, ethylbenzene and o-xylene were less than the Limit of Detection (LOD).
- Asbestos was reported as ‘no asbestos detected’ for all samples.

4.6 Hydrogeology

4.6.1 Groundwater Body and Flow Regimes

The EPA (EPA, 2025) maps the groundwater body (GWB) beneath the site as the Clare-Corrib GWB (EU Code: IE_WE_G_0020). The Clare-Corrib GWB covers some 642 km2 and occupies an area across Co. Galway, Co. Mayo and Co. Roscommon (GSI, 2025).

The Clare-Corrib GWB Report (GSI, 2025) identifies that diffuse recharge occurs over the GWB via rainfall percolating through the permeable subsoil and point recharge to the underlying aquifer occurs by means of swallow holes and collapse features/dolines.

Groundwater primarily discharges into rivers, large springs, and Lake Corrib (EU Code: IE_WE_30_666a), located approximately 3.55m north of the Site at its closest point. During winter, it contributes to turloughs and is directed through artificial channels to manage flooding. Contributions to the River Corrib (River Waterbody Code: IE_WE_30C020600), located approximately 0.07km west of the site at its closest point, and the Terryland Stream, located approximately 0.13km north of the site at its closest point, are also considered likely.

The karstic systems within the Clare-Corrib GWB exhibit high levels of interconnection, facilitating regional-scale flow systems. Groundwater can bypass surface water catchments by flowing beneath surface water channels and across catchment divides. Flow paths within karst areas can extend up to 10km in length.

Groundwater flow occurs through various geological features such as fissures, faults, joints, and bedding planes. Notably, in limestone formations, karstification significantly enhances permeability, particularly along structural elements like fold axes and faults. This intricate network of pathways complicates predictions of groundwater flow. While the overall groundwater flow direction generally trends towards the River Clare and Lake Corrib, the highly karstified bedrock introduces significant local variability in flow directions. In the vicinity of the site groundwater flow likely follows a path that ultimately leads towards the River Corrib.

4.6.2 Aquifer Classification

The GSI (GSI, 2025) has classified the bedrock of the Burren Formation beneath the site and within the surrounding areas as a ‘Regionally Important Aquifer - Karstified (conduit) (RKc).

Regionally important aquifers are capable of supplying regionally important abstractions (e.g. large public water supplies), or ‘excellent’ yields (>400 m3/d). ‘Karstification’ is the process whereby limestone is slowly dissolved away by percolating waters. Karstification frequently results in the uneven distribution of permeability through the rock, and the development of distinctive karst landforms at the surface (e.g. swallow holes, caves, dry valleys), some of which provide direct access for recharge/surface water to enter the aquifer.

The bedrock aquifer beneath the Site is presented in Figure 4-7 below.

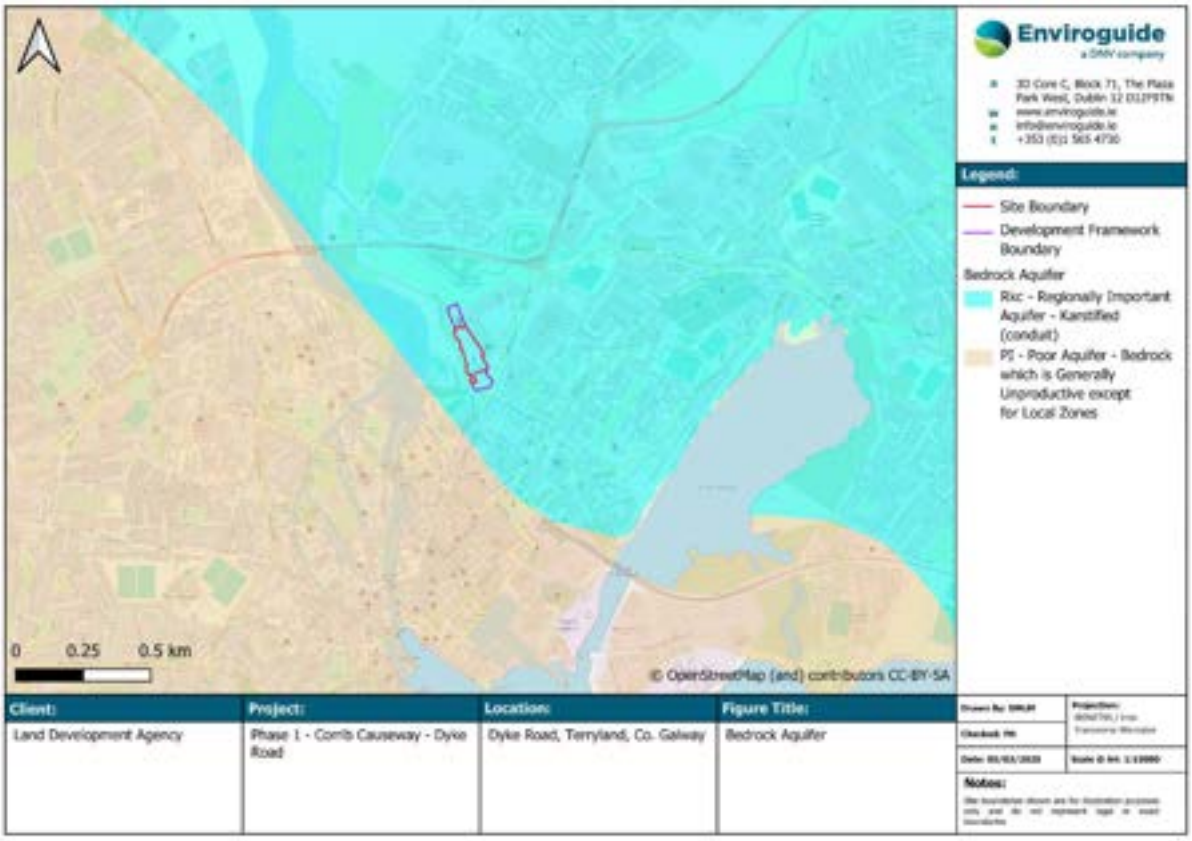

Figure 4-7. Bedrock Aquifer

4.6.3 Groundwater Vulnerability

The vulnerability categories, and methods for determination, are presented in the Groundwater Protection Schemes publication (DEHLG/EPA/GSI, 1999) and summarised in Table 4-1. The publications state that *'as all groundwater is hydrologically connected to the land surface, it is the effectiveness of this connection that determines the relative vulnerability to contamination. Groundwater that readily and quickly receives water (and contaminants) from the land surface is considered to be more vulnerable than groundwater that receives water (and contaminants) more slowly and in lower quantities. The travel time, attenuation capacity and quantity of contaminants are a function of the following natural geological and hydrogeological attributes of any area'.*

Table 4-1. Vulnerability Mapping Criteria

Subsoil Thickness	***Hydrogeological Requirements***				
	Diffuse Recharge			***Point recharge***	***Unsaturated Zone***
	Subsoil Permeability & Type			***(Swallow holes, losing streams)***	***(sand & gravel aquifers only)***
	High permeability (sand & gravel)	***Moderate permeability (sandy subsoil)***	***Low permeability (clayey subsoil, clay, peat)***		
0-3m	*Extreme*	*Extreme*	*Extreme*	*Extreme (30m radius)*	*Extreme*
3-5m	*High*	*High*	*High*	*N/A*	*High*
5-10m	*High*	*High*	*Moderate*	*N/A*	*High*
>10m	*High*	*Moderate*	*Low*	*N/A*	*High*
Notes: (i) N/A = not applicable (ii) Permeability classifications relate to the material characteristics as described by the subsoil description and classification method.					

The GSI (GSI, 2025) has assigned a groundwater vulnerability rating of 'High' for the groundwater beneath the site. The anticipated depth to bedrock based on the high groundwater vulnerability rating and moderate permeability subsoils beneath the site is between 3.0mbGL and 5.0mbGL.

Site Investigations (GII, 2024) recorded a depth to bedrock ranging from 6.1mbGL to 15.3mbGL. Considering the moderate permeability subsoils encountered this indicates a vulnerability rating of 'High'.

The groundwater vulnerability rating map is provided in Figure 4-8.

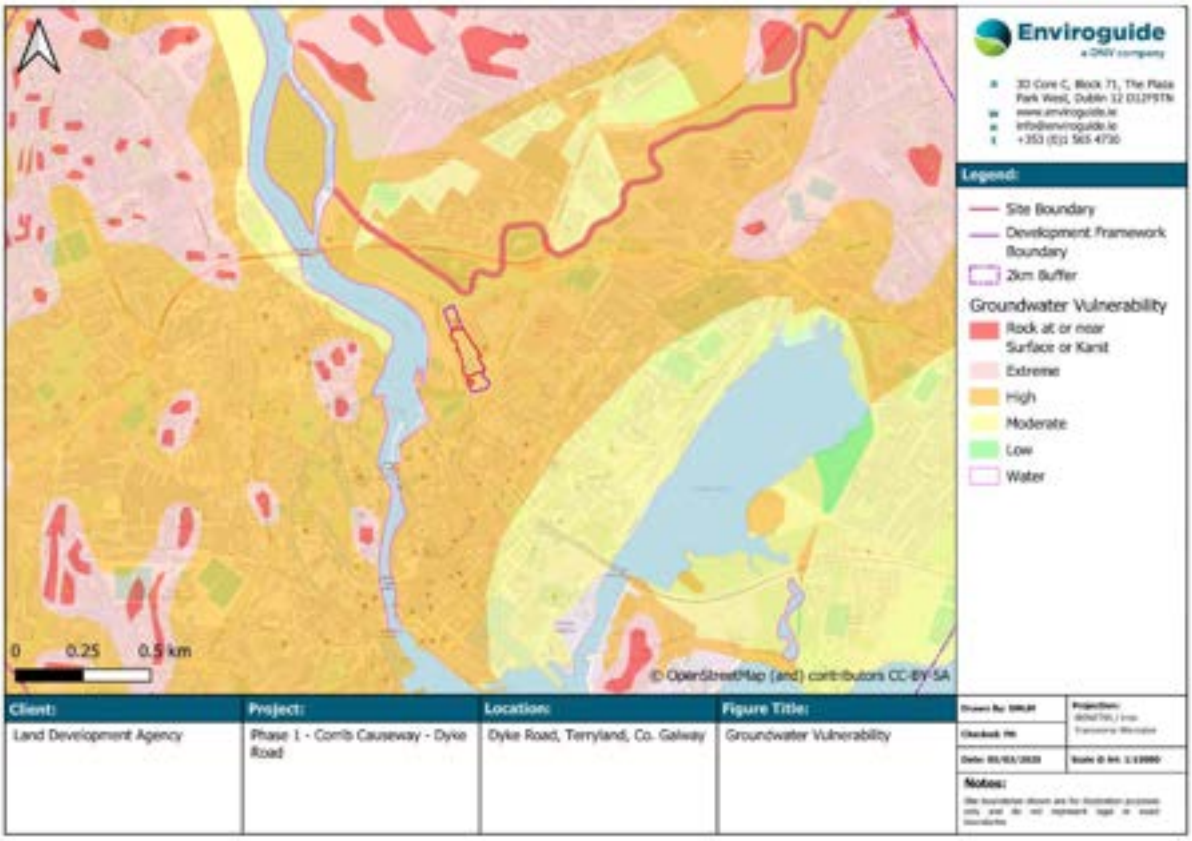

Figure 4-8. Groundwater Vulnerability

4.6.4 Site Hydrogeology

As documented in the Ground Investigation Report (GII, 2024), groundwater strikes were recorded between 1.30mbGL and 9.5mGL during borehole drilling. Four (4No.) groundwater monitoring wells were installed at the site (BRC1, BRC02, BRC04 and BRC05) to allow the equilibrium groundwater level to be determined.

Groundwater level measurements at each of the monitoring wells were recorded by GII relative to ground level on the 26th of June 2024 and are presented in Table 4-2.

Table 4-2. Measured Water Levels (26/06/2024)

Monitoring Location ID	Measured Water Level (mbTOC)
BRC01	0.17
BRC02	0.87
BRC04	2.25
BRC05	1.30

4.7 Hydrology

The site is mapped by the EPA (EPA, 2025) as within the Corrib WFD Catchment (Catchment I.D.: 30), the Corrib_SC_010 WFD Sub-catchment (Sub-catchment I.D.: 30_18) and the Terryland_010 WFD River Sub-Basin (River Waterbody Code: IE_WE_30T010500).

The closest surface water feature is recorded on the EPA database (EPA, 2025) as the Terryland Stream (River Waterbody Code: IE_WE_30T010500), which is located approximately 0.13km north of the site at its closest point.

As detailed in the Galway City County Geological Site Report (GSI, 2020), the Terryland Stream originates from a narrow channel on the east side of Jordan’s Island, just north of the ruins of Terryland Castle, and approximately 0.62km northwest of the site. Typically, the Terryland Stream flows eastward toward two stream sinks, which are situated approximately 2.18km northeast of the site at their closest point (refer to Section 4.4.1). Although these sinks are near limestone outcrops, the Terryland Stream continues its course through a low-lying area characterised by substantial overburden. The subsoil's low permeability facilitates the conveyance of surface water across the valley until encountering limestone on the southern side. During periods of elevated groundwater levels, these sinks undergo a transformation into resurgences, releasing groundwater into the Terryland Stream. This augmented flow eventually converges with the Corrib River (River Waterbody Code: IE_WE_30C020600), located approximately 0.07km west of the site at its closest point. This shift from sink to resurgence categorises these features as estavelles. It is understood that these estavelles are connected to Galway Bay or Lough Atalia (i.e., the Corrib Estuary) through an underground conduit system, although the precise discharge locations remain unknown.

The Corrib River flows south before discharging to the Corrib Estuary transitional waterbody (EU Code: IE_WE_170_0700) approximately 0.99km southwest of the Site at its closest point. The Corrib Estuary ultimately discharges to the Inner Galway Bay North coastal waterbody (EU Code: IE_WE_170_0000) located approximately 3.32km southeast of the Site at its closest point.

The local surface waterbodies within a 2km radius of the Site are presented in Figure 4-9.

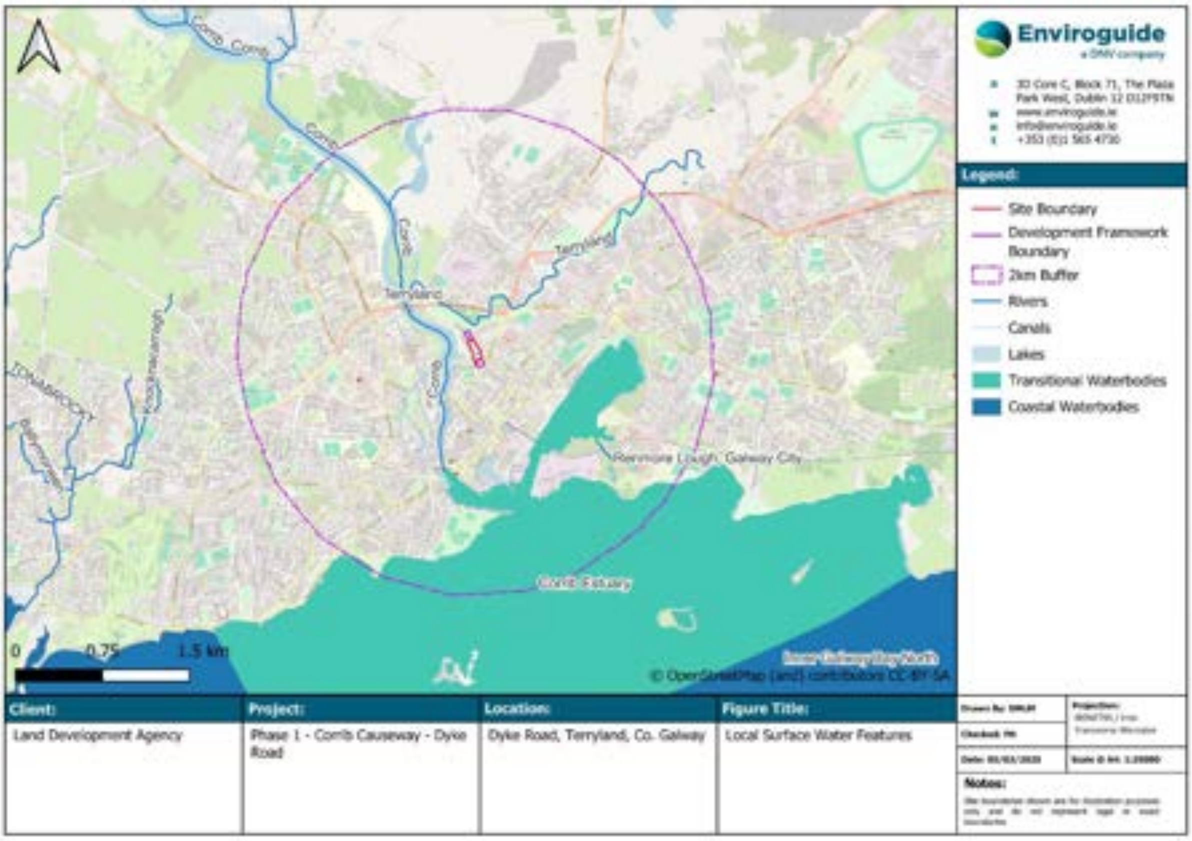

Figure 4-9. Local Surface Water Features

4.7.1 Existing Surface / Storm Drainage

As documented in the Infrastructure Report (AECOM, 2025a), the main surface water pipe running south to north along the western boundary of the site is a 450mm Ø concrete pipe. The pipe starts at an invert level of 5.8m on Bóthar Na Dige Road and falls to an invert level of 3.73m around the middle of the site, where it increases in size to a 525mm Ø concrete pipe and continues northwards until the discharge point. There is also a surface water pipe running through the site which serves the retail development on the Headford Road to the east of the Proposed Development which discharges into this surface water pipe (refer to Figure 4-10).

Based on the information shown on the record mapping (refer to Figure 4-10), and as confirmed by GCC, the existing network runs in a northerly direction along the western boundary of the site before discharging to the Terryland Stream. The bed level of the anticipated discharge point is approximately 2.9mOD (AECOM, 2025a). It is noted that preliminary investigations undertaken by LDA and GCC indicate sections of the pipe north of the Phase 1 site (on Phase 3 lands) may require repairs. As part of the Phase 1 Corrib Causeway Development project, The LDA on behalf of Galway City Council (GCC) proposes to install a new separate gravity surface water drainage network to service the development, which will discharge into the existing GCC 600mm Ø surface water concrete pipe. GCC records shows that this pipe runs south-north along the western boundary of the Phase 1 site, and discharges into the Terryland Stream. Preliminary investigations undertaken by GCC in 2025 indicate sections of the pipe south of the Phase 1 site (on Phase 3 lands) may require repairs. GCC advises it will consider any potential future repairs in conjunction with LDA contribution from phase 1, to ensure the Phase 1 development can connect to the existing surface water infrastructure.

The carpark site is nearly 100% impermeable and unattenuated flows discharges to the Terryland Steam. The unattenuated run-off rate from the site at 80mm/hour is estimated to be 216 l/s (AECOM, 2025a).

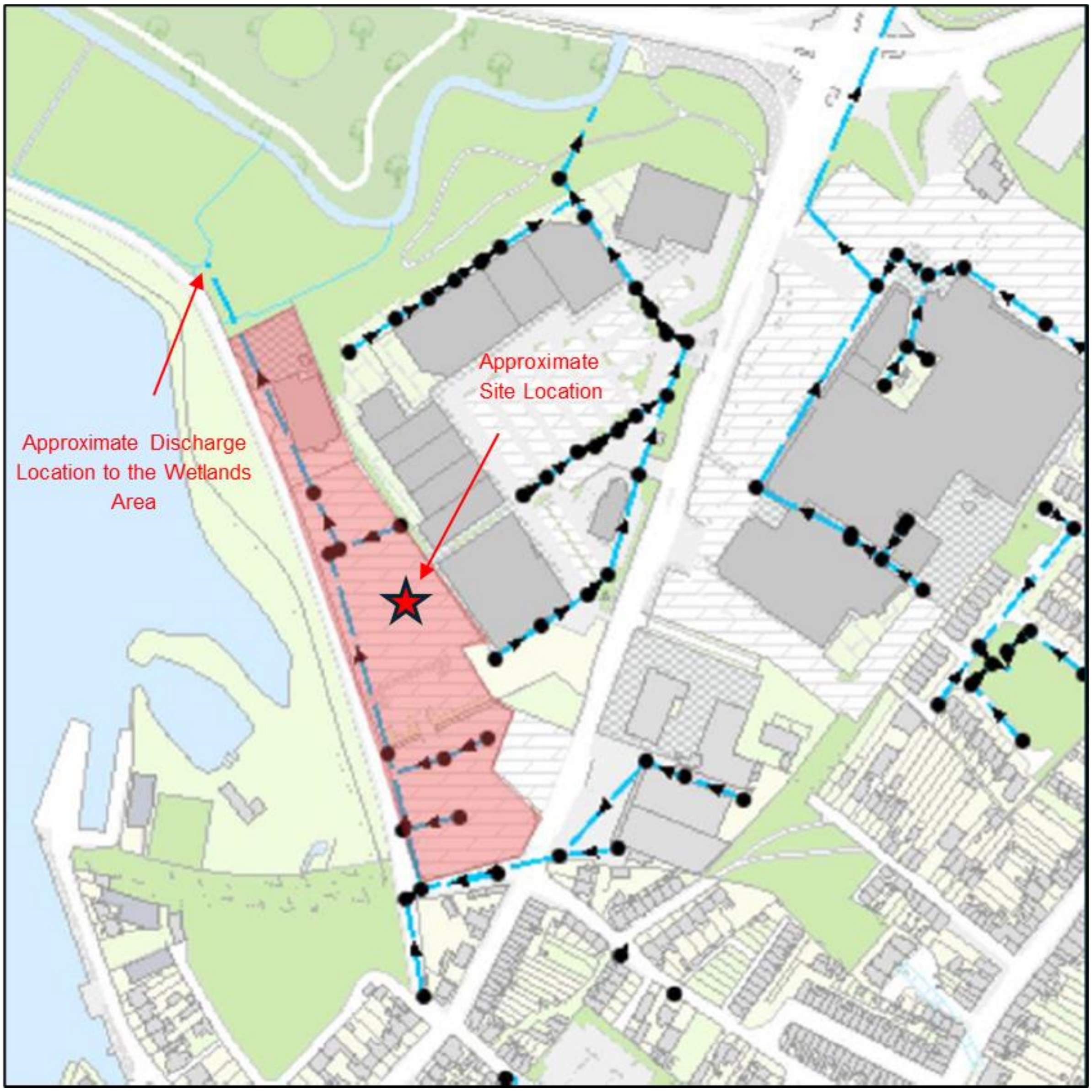

Figure 4-10. Drainage Infrastructure (AECOM, 2025a)

4.8 Flooding

The Site-Specific Flood Risk Assessment (SSFRA) report produced by AECOM (AECOM, 2025b) evaluates the flood risks associated with the Proposed Development. The assessment identifies the primary sources of flood risk as fluvial flooding from the River Corrib and the Terryland Stream, with additional considerations for coastal, pluvial, and groundwater flooding. The site benefits from the Dyke Road flood protection embankment, which provides some defence against the 1% Annual Exceedance Probability (AEP) event, though it lacks sufficient freeboard and climate change allowances. The Proposed Development includes measures such as setting the finished floor level at 7.28m OD, above the 1% AEP level with climate change and freeboard allowances and maintaining flood storage volume by constructing the building on stilts.

The SSFRA (AECOM, 2025b) also outlines the flood risk management strategies, including the sequential approach to avoid, substitute, justify, and mitigate flood risks. The assessment incorporates the Galway City Council Development Plan 2023-2029, which emphasises the importance of flood risk management through policies and land use zoning. The Proposed Development will include flood mitigation measures such as watertight external services, anti-flood valves, and emergency evacuation routes above the design flood level. The hydraulic modelling conducted by Arup confirms that the Proposed Development will not significantly impact flood levels in the surrounding areas, with a maximum increase of approximately 3mm in water levels during the 1% AEP event. Additionally, the hydraulic model demonstrates that the permeability of the lower ground façade, which includes screens and louvres, does not impede the storage or flow of floodwaters below the building.

In conclusion, the SSFRA (AECOM, 2025b) demonstrates that the flood risks to the proposed development can be adequately managed through the implementation of appropriate mitigation measures and adherence to the guidelines set out in the Galway City Council Development Plan and the Planning System and Flood Risk Management Guidelines. The Proposed Development will not adversely impact flood risk in the surrounding areas, and the inclusion of flood compensatory storage and sustainable drainage systems will ensure that the flood risk to the Proposed Development and adjacent properties is minimised.

4.9 Water Use and Source Protection

A search of the GSI groundwater well database (GSI, 2025) was conducted to identify registered wells and groundwater sources in the surrounding area. There is one (1No.) known groundwater source recorded within a 2km radius of the site. The source use for the supply (GSI Name: 1121NEW005), which is located approximately 0.66km northeast of the site is domestic. The yield for the supply is classified as ‘Good’ with a reported yield of 141.8m^3/day (GSI, 2025). There are also a small cluster of five (5No.) boreholes of unknown use located approximately 0.72km southeast of the site. The location of the groundwater wells in the vicinity of the site is presented in Figure 4-12.

The site of the Proposed Development is located within an area serviced by mains water supply. There is an existing 9” cast-iron watermain in Dyke Road to the west of the site (refer to Figure 4-11). A water connection feeds the Black Box theatre and the Headford Road shopping centre. It is noted that water supply to the Proposed Development will be via this existing 9” cast-iron watermain in Dyke Road. A 300mm asbestos-cement watermain also runs in Headford Road and Bóthar Na Dige Road, while a shorter section of 100mm uPVC water distribution main runs along a short section of Headford Road (AECOM, 2025a).

There are no groundwater source protection areas located within a 2km radius of the Site (GSI, 2025).

The Corrib River, located approximately 0.07km west of the Site at its closest point, is identified by the EPA (EPA, 2025) as a surface water drinking water sources, under Article 7 of the Water Framework Directive. There are no other surface water drinking water sources recorded within a 2km radius or hydraulically downstream of the Site.

Figure 4-11. Water Supply Infrastructure (AECOM, 2025a)

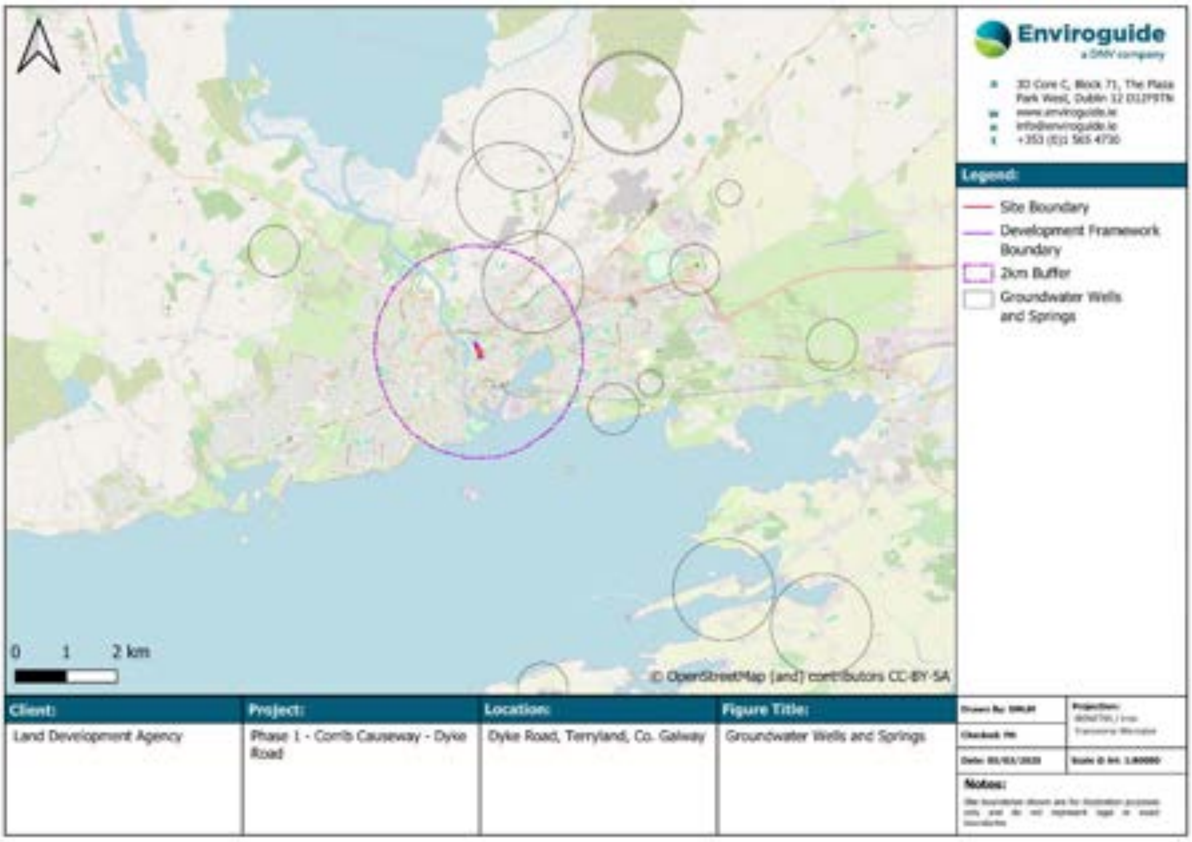

Figure 4-12. Groundwater Wells and Springs within a 2km Radius

4.10 Water Quality

4.10.1 Published Regional Surface Water Quality

The EPA surface water quality monitoring database (EPA, 2025) was consulted. A summary of the most recent published EPA water quality monitoring data (EPA, 2025) for waterbodies which have a potential hydraulic connection to the Site is presented in Table 4-3 below.

The Corrib River flows south before discharging to the Corrib Estuary transitional waterbody (EU Code: IE_WE_170_0700) approximately 0.99km southwest of the site at its closest point. The Corrib Estuary ultimately discharges to the Inner Galway Bay North coastal waterbody (EU Code: IE_WE_170_0000) located approximately 3.32km southeast of the site at its closest point.

Table 4-3. Surface Water Quality

River I.D. (Monitoring Station Location)	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2017)
Terryland Stream (At Terryland Castle -1.88km northeast)	Ammonia-Total (as N)	Annual	Moderate	Upwards	0.166mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Upwards	0.516mg/l
	ortho-Phosphate (as P) - unspecified	Annual	Good	Upwards	0.028mg/l
Terryland Stream (Bridge on Galway-Headford Rd – 1.58km northeast)	Ammonia-Total (as N)	Annual	Moderate	Upwards	0.150mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Upwards	0.516mg/l
	ortho-Phosphate (as P) - unspecified	Annual	Good	Upwards	0.026mg/l
Terryland Stream (50 m d/s Terryland Bridge – 0.75km northeast)	Ammonia-Total (as N)	Annual	Moderate	Upwards	0.110mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.398mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Upwards	0.016mg/l
Terryland Stream (Br d/s Terryland Br on ring road – 0.36km northwest)	Ammonia-Total (as N)	Annual	High	Downwards	0.032mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.288mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Downwards	0.007mg/l
Corrib River (Menlough Castle – 2.15km northwest)	Ammonia-Total (as N)	Annual	High	Downwards	0.016mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.337mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Downwards	0.005mg/l
Corrib River (Quincentennial	Ammonia-Total (as N)	Annual	High	Downwards	0.019mg/l

River I.D. (Monitoring Station Location)	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2017)
Bridge – 0.58km northwest)	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.312mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Downwards	0.005mg/l
Corrib River (Waterside-Galway - 0.23km west)	Ammonia-Total (as N)	Annual	High	Downwards	0.017mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.328mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Downwards	0.005mg/l
Corrib River (Salmon Weir Bridge- Galway - 0.45km southwest)	Ammonia-Total (as N)	Annual	High	Upwards	0.018mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.359mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Downwards	0.005mg/l
Corrib Lower Lake (3.56km northwest)	Ammonia-Total (as N)	Annual	High	Upwards	0.026mg/l
	Chlorophyll	Annual	High	Downwards	2.104ug/l
	Total Phosphorus (as P)	Annual	High	Downwards	0.009mg/l
Corrib Estuary (0.99km south)	Chlorophyll	Summer	High	Upwards	2.5mg/m^3
		Winter	High	Downwards	1.4mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Summer	High	Upwards	0.035mg/l
		Winter	High	None	0.288mg/l
	ortho-Phosphate (as P)- unspecified	Summer	High	Upwards	5.9ug/l
		Winter	High	Downwards	7.4ug/l
Inner Galway Bay North (3.32km southeast)	Chlorophyll	Summer	High	Upwards	2.6mg/m^3
		Winter	High	Upwards	1.3mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Summer	High	Upwards	0.034mg/l
		Winter	High	Upwards	0.225mg/l
	ortho-Phosphate (as P)- unspecified	Summer	High	Upwards	5.5ug/l
		Winter	High	Downwards	8.0ug/l
Inner Galway Bay South (6.63km south	(No Chemical Monitoring data available)				
Outer Galway Bay (7.0km southwest)	Chlorophyll	Summer	High	Upwards	1.5mg/m^3
		Winter	High	Downwards	0.5mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Summer	High	None	0.029mg/l
		Winter	High	Upwards	0.148mg/l
	ortho-Phosphate (as P)- unspecified	Summer	High	Downwards	2.5ug/l
		Winter	Good	Downwards	6.6ug/l
Aran Islands, Galway Bay,	(No Chemical Monitoring data available)				

River I.D. (Monitoring Station Location)	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2017)
Connemara (HAs 29;31) (17.06km southwest)					

4.10.2 Published Regional Groundwater Quality

The EPA (EPA, 2025) groundwater monitoring data was reviewed and there are no hydraulically connected groundwater quality monitoring stations within a 2km radius of the Site.

4.10.3 Receiving Water Quality – Galway Wastewater Treatment Plant (WWTP)

Foul water from the Site will discharge via the Galway WWTP to the Corrib Estuary transitional waterbody (EU Code: E_WE_170_0700) and the Inner Galway Bay North coastal waterbody (EU Code: IE_WE_170_0000).

The Galway WWTP is operated under relevant statuary approvals. The most recent available Annual Environmental Report (AER) for the Galway WWTP is 2022 (UE, 2023). The AER identified that the final effluent was compliant with the Emission Limit Values (ELVs) specified in the discharge license (EPA Licence No. D0050-01). The 2022 AER notes the following in relation to ambient monitoring in the Corrib Estuary transitional waterbody and the Inner Galway Bay North coastal waterbody:

'The coastal/transitional ambient monitoring results meet the required EQS. The EQS relates to the Oxygenation and Nutrient Conditions set out in the Surface Water Regulations 2009.

The WWTP discharge was compliant with the ELV's set in the wastewater discharge licence.

The discharge from the wastewater treatment plant does not have an observable impact on the water quality.

The discharge from the wastewater treatment plant does not have an observable negative impact on the Water Framework Directive status.'

4.11 Water Framework Directive

The WFD status for river, lake, groundwater, transitional and/or coastal water bodies that have a potential hydraulic connection to the Site as recorded by the EPA (EPA, 2025) in accordance with European Communities (Water Policy) Regulations 2003 (SI no. 722/2003) are provided in Table 4-4 and shown in Figure 4-13.

Table 4-4. Water Framework Directive Status

WFD Waterbody Name (EPA Name)	Waterbody EU Code	Location from Site	Distance from Site (km)	WFD Status (2016-2021)	WFD Risk	Hydraulic Connection to the Site
River Waterbodies						
Terryland_010 (Terryland Stream)	IE_WE_30T010500	North	0.13	Moderate	At Risk	Yes, receives surface water drainage from the Site.
Corrib_020 (Corrib River)	IE_WE_30C020600	West	0.07	Good	Not at Risk	Yes, downstream of the Terryland Stream (diurnal flow) and receives groundwater from the Site.
Corrib_010 (Corrib River)	IE_WE_30C020300	Northwest	3.22	Good	Not at Risk	No, hydraulically upstream of the Site.
Lake Waterbodies						
Corrib Lower	IE_WE_30_666a	Northwest	3.56	Good	Not at Risk	No, hydraulically upstream of the Site.
Transitional Waterbodies						
Corrib Estuary	IE_WE_170_0700	South	0.99	Moderate	Review	Yes, downstream of the Terryland Stream (via an underground conduit system) and the Corrib River. Also receives treated effluent from the Galway WWTP
Coastal Waterbodies						
Inner Galway Bay North	IE_WE_170_0000	Southeast	3.32	Good	Not at Risk	Yes, downstream of the Corrib Estuary and receives treated effluent from the Galway WWTP

WFD Waterbody Name (EPA Name)	Waterbody EU Code	Location from Site	Distance from Site (km)	WFD Status (2016-2021)	WFD Risk	Hydraulic Connection to the Site
Inner Galway Bay South	IE_WE_160_0000	South	6.63	High	Not at Risk	Yes, downstream of the Inner Galway Bay North coastal waterbody
Outer Galway Bay	IE_WE_100_0000	Southwest	7.00	High	Not at Risk	Yes, downstream of the Inner Galway Bay North coastal waterbody
Aran Islands, Galway Bay, Connemara (HAs 29;31)	IE_WE_010_0000	Southwest	17.06	High	Review	Yes, downstream of the Outer Galway Bay coastal waterbody
Groundwater Bodies						
Clare-Corrib	IE_WE_G_0020	Underlying Aquifer	n/a	Good	Not at risk	Yes, Underlying Aquifer

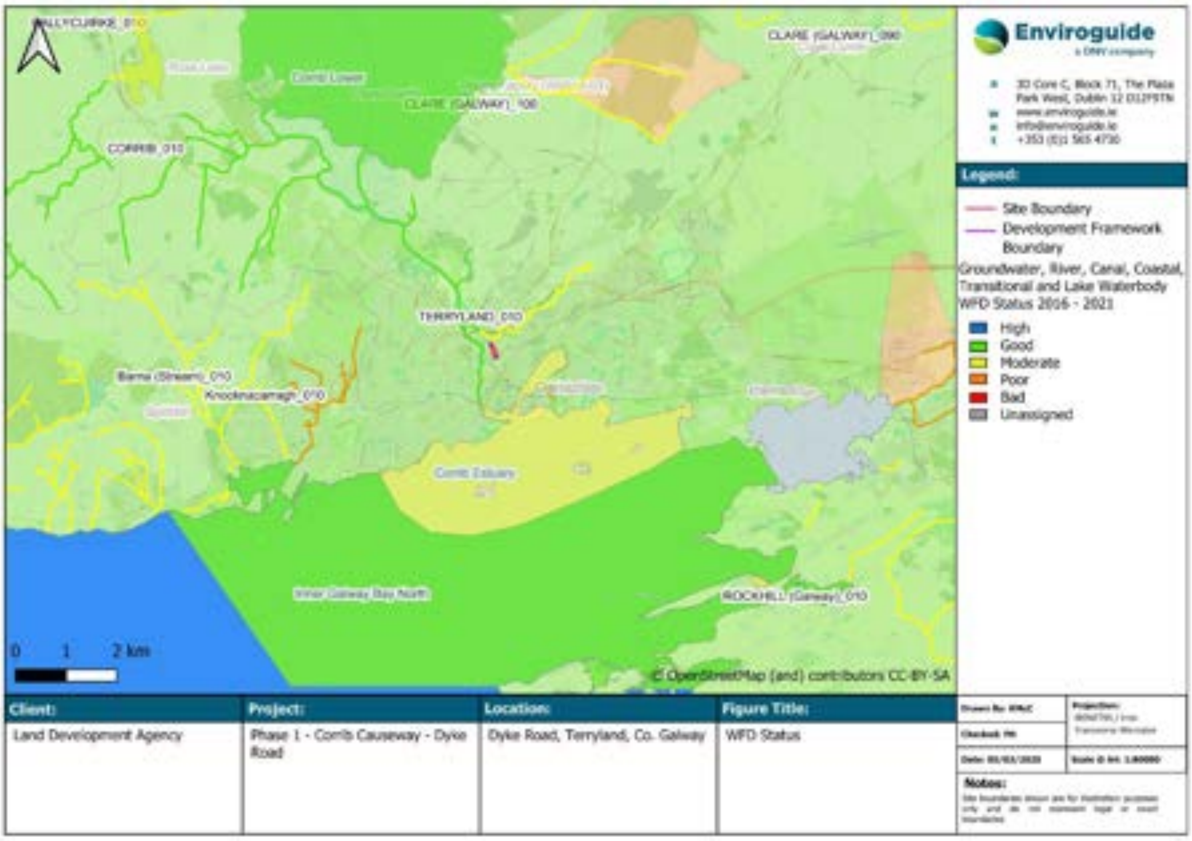

Figure 4-13. Water Framework Directive Status

4.11.1 Nature Conservation

The Habitats Directive (92/43/EEC) seeks to conserve natural habitats and wild fauna and flora by the designation of Special Areas of Conservation (SACs) and the Birds Directive (2009/147/EC) seeks to protect birds of special importance by the designation of Special Protection Areas (SPAs). SACs and SPAs are collectively known as Natura 2000 or European sites (referred to hereafter as Natura 2000 sites).

Natural Heritage Areas (NHAs) are designations under the Wildlife Acts to protect habitats, species, or geology of national importance. The boundaries of many of the NHAs in Ireland overlap with SAC and/or SPA sites. Although many NHA designations are not yet fully in force under this legislation (referred to as 'proposed NHAs' or pNHAs), they are offered protection in the meantime under planning policy which normally requires that planning authorities give recognition to their ecological value.

As documented in the AA Screening Report prepared by Scott Cawley (Scott Cawley, 2025a) and submitted with the planning application, the identification of source-pathway-receptor connection(s) between the Proposed Development and European sites essentially is the process of identifying which European sites are within the Zone of Influence (ZoI) of the Proposed Development, and therefore potentially at risk of significant effects. The ZoI is defined as the area within which the Proposed Development could affect the receiving environment such that it could potentially have significant effects on the QI habitats or QI/SCI species of a European site, or on the achievement of their conservation objectives (as defined in CIEEM, 2022).

There are four (4No.) Natura 2000 Sites that are identified with a potential hydraulic connection to the site and located within the ZoI whereby the Proposed Development could affect the receiving environment such that it could potentially have significant effects on the Natura 2000 site or on the achievement of their conservation objectives

- Lough Corrib SAC (Site Code: 000297) – approximately 0.015km west of the Site.
- Lough Corrib SPA (Site Code: 004042) – approximately 2.80km north of the Site.
- Galway Bay Complex SAC (Site Code: 000268) – approximately 0.70km south of the Site.
- Inner Galway Bay SPA (Site Code: 004031) – approximately 0.70km south of the Site.

Other Natura 2000 Sites that are identified with a potential hydraulic connection to the Site but are considered to be located outside of the ZoI include:

- Black Head-Poulsallagh Complex SAC (Site Code: 000020).
- Inisheer Island SAC (Site Code: 001275).
- Inishmaan Island SAC (Site Code: 000212).
- Inishmore Island SAC (Site Code: 000213).
- Inishmore Island SPA (Site Code: 004152).
- Kilkieran Bay And Islands SAC (Site Code: 002111).

There are two (2No.) proposed NHAs identified with a potential hydraulic connection to the Site and considered to be located within the ZoI:

- Lough Corrib (Site Code: 000297).
- Galway Bay Complex (Site Code: 000268).

Other proposed NHAs that are identified with a potential hydraulic connection to the Site but are considered to be located outside of the ZoI include:

- Black Head-Poulsallagh Complex (Site Code: 000020).
- Inisheer Island (Site Code: 001275).
- Inishmaan Island (Site Code: 000212).
- Inishmore Island (Site Code: 000213).

The SACs, SPAs, and pNHAs with a potential hydraulic connection to the Site are presented in Figure 4-14.

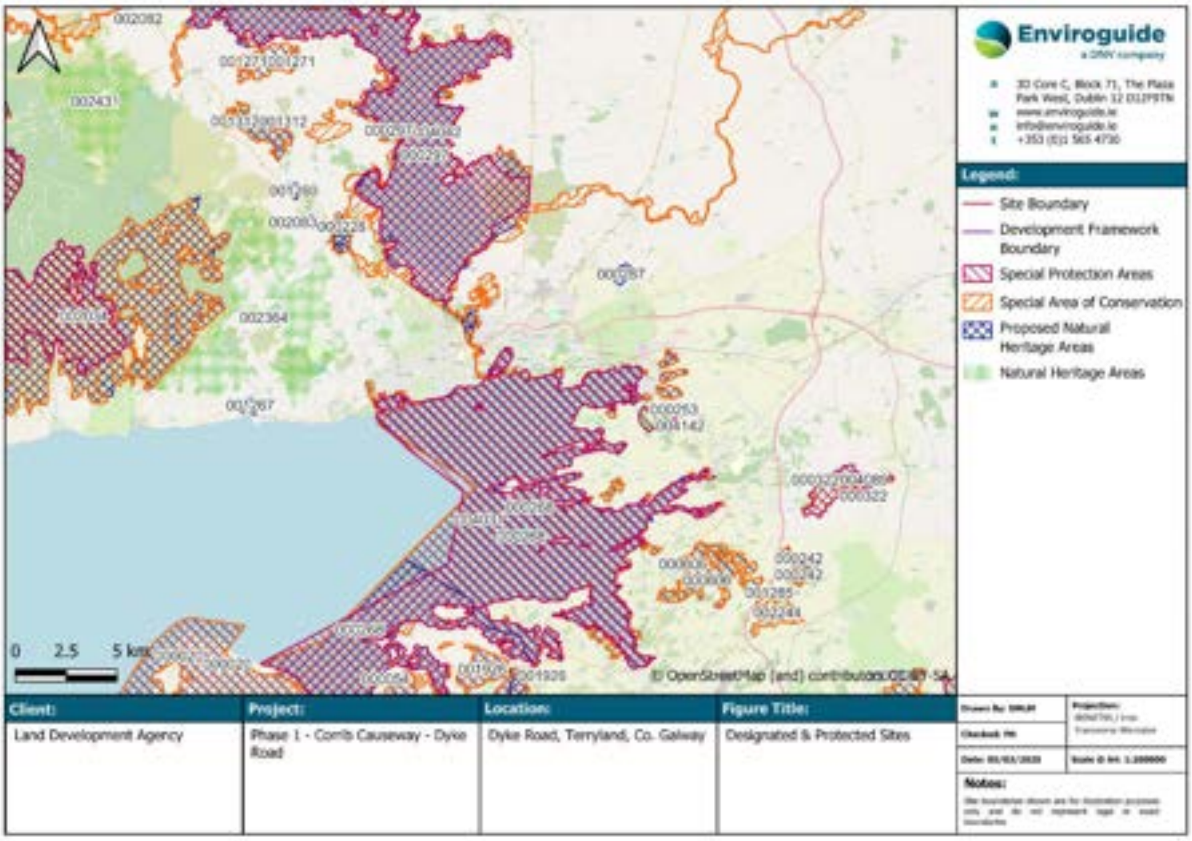

Figure 4-14. Designated and Protected Areas

4.11.2 Drinking Water

The river drinking water protected areas (DWPA) are represented by the full extent of the WFD river waterbodies from which there is a known qualifying abstraction of water for human consumption as defined under Article 7 of the WFD.

As stated in Section 4.9, the CORRIB_020 river ~120m to the west is identified by the EPA (EPA, 2025) as a surface water drinking water sources, under Article 7 of the Water Framework Directive. There are no other surface water drinking water sources recorded within a 2km radius or hydraulically downstream of the site.

4.11.3 Shellfish Areas

Although the Shellfish Waters Directive (SWD) has been repealed, areas used for the production of shellfish that were designated under the SWD, are protected under the WFD as ‘areas designated for the protection of economically significant aquatic species’.

The requirement from a WFD perspective is to ensure that water quality does not impact on the quality of shellfish produced for human consumption. In Ireland, 64 areas have been designated as shellfish waters (S.I. No. 268 of 2006, S.I. No. 55 of 2009, S.I. 464 of 2009).

The closest designated Shellfish Area location is Clarinbridge/Kinvara Bay approximately 7.5km downstream of the site across Galway Bay. There are also two SWD along the southern shore of Galway Bay, Ballyvaughan/Poulnaclough Bay and The Bay at Aughinish.

4.11.4 Nutrient Sensitive Areas

EU member states are required under the Urban Wastewater Treatment Directive (91/271/EEC) to identify nutrient-sensitive areas. These have been defined as “natural freshwater lakes, other freshwater bodies, estuaries and coastal waters which are found to be eutrophic or which in the near future may become eutrophic if protective action is not taken”.

There are no Nutrient Sensitive Areas directly upstream, downstream or within 2km of the Site.

4.11.5 Bathing Waters

Bathing waters are designated under Regulation 5 of Directive 2006/7/EC. Designated Bathing Waters exist under S.I. No. 79/2008 and S.I. No. 351/2011 Bathing Water Quality (Amendment) Regulations 2011. The EC Bathing Water Profiles - Best Practice and Guidance 2009 provides additional guidelines for maintaining and improving bathing water quality.

Ballyloughane Beach and Grattan Road Beach are located approximately 2.5km and 5.3km downstream of the Site respectively with Grattan Road Beach being located 1.5km from the primary emission point for the Galway City WWTP. Salthill Beach is approximately 5.3km downstream of the Site, to the west of Grattan Road Beach, and approximately 2.1km from the primary emission point for the Galway City WWTP. The EPA bathing water quality monitoring database (EPA, 2025) classifies the current water quality of Ballyloughane Beach and Salthill Beach as ‘excellent’ and of Grattan Road Beach as ‘good’.

5 ASSESSMENT OF POTENTIAL IMPACTS

5.1 Conceptual Site Model

As outlined in Section 2.4, the conceptual site model (CSM) represents the characteristics of the Site and identified the possible relationship and potential risk between the contaminant sources, pathways and receptors.

The CSM and identified sources, pathways and receptors associated with the Proposed Development are outlined in Section 5.2 and Section 5.5.

5.2 Potential Sources

The potential sources associated with the Proposed Development during construction and operational phases are discussed below.

5.2.1 Construction Phase

During the construction phase there will be no direct discharges to surface water or groundwater at the Proposed Development with the exception of rainfall which will continue to infiltrate to ground during the construction phase.

Based on the findings of the Ground Investigation (GII, 2024), there may be a requirement for management of surface water (rainwater) and shallow groundwater (recorded at levels ranging between 0.17mbGL and 2.25mbGL), where encountered during groundworks. There will be no unauthorised discharge of water (groundwater or surface water runoff) to ground, drains or water courses during the construction phase.

Foul water discharge from the temporary welfare units at the Site during the construction phase will be either tankered offsite in accordance with waste management legislation or discharged under temporary consent to the UE mains foul network for treatment at Galway WWTP subject to agreement with UE.

Other potential sources of contamination that could impact on water quality during the construction phase based on the design of the Site include:

- Storage and use of fuel, oils and chemicals used during construction which in the event of an accidental release through the failure of secondary containment or a materials handling accident could infiltrate to the underlying groundwater.
- Use of concrete and cementitious materials during construction in particular for installation of below ground infrastructure and piled foundations where shallow groundwater will likely be encountered.
- Suspended sediment and other contaminants entrained in runoff arising from groundworks, stockpiling of materials and other construction works at the Site.
- Sediment or other material on construction vehicles could potentially be tracked offsite to external public roads.
- Accidental release of wash-water or foul water from facilities at the Site (e.g., wheel wash and temporary welfare facilities).

- Release of foul water from existing foul water drainage during connection to live sewers.

5.2.2 Operational Phase

During the operational phase there will be no discharges to groundwater from the Proposed Development.

Surface water runoff from the Proposed Development, which will be managed in accordance with the principles and objectives of SuDS, will be treated and attenuated prior to discharge from the Site.

Foul water from the Proposed Development will be treated in the Galway WWTP before ultimately discharging to the Corrib Estuary transitional waterbody and the Inner Galway Bay North coastal waterbody. The increase discharge to the Galway WWTP as a result of the Proposed Development will reduce the overall available capacity of the facility. Foul water from the Proposed Development will only be discharged to Uisce Eireann (UE) foul sewer under agreement from UE and other applicable statutory consents verifying capacity at the Galway WWTP for the Proposed Development. The UE CoF notes that the foul water connection is feasible subject to infrastructure upgrades. The Applicant will ensure that these upgrades are completed prior to any connections from the Proposed Development. A SoDA has been issued by UE.

There will be no requirement for bulk storage of petroleum hydrocarbon-based fuels during the operational phase as the main operating system for heating will be natural gas.

The Site is located within Flood Zone A where the probability of flooding is high. As documented in the SSFRA (AECOM, 2025b) and summarised in Section 4.8, when in operation in a future climate scenario, all proposed structures will be defended from flooding to an appropriate standard. As such, the risk of contamination of surface waters exacerbated during a future climate scenario flood event is considered low.

The most plausible, albeit worst case, source scenarios are outlined below:

- Fuels or other potentially hazardous materials released in the event of an accidental spill or leak from a vehicle (assumed 500 litres) is considered a worst-case source at the Site. This potential source is considered to be a short-term event in a worst-case scenario and while unlikely to occur, this scenario will be considered in the assessment.
- Suspended sediment entrained in runoff is considered a low-risk source of contamination at the Site for the Operational Phase of the Proposed Development.

5.3 Pathways

The following potential pathways are identified and evaluated below:

- **Vertical Migration to the Underlying Bedrock and Lateral Migration within the Aquifer to Downgradient Receiving Surface Waterbodies**

Galway City and its surrounding areas are characterised by a unique karst landscape defined by limestone formations and geological features. While no evidence of karst features were identified during the ground investigation (GII, 2024), the geophysical survey undertaken for the site (Minerex, 2024) indicated the potential presence of karstified rock.

During the construction phase of the Proposed Development, there will be a temporary reduction in impermeable surfaces across the Site and the groundwater vulnerability is expected to temporarily increase. In karstified limestone areas like the Clare-Corrib GWB, there is a high degree of interconnection between groundwater and surface water. Furthermore, groundwater storage in karstified bedrock is low, limiting the potential for contaminant attenuation in such aquifers. During the construction phase the release of contaminants used onsite could enter the underlying aquifer and rapidly migrate towards receiving watercourses including the Terryland Stream, the Corrib River and the Corrib Estuary.

- **Introduction of Preferential Pathways During Piling**

Piling in karstified aquifers presents unique challenges and risks due to the characteristics of karst landscapes. Karst terrain is characterised by soluble bedrock such as limestone, which can form conduits, caves, and sinkholes through dissolution by groundwater over time. Piling during the construction phase of the Proposed Development, may potentially create pathways for contaminants to enter underlying groundwater systems more rapidly and directly than in non-karst areas. The risk of piling in karstified aquifers lies in the potential for contaminants used during construction, such as grout or other materials, to infiltrate quickly into the groundwater through existing conduits, fractures, or dissolution features created by the piling process. These contaminants can then spread rapidly through the interconnected network of underground pathways characteristic of karst landscapes to receiving watercourses including the Terryland Stream, the Corrib River and the Corrib Estuary.

- **Surface Water Runoff and Migration Offsite to Downstream Surface Waterbodies**

The excavation, handling, stockpiling, reprofiling and removal offsite of soils and subsoils could result in generation of runoff with entrained sediment or other contaminants which could potentially impact on the receiving water quality and WFD status of the Terryland Stream, the Corrib River and downstream waterbodies via existing surface water drainage within the site.

- **Discharge of Water (Groundwater and/or Surface Water) to Mains Sewer and Downstream Receiving Surface Waterbodies**

Based on the findings of the Ground Investigation (GII, 2024), there may be a requirement for management of surface water (rainwater) and shallow groundwater (recorded at levels ranging between 0.17mbGL and 2.25mbGL), where encountered during groundworks and/or during the operational phase of the Proposed Development.

Where required, groundwater and surface water runoff (rainwater) during the construction phase will be discharged offsite in accordance with the necessary discharge licences issued by UEunder Section 16 of the Local Government (Water Pollution) Acts and Regulations for any water discharges to sewer (and ultimately the Irish Sea via the Galway WWTP) or from GCC under Section 4 of the Local Government (Water Pollution) Act 1977, as amended in 1990 for discharges to surface water (and ultimately the Terryland Stream, the Corrib River, the Corrib Estuary and downstream receiving waterbodies).

During the operational phase, attenuated and treated surface water runoff from the Proposed Development will ultimately outfall to the Terryland Stream.

Therefore, the pathways to the Terryland Stream, the Corrib River, the Corrib Estuary and associated downstream watercourses and receptors are considered valid for this assessment.

- **Foul Water Discharge to Main Sewer and Receiving Surface Waterbodies**

Foul water during the Construction Phase of the Proposed Development will be either removed by tanker in accordance with waste management legislation and managed accordingly or discharged under consent to the mains UE drainage network and ultimately discharged to the receiving surface waterbodies (i.e., the Corrib Estuary transitional waterbody and the Inner Galway Bay North coastal waterbody via the Galway WWTP). Foul water from the site will only be discharged to the UE network under the appropriate consents from UE and therefore, the Proposed Development will not cause a potential impact at any receiving waterbody or Natura 2000 sites associated with discharges from the Site.

5.4 Receptors

The receptors considered in this assessment include the following:

- Groundwater
  - Underlying poor bedrock Regionally Important Aquifer - Karstified (conduit) (RKc)which is part of the Clare-Corrib GWB

It is noted that there is (1No.) domestic groundwater source located approximately 0.66km northeast of the Site. In the vicinity of the Site groundwater flow likely follows a path that ultimately leads towards the River Corrib. Therefore, for the purpose of this assessment this known domestic groundwater source is considered upgradient of the Site and therefore there is no perceived pathway.

- Surface Water:
  - Terryland Stream.
  - Corrib River.
  - Corrib Estuary.
  - Inner Galway Bay North.
  - Inner Galway Bay South.
  - Outer Galway Bay.
- Natura 2000 Sites:
  - Lough Corrib SAC (Site Code: 000297).
  - Lough Corrib SPA (Site Code: 004042).
  - Galway Bay Complex SAC (Site Code: 000268).
  - Inner Galway Bay SPA (Site Code: 004031).
- Other Protected Sites:
  - Lough Corrib (Site Code: 000297).
  - Galway Bay Complex (Site Code: 000268).

It is noted that there are other Natura 2000 sites and other protected and designated sites or areas with a potential hydraulic connection to the Site, however, those hydraulically closest to the Site and located within of the ZoI are considered as the most sensitive sites for this assessment.

5.5 Risk Evaluation of Source-Pathway-Receptor Linkages

A risk-based assessment of the Source-Pathway-Receptor Model and the potential risk linkages associated with the Construction Phase and Operational Phase of the Proposed Development was undertaken. The results were evaluated to determine if the Proposed

Development could potentially impact any potential receptors which could be effected by the Proposed Development (refer to Section 5.4).

Table 5-1. Conceptual Site Model (Source- Pathway Receptor) and Risk Evaluation

Source	Pathway	Receptor	Risk Evaluation and Avoidance
Construction Phase			
Discharge of Contaminants to Ground / Groundwater	Vertical and Lateral Groundwater Migration in Bedrock Aquifer	Underlying Bedrock Aquifer Receiving surface waterbodies (i.e., the Terryland Stream, the Corrib River, the Corrib Estuary, and Galway Bay) Natura 2000 Sites	Low to Moderate Risk (worst-case unmitigated scenario) During groundworks and excavations, the groundwater vulnerability will be increased and there will be a more direct pathway for surface contaminants to enter the underlying bedrock aquifer and migrate towards downgradient receiving surface water bodies. The Clare-Corrib GWB beneath the site is considered to have high levels of interconnection between groundwater and surface water with limited potential for attenuation of dissolved phase contaminants which have the potential to rapidly migrate towards receiving watercourses and Natura 2000 sites. In a worst-case scenario during either the Construction Phase (e.g., accidental release of fuels, chemicals or oils through the failure of secondary containment or a materials handling accident) in the absence of any mitigation measures there is potential for discharge of contaminants to groundwater. The groundwater within the Clare-Corrib GWB will be impacted and taking account of the limited attenuation within the aquifer, it is considered that there is an indirect risk to the downstream receiving waterbodies (i.e., Corrib River, the Corrib Estuary, Galway Bay and Natura 2000 sites). During the construction phase, all works will be undertaken in strict accordance with the CEMP which will detail appropriate design avoidance and mitigation measures to prevent any potential impact to the receiving water quality.
Piling	Introduction of Preferential Pathways During Piling	Underlying Bedrock Aquifer Receiving surface waterbodies (i.e.,	Low to Moderate Risk Piling during the construction phase of the Proposed Development, may potentially create pathways for

Source	Pathway	Receptor	Risk Evaluation and Avoidance
		the Terryland Stream, the Corrib River, the Corrib Estuary, and Galway Bay) Natura 2000 Sites	contaminants to enter underlying groundwater. Pilling also has the potential to alter karstic flow paths linking downstream waterbodies with pollutants. In the worst-case scenario drilling fluids used during piling could potentially be introduced to the subsurface and groundwater and rapidly migrate to the receiving waterbodies including the Terryland Stream, the Corrib River, the Corrib Estuary and downstream receiving waterbodies. Given the vulnerability of the underlying groundwater at the site, the shallow groundwater table, the potential presence of karst landforms and the detectable concentrations of hydrocarbons in shallow soils (GII, 2024), it is recommended that a piling risk assessment is completed by the main contractor at detailed design stage and in advance of construction works commencing onsite. The proposed piling methodology (informed by the piling risk assessment) will minimise the potential for the introduction of any temporary conduit between any potential sources of contamination at the ground surface and underlying groundwater.
Discharge of Entrained Sediment or Other Contaminants in Surface Runoff	Lateral Migration at the Site to the Onsite Drainage and Migration Offsite	Receiving surface waterbodies (i.e., the Terryland Stream, the Corrib River, the Corrib Estuary, and Galway Bay) Natura 2000 Sites	Low to Moderate Risk Potential risk of runoff with contaminants migrating offsite via existing surface water drainage within the site. Potential impact to water quality and WFD status of the Terryland Stream, the Corrib River and downstream waterbodies. During the construction phase, all works will be undertaken in strict accordance with the CEMP which will detail appropriate design avoidance and mitigation measures to prevent any potential impact to the receiving water quality.
Dewatering During Excavation	Changes to Hydrogeological Regime	Underlying Bedrock Aquifer	Low Risk to Moderate Risk Appropriate construction measures to enable working in the dry during excavations, and methods to

Source	Pathway	Receptor	Risk Evaluation and Avoidance
			minimise the volume of dewatering water generated that will require management will be considered in the detailed design and the contractors construction methods. Where water must be pumped from the excavations, it is considered that there will be a temporary drawdown of local groundwater levels during the dewatering operations. However, the extent of the impact is considered to be temporary and localised to the immediate area surrounding the excavations.
Dewatering During Excavation	Discharge of water (groundwater / surface water runoff) to ground, sewer or watercourses	Receiving surface waterbodies (i.e., the Terryland Stream, the Corrib River, the Corrib Estuary, and Galway Bay) Natura 2000 Sites	Low Risk There will be no discharge of groundwater to ground. Unauthorised discharge of water (groundwater / surface water runoff) to sewers or watercourses will also not be permitted. The main contractor will ensure that the discharge of water to sewers or watercourses will be in accordance with the necessary discharge licences issued by UE under Section 16 of the Local Government (Water Pollution) Acts and Regulations for any water discharges to sewer or from Galway County Council under Section 4 of the Local Government (Water Pollution) Act 1977, as amended in 1990 for discharges to surface water and ultimately discharged to the receiving surface waterbodies (i.e., the Terryland Stream, the Corrib River or Galway Bay via Galway WWTP).
Foul Water Discharge	Discharge to Mains Sewer	Receiving surface waterbodies (i.e., the Terryland Stream, the Corrib River, the Corrib Estuary, and Galway Bay) Natura 2000 Sites	Low Risk Foul water during the Construction Phase of the Proposed Development will be either removed by tanker in accordance with waste management legislation and managed accordingly or discharged under consent to the mains UE drainage network and ultimately discharged to the receiving surface waterbodies (i.e., Galway Bay via Galway WWTP). Foul water from the Site will only be discharged to the UE network under the appropriate consents from UE and therefore, the Proposed Development will not cause a potential impact at any receiving waterbody or Natura 2000 sites

Source	Pathway	Receptor	Risk Evaluation and Avoidance
			associated with discharges from the site.
Operational Phase			
Discharge of Surface Water Runoff	Discharge to Surface Water Drainage Network	Receiving surface waterbodies (i.e., the Terryland Stream, the Corrib River, the Corrib Estuary, and Galway Bay) Natura 2000 Sites	Low to Moderate Risk (worst-case unmitigated scenario) During the Operational Phase of the Proposed Development, there is limited potential for discharge of any contaminated runoff to the receiving water courses associated with surface water runoff from the Site. However, in a worst-case scenario during the Operational Phase (e.g., failure of SuDS) in the absence of any mitigation measures there is potential for discharge of contaminants to receiving surface water receptors (i.e., the Terryland Stream and downstream receptors). Surface water runoff from roofs and paved areas will be managed and treated in accordance with SUDS and pass through petrol interceptor and attenuation tanks prior to discharging to the Terryland Stream.
Discharge of Contaminants to Ground / Groundwater	Vertical and Lateral Groundwater Migration in Bedrock Aquifer	Underlying Bedrock Aquifer Receiving surface waterbodies (i.e., the Terryland Stream, the Corrib River, the Corrib Estuary, and Galway Bay) Natura 2000 Sites	No Identified Risk Based on the design of the Proposed Development there is limited potential sources of contamination during the Operational Phase and there will be limited potential for discharge of contaminants associated with surface water runoff to ground via unpaved, permeable areas due to the low infiltration potential at the Site. Furthermore, the proposed attenuation design does not allow for infiltration due to poor ground conditions, a high-water table and the potential presence of karst features beneath the site. Surface water will be managed in accordance with the principles and objectives of SuDS to treat and attenuate water prior to discharging offsite. Ongoing regular operational monitoring and maintenance of drainage and the SuDS measures will be incorporated into the overall management strategy for the Proposed Development. This will ensure that there are no impacts on

Source	Pathway	Receptor	Risk Evaluation and Avoidance
			water quality during the Operational Phase of the Proposed Development.
Foul Water Discharge	Discharge to Mains Sewer	Receiving surface waterbodies (i.e., the Terryland Stream, the Corrib River, the Corrib Estuary, and Galway Bay) Natura 2000 Sites	Low Risk Foul water during the Operational Phase of the Proposed Development will be discharged to the UE drainage network and ultimately discharged to Galway Bay via Galway WWTP. Foul water from the Site will only be discharged to the UE network under the appropriate consents from UE. The Galway WWTP (EPA Licence No. D0050-01) was identified by UE to have sufficient capacity to accept foul water from the Proposed Development subject to provision of the new WWPS and upgrade works to the existing 150mm diameter sewer from Dyke Road to Wood Quay, which will be completed in advance of any connection from the Site. Therefore, the Proposed Development will not cause a potential impact at any receiving waterbody or Natura 2000 sites associated with discharges from the Site.

5.5.1 Design Avoidance and Mitigation

The assessment of the potential impacts on the receiving environment takes account of the embedded design avoidance measures and standard good practice construction methods to reduce the potential for impacts to the water environment. These are outlined below together with additional specific measures based on the findings of this assessment.

5.5.1.1 Construction Phase

During the Construction Phase, all works will be undertaken in accordance with the Construction Environmental Management Plan (CEMP) (AECOM, 2025c). Following appointment, the contractor will be required to further develop the CEMP to provide detailed construction phasing and methods to manage and prevent any potential emissions to ground and surface water with regard to the relevant industry standards (e.g., Guidance for Consultants and Contractors, CIRIA-C532', CIRIA, 2001). The CEMP will be implemented for the duration of the Construction Phase, covering construction and waste management activities that will take place during the Construction Phase of the Proposed Development. Mitigation works will be adopted as part of the construction works for the Proposed Development. These measures will address the main activities of potential impact which include:

- Control and Management of surface water runoff.
- Control and management of shallow groundwater during excavation and dewatering.
- Management and control of soil and materials.

- Appropriate fuel and chemical handling, transport and storage.
- Management of accidental release of contaminants at the site.
- Control and handling of cementitious materials.

The main contractor will produce a Pollution Prevention Plan (or similar document). This will include procedures and diagrams for:

- Dewatering of excavations.
- Temporary soil storage.
- Fuel storage/refuelling.
- Concrete wash-out area.
- Controlling surface water entering Site.
- Preventing existing drainage features becoming pathways for construction run-off.
- Reducing soil exposure and reinstating as rapidly as possible.
- Contingency measures.

Surface water runoff management will be required to prevent runoff entering excavations during construction. Surface water will require diversion around the open excavations using standard temporary drainage methods to ensure that surface water is effectively conveyed around works areas.

The dewatering methodology to be implemented by the main contractor will ensure that any dewatering is confined to the localised zone and does not extend towards the Site boundaries. Where required, shallow recharge wells will be utilised to ensure the existing hydrogeological regime is maintained by allowing water to infiltrate back into the ground, ensuring that groundwater levels remain stable.

There will be no authorised discharge of water to ground during the construction phase. Where water must be pumped from the excavations, water will be discharged by the contractor, following appropriate treatment (e.g., settlement or hydrocarbon interceptor) to sewer in accordance with the necessary discharge licences issued by UE under Section 16 of the Local Government (Water Pollution) Acts and Regulations for any water discharges to sewer or from GCC under Section 4 of the Local Government (Water Pollution) Act 1977, as amended for discharges to surface water. Under no circumstances will any untreated wastewater generated onsite (from equipment washing, road sweeping etc.) be released offsite. Where required, all existing drainage channels and public sewers will be protected to ensure that any untreated wastewater generated onsite does not enter the public sewers. Drainage channels will be clearly identified on site and shown on method statements and site plans.

Where required, standard design and construction measures (i.e., groundwater drainage around impermeable subsurface structures) will ensure that groundwater flow across the site is maintained and that there will be no impact on groundwater levels.

During the construction phase, fuelling and lubrication of equipment will be carried out in accordance with the procedures outlined in the CEMP in a designated area of the site away from any watercourses and drains (where not possible to carry out such activities offsite). Any diesel, fuel or hydraulic oils stored onsite will be stored in designated areas. These areas will be bunded and located away from surface water drainage and features. Bunds will have regard to Environmental Protection Agency guidelines ‘Amendment to IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities’ (EPA, 2013). The main contractor will maintain an emergency response action plan and emergency procedures will be developed by the main contractor in advance of any works commencing.

Strict supervision of contractors will be adhered to in order to ensure that all plant and equipment utilised on-site is in good working condition. Any equipment not meeting the required standard will not be permitted for use within the Proposed Development site. Only emergency breakdown maintenance will be carried out on-site. Drip trays and spill kits will be available on-site to ensure that any spills from vehicles are contained and removed off-site.

There may also be the requirement for use of portable generators or similar fuel containing equipment during the construction phase of the Proposed Development, which will be placed on suitable drip trays. Regular monitoring of drip tray content will be undertaken to ensure sufficient capacity is maintained at all times.

Emergency procedures will be developed by the main contractor in advance of works commencing and spillage kits will be available on-site including in vehicles operating on-site. Construction staff will be familiar with emergency procedures in the event of accidental fuel spillages. Remedial action will be immediately implemented to address any potential impacts in accordance with best practice standards and legislative requirements including but not limited to the Environmental Protection Agency Act, 1992 (as amended), Waste Management Act, 1996 (as amended) and the Safety, Health and Welfare at Work Act, 2005 (as amended):

- Any required emergency vehicle or equipment maintenance work will take place in a designated impermeable area within the site.
- Emergency response procedures will be put in place, in the unlikely event of spillages of fuels or lubricants.
- Spill kits including oil absorbent material will be provided so that any spillage of fuels, lubricants or hydraulic oils will be immediately contained.
- In the event of a leak or spill from equipment in the instance of a mechanical breakdown during operation, any contaminated soil will be removed from the Proposed Development site and compliantly disposed of off-site. Residual soil will be tested to validate that all potentially contaminated material has been removed. This procedure will be undertaken in accordance with industry best practice procedures and standards.
- All construction works staff will be familiar with emergency procedures in the event of accidental fuel spillages.
- All construction works staff on-site will be fully trained on the use of equipment.

Pumping of concrete will be monitored to ensure that there is no accidental discharge. All work will be carried out in the dry and effectively isolated from any onsite drains. A suitable risk assessment for wet concreting will be completed prior to works being carried out. There will be no mixer washings or excess concrete discharged onsite. All excess concrete is to be removed from site and all washout of concrete chutes to be captured in a tank which will be removed offsite for disposal at an authorised waste facility.

Given the vulnerability of the underlying groundwater at the Site, the shallow groundwater table, the potential presence of karst landforms and the detectable concentrations of hydrocarbons in shallow soils (GII, 2024), a piling risk assessment will be completed by the main contractor at detailed design stage and in advance of construction works commencing onsite. The proposed piling methodology, will give cognisance to the Environment Agency’s (EA) guidance on ‘Piling into Contaminated Sites’ (EA, 2002) and ‘Piling and Penetrative

Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention' (EA, 2001), (or similar best practice) in order to minimise the potential for the introduction of any temporary conduit between any potential sources of contamination at the ground surface and underlying groundwater. The piling method will also include procedures to ensure any potential impact to water quality is prevented including preventing surface runoff or other piling/drilling fluids from entering the pile bores and surrounding formation. Where there is a requirement to use lubricants, drilling fluids or additives the contractor will use water-based, biodegradable, and non-hazardous compounds under controlled conditions.

All below ground drainage infrastructure will be constructed in accordance with current UE requirements to ensure that there are no potential impacts to groundwater quality.

The main contractor will prepare method statements for weather and tide/storm surge forecasting and continuous monitoring of water levels in the River Corrib and Corrib Estuary. These will be made available to the local authority where requested. The Contractor will also provide method statements for the removal of site materials, fuels, tools, vehicles, and persons from flood zones in order to minimise the risk to persons working on the Site as well as potential input of sediment or construction materials into the waterbodies during flood events

Welfare facilities have the potential, if not managed appropriately, to release organic and other contaminants to ground or surface water courses. Foul drainage from temporary welfare facilities during the construction phase of the Proposed Development will either be discharged to temporary holding tank(s), the contents of which will periodically be tankered off site to a licensed facility or discharged to public sewer in accordance with the necessary temporary discharge licences issued by UE. The Galway WWTP is operated in accordance with relevant statutory approvals issued by UE. The increase discharge to the Galway WWTP as a result of the Proposed Development is considered to be insignificant in terms of the overall scale of the facility. The increased load does not have the capacity to alter the effluent released from the WWTP to such an extent as to result in likely significant effects on its receiving waters. Therefore, there will be no potential impact on water quality and the WFD status of receiving waterbodies and any Natura 2000 sites associated with discharges from the Site.

5.5.1.2 Operational Phase

Based on the design of the Proposed Development there is limited potential sources of contamination during the operational phase. Furthermore, the proposed attenuation design does not allow for infiltration to ground. Surface water will be managed in accordance with the principles and objectives of SuDS and the GDSDS to treat and attenuate water prior to discharging offsite. Ongoing regular operational monitoring and maintenance of drainage and the SuDS measures will be incorporated into the overall management strategy for the Proposed Development. This will ensure that there are no impacts on water quality and quantity (flow regime) during the operational phase of the Proposed Development.

Foul water during the operational phase of the Proposed Development will ultimately discharge via the Galway WWTP to Galway Bay under the appropriate consents from UE. As mentioned above, the Galway WWTP, which is operated in accordance with relevant statutory approvals issued by UE. Foul water from the site will only be discharged to the UE network under the appropriate consents from UE, and therefore, the Proposed Development will not cause a potential impact on water quality and the WFD status of receiving waterbodies and any Natura 2000 sites associated with discharges from the site.

5.5.2 Potential Impact on Natura 2000 Sites

Based on the findings of this assessment, it is considered that in the absence of any mitigation or avoidance measures that there would be a potential impact on water quality of the Corrib River, the Corrib Estuary and associated downstream Natura 2000 sites including the Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC and Inner Galway Bay SPA. Considering the distance downstream and the significant dilution which will occur, it is considered that there is no perceived impact on any further downstream Natura 2000 sites.

The mitigation measures as outlined above, including the provision of SuDS in accordance with the GDSDS and construction mitigation measures, will prevent any impact on the receiving groundwater and surface water environment.

- The construction phase will be managed in accordance with the CEMP (AECOM, 2025c) which will be further developed by the main contractor and will include appropriate avoidance and mitigation measures to prevent any potential impact on the receiving water bodies and associated Natura 2000 sites.
- During the operational phase, surface water from the site will be managed in accordance with the principles and objectives of SuDS to treat and attenuated water prior to discharge to ground through infiltration. Therefore, there will be no impact on baseline conditions at any Natura 2000 sites associated with the discharge of surface water from the Proposed Development.
- During the operational phase, foul water from the site will discharge via the Galway WWTP to the Corrib Estuary transitional waterbody and Inner Galway Bay coastal waterbody. The WWTP is operated in accordance with relevant statutory approvals and therefore, there will be no impact on baseline conditions at any Natura 2000 sites associated with foul discharges from the proposed development.

5.5.3 Water Framework Directive Status

The findings of the risk-based assessment identified that in the absence of any mitigation and avoidance measures there could be a potential impact on the water quality within receiving water bodies associated with the Proposed Development, specifically within the Clare-Corrib GWB, the Terryland_10 and the Corrib_020 river waterbodies, the Corrib Estuary transitional waterbody and the Inner Galway Bay North coastal waterbody. There is no identified potential impact to the Inner Galway Bay South and Outer Galway Bay coastal waterbodies attributed to the separation distances and anticipated assimilation capacity of the receiving water bodies taking account of the existing baseline conditions and WFD Status.

The mitigation measures as outlined above, including the implementation of a robust CEMP during the construction phase and the incorporation of SuDS in the design of the Proposed Development, will prevent any impact on the receiving groundwater and surface water environment. Hence, the Proposed Development will not have any impact on compliance with the EU Water Framework Directive, European Communities (Environmental Objectives) Surface Water Regulations, 2009 (SI 272 of 2009, as amended 2012 (SI No 327 of 2012), and the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010), as amended 2012 (SI 149 of 2012) and 2016 (S.I. No. 366 of 2016).

The Proposed Development will not cause a deterioration in the status of waterbodies hydraulically connected with the Proposed Development, taking account of design avoidance and mitigation measures that will be implemented. The Proposed Development will not jeopardise the objective to achieve ‘good’ surface water status or good ecological potential.

There will be no impact to the existing WFD status of water bodies associated with the Proposed Development including the Terryland_10, Corrib_020, the Corrib Estuary, the Inner Galway Bay North, the Inner Galway Bay South, the Outer Galway Bay and the Clare-Corrib GWB as a result of the Proposed Development taking account of design avoidance and mitigation measures.

6 CONCLUSIONS

EGC has carried out a risk-based hydrological and hydrogeological impact assessment for the Proposed Development to determine if there is any potential for significant impacts on the receiving water environment and designated Natura 2000 sites in the absence of avoidance and mitigation measures.

The CSM was developed identifying plausible S-P-R linkages for the Proposed development and receiving water environment. The CSM formed the basis of the evaluation of any potential impacts to receptors including waterbodies, GWDTEs and Natura 2000 sites associated with the Proposed Development. The assessment assumed a worst-case scenario and in the absence of any mitigation measures intended to avoid or reduce potential harmful effects.

Based on the findings of this assessment the following can be concluded:

- The underlying aquifer has been identified as “Regionally Important Aquifer - Karstified (conduit) (RKc)” which has inherent pathways for potential pollutants pathways within the GWB and to migration to receiving waterbodies including the Corrib River and Corrib Estuary.
- In the unmitigated scenario, there is a potential risk associated with the discharge of contaminants to ground affecting both the underlying aquifer and downstream waterbodies including the Corrib River, the Corrib Estuary and associated downstream Natura 2000 sites including the Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC and Inner Galway Bay SPA. Considering the distance downstream and the significant dilution which will occur, it is considered that there is no perceived impact on any further downstream Natura 2000 sites.
- In the unmitigated scenario, there is also a potential risk associated with the indirect (mains drainage) discharge of surface water runoff from the Proposed Development on the receiving water quality of the Terryland Stream, the Corrib River, the Corrib Estuary and associated downstream Natura 2000 sites including the Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC and Inner Galway Bay SPA.
- There is no identified risk to water quality via foul water drainage or discharges from the Proposed Development that will ultimately be discharged to the Corrib Estuary transitional waterbody and the Inner Galway Bay North coastal waterbody via the Galway WWTP under appropriate consent from UE.
- The appropriate standard design measures for the construction phase and operational phase of the Proposed Development including implementation of the CEMP and SuDS measures within the drainage design will prevent, limit and mitigate any the potential for the worst-case scenario to occur. These design avoidance measures will ensure there is no risk to water quality of the receiving watercourses.
- Overall, there is no identified impact to the existing WFD status of water bodies associated with the Proposed Development including within the Clare-Corrib GWB, the Terryland_10 and the Corrib_020 river waterbodies, the Corrib Estuary transitional waterbody and the Inner Galway Bay North coastal waterbody as a result of the Proposed Development taking account of design avoidance and mitigation measures that will be implemented as described.

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Environmental Consultancy Services

Appendix 8-2

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Water Framework Directive Assessment

PRESENTED TO

Galway City Council
Phase 1 - Corrib Causeway - Dyke Road

DATE

March 2025

Environmental Consultancy Services

DOCUMENT CONTROL SHEET

Client	Galway City Council
Project Title	Phase 1 - Corrib Causeway - Dyke Road
Document Title	Water Framework Directive Assessment

Rev.	Status	Author(s)	Reviewed by	Approved by	Issue Date
01	ISSUE	Gareth Carroll *Principal Consultant*	Warren Vokes *Senior Consultant*	Gareth Carroll *Principal Consultant*	07/02/2024
02	ISSUE – Legal Review	Gareth Carroll *Principal Consultant*	Warren Vokes *Senior Consultant*	Gareth Carroll *Principal Consultant*	05/03/2024

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If the scope of work includes subsurface investigation such as boreholes, trial pits and laboratory testing of samples collected from the subsurface or other areas of the site, and environmental or engineering interpretation of such information, attention is drawn to the fact that special risks occur whenever engineering, environmental and related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with best practice and a professional standard of care may fail to detect certain conditions. Laboratory testing results are not independently verified by Enviroguide and have been assumed to be accurate. The environmental, ecological, geological, geotechnical, geochemical and hydrogeological conditions that Enviroguide interprets to exist between sampling points may differ from those that actually exist. Passage of time, natural occurrences and activities on and/or near the site may substantially alter encountered conditions.

LIST OF ABBREVIATIONS

Abbreviation	Definition
AEP	Annual Exceedance Probability
AFA	Area for Further Assessment
DEHLG	Department of Environment, Heritage and Local Government
DWPA	Drinking Water Protected Areas
EGC	Enviroguide Consulting
GSI	Geological Survey Ireland
OPW	Office of Public Works
RBMP	River Basin Management Plan
TII	Transport Infrastructure Ireland
UE	Uisce Éireann
WAP	Water Action Plan
WFD	Water Framework Directive
WWTP	Wastewater Treatment Plant

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1 INTRODUCTION

Enviroguide Consulting (hereafter referred to as EGC) was appointed by the Land Development Agency (hereafter referred to as the LDA), on behalf of Galway City Council (hereafter referred to as GCC) to complete a Water Framework Directive (WFD) Assessment for the first phase of the proposed residential-led mixed use development at Dyke Road, Terryland, Co. Galway (hereafter referred to as the 'Proposed Development' and 'site').

This report presents the findings of the WFD Assessment for the site and Proposed Development.

1.1 Project Objective

The overall objective of this WFD assessment is to determine if any specific components or activities associated with the Proposed Development will compromise WFD Article 4 objectives, cause a deterioration in the status of any surface water or groundwater body and/or jeopardise the attainment of good surface water or groundwater status. This assessment also aims to identify any waterbodies with the potential to be impacted, describe the proposed mitigation measures, and define any residual potential impacts.

1.2 Project Scope of Work

The scope of the water framework directive assessment included the following tasks:

- A desk-based review of published information and information pertaining to the Site and Proposed Development provided by the LDA / GCC .
- Develop a hydrological / hydrogeological Conceptual-Site-Model and identify any potential source-pathway-receptor linkages; and
- Identify and assess any potential impacts of the Proposed Development on the WFD status of sensitive receptors associated with the receiving water environment.

This assessment is reliant on the design information for the Proposed Development provided by GCC.

1.3 Professional Competency

The report was reviewed by Warren Vokes Ba MSc MCIWEM C.WEM a Senior Consultant of EGC. Warren is a Chartered Water and Environmental Manager with over 8 years' experience of preparing environmental and hydrological assessments. The report was approved by Gareth Carroll BA BEng MIEnvSc CEnv, a Principal Consultant of EGC. Gareth is a Chartered Environmentalist (CEnv) with the Institute of Environmental Sciences (IES) with over 12 years' experience of preparing environmental and hydrogeological assessments for a range of project types and geological and hydrogeological site settings and accredited to undertake water framework directive assessments.

2 METHODOLOGY

2.1 Legislative Context

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU, and 2014/101/EU ("WFD"), was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) as amended. Additionally, the European Communities (Environmental Objectives) Surface Water Regulations, 2009 (SI 272 of 2009, as amended, and the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010) (as amended), set out specific requirements for the protection and improvement of surface water and groundwater quality. These regulations aim to prevent the deterioration of water status, promote sustainable water use, and enhance the protection of aquatic ecosystems and associated habitats.

The WFD requires that all member states protect and improve water quality in all waters, with the aim of achieving good status by 2027 at the latest. Any new development must ensure that this fundamental requirement of the WFD is not compromised. The Article 4 objectives, which have been considered as part of the design process of the Proposed Development, include:

- Protect, enhance, and restore all bodies of surface water and groundwater with the aim of achieving good surface water status by 2027.
- Prevent deterioration and maintain a 'high' status where it already exists.
- Implement the necessary measures with the aim of progressively reducing pollution in surface waters and groundwater.
- Ensure waters in protected areas meet requirements.

The WFD is implemented through the River Basin Management Plans (RBMP), which comprise a six-yearly cycle of planning, action, and review. RBMPs include identifying river basin districts, water bodies, protected areas, and any pressures or risks, monitoring, and setting environmental objectives. In Ireland, the first RBMP covered the period from 2010 to 2015, with the second cycle plan covering the period from 2018 to 2021.

The Water Action Plan 2024 (RBMP 3rd Cycle) Programme of Measures outlines comprehensive measures to protect and improve water quality across various sectors. The Programme of Measures (PoM) for RBMP is a comprehensive set of actions designed to achieve the environmental objectives set out in the Water Framework Directive. The PoM includes both basic and supplementary measures:

- Basic measures are mandatory actions required to fully implement existing water protection directives. The 11 key EU Directives which form the Basic Measures are: Bathing Waters Directive, Birds Directive, Habitats Directive, Drinking Waters Directive, Major Accidents and Emergencies Directive, Environmental Impact Assessment Directive, Sewage Sludge Directive, Urban Wastewater Treatment Directive, Plant Protection Products Directive, Nitrates Directive, and Industrial Emissions Directive.
- Supplementary measures augment basic actions to achieve water objectives and include codes of practice, voluntary agreements, demand reduction, education,

rehabilitation or research programmes, and legal, administrative, and economic instruments.

Key elements of the PoM include:

- Integrated Catchment Management: The PoM uses an integrated catchment management approach, focusing on identifying the right measures for specific locations to maximise effectiveness.
- Collaboration: Implementation involves collaboration between various government departments, local authorities, the EPA, and other stakeholders, with the Programme Delivery Office overseeing and coordinating efforts.
- Monitoring and Reporting: An enhanced monitoring and reporting programme tracks the implementation progress and assesses the effectiveness of the measures.
- Targeted Actions: The PoM identifies specific actions under each pressure/issue affecting water quality, assigning lead organisations, timelines, and key performance indicators.
- Multiple Benefits: The PoM aims to deliver multiple benefits for water, biodiversity, and climate change mitigation and adaptation.
- Environmental Assessment: All measures and projects arising during the third-cycle RBMP are subject to further environmental assessments, including Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA), as required.

The Water Action Plan 2024 provides numerous specific examples of measures within the PoM, categorised by the sector driving the impact:

- Agriculture: Implementation of a stronger and more targeted Nitrates Action Programme, including tighter controls on nutrient applications, a livestock excretion banding system, a national fertiliser sales database, and enhanced inspection and enforcement programmes.
- Hydromorphology: Developing a new Controlled Activities for the Protection of Waters regime to address pressures on the physical condition of waters.
- Forestry: Increasing the area of forests with appropriate water setbacks, seeking improvements to the licence applications process for key forestry activities, and rolling out schemes that promote water protection.
- Urban Wastewater: Continued investment in urban wastewater infrastructure and a review of water bodies where urban wastewater is a significant pressure.
- Peatlands: Updating the National Peatlands Strategy and continuing the national programme of peatland restoration.

These measures are designed to ensure that all new developments comply with the WFD's fundamental requirements and contribute to the overall goal of achieving good water status by 2027.

This assessment takes into account and meets all the requirements and objectives outlined above, ensuring compliance with the WFD.

2.2 WFD Assessment Criteria

2.2.1 Surface Water Quality Assessment

Under the WFD, surface water bodies are defined as either rivers, lakes, transitional waters or coastal waters, or as artificial surface water bodies or heavily modified surface water bodies. each natural surface water body is assessed on its ecological status and its chemical status.

Ecological status is assessed based on the following categories, with each category receiving a rating of, “High”, “Good”, “Moderate”, “Poor” or “Bad”:

- Biological quality (aquatic flora and fauna).
- Physio-chemical quality (temperature, oxygenation, nutrient conditions).
- Hydromorphological quality (waterflow, sediment composition and movement, river bank structure etc).

The over-all ecological status will be based on the lowest of the three individual ratings.

In the case of artificial and heavily modified waters, ecological potential status is assessed similarly to ecological status above but is rated as “Maximum”, “Good”, “Moderate”, “Poor” or “Bad ecological potential” instead. In general terms, ‘maximum ecological potential’ means that the water body is as close as possible to a comparable surface water body, with the only differences being those directly attributed to artificial or modified nature of the water body.

Chemical status is given one of two rating: ‘Good’ or ‘Failing to Achieve Good’. For an assessment of ‘Good’, no substance listed in the European Communities (Environmental Objectives) Surface Water Regulations, 2009 (SI 272 of 2009, as amended, may be found in concentrations above the relevant EQS limits.

The over-all chemical status of a waterbody is determined by the lowest status found to apply.

2.2.2 Groundwater Quality Assessment

Groundwater is awarded either “Good” or “Poor” status. Groundwater is assessed based on its chemical and quantitative status.

Good chemical status of a groundwater body requires the entry of hazardous substances and saline intrusion into the groundwater to be prevented, and the entrance of other pollutants to be below the limits within the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010) (as amended). Concentrations of pollutants must also not be of such a concentration as to impact the ecological or chemical status of associated surface waters or to damage linked terrestrial ecosystems.

Quantitative status is assessed based on whether or not the available groundwater resource is being reduced by the long-term rate of annual abstraction and is rated as “Good” or “Poor”.

2.3 Approach to WFD Assessment

In order to assist in the implementation of the WFD, EU member states, alongside Norway and the European Commission, developed a Common Implementation Strategy (CIS) in May 2001. This CIS was designed to provide coherent and comprehensible guidelines aimed at achieving the aims of WFD.

CIS Guidance Document 36 provides an outline of an approach to WFD Assessments which breaks the assessment down into the following sequential steps.

- Screening for Potential Effects - Determine whether the Proposed Development could have any direct or indirect effect on the different quality elements relevant to the WFD.
- Scoping of Further Investigations - Outline the information required to determine the significance of any effect on the relevant quality elements.
- Data Collection and Assessment - Assess whether any effect could cause deterioration or compromise the status/potential status of a water body.

If the Proposed Development is determined to comprise or deteriorate the status/potential status of a waterbody then an “Article 4(7) Test” is required. The Proposed Development can only be authorised if the conditions as outlined under Article 4(7) a) to d) are fulfilled. If the conditions are not fulfilled the Proposed Development cannot be authorised according to the WFD.

If no impacts are identified, then no Article 4(7) assessment is required and authorisation may be authorised according to the WFD.

2.3.1 Screening for Potential Effects

2.3.1.1 Desk-based Study

A desk-based study was undertaken including a review of relevant information from the following publicly available sources and information provided by GCC:

- Ordnance Survey Ireland Online mapping (OSI, 2025).
- Geological Survey of Ireland Online mapping (GSI, 2025).
- Environmental Protection Agency Online mapping (EPA, 2025).
- National Parks & Wildlife Services, Protected Sites Webmapping (NPWS, 2025).
- Relevant drawings and design reports for the Proposed Development provided by the GCC.

The methodology for screening waterbodies in or out based on proximity involved considering the potential effects of the Proposed Development on the WFD surface waterbody status during both construction and operation phases. The study area extends beyond the site boundaries and includes a 2.0km radius of the site and Proposed Development and potential receptors outside of this radius that are potentially hydraulically connected with the Site. The extent of the wider study area was based on the Institute of Geologists of Ireland (IGI) Guidelines (IGI, 2013) that recommends a minimum distance of 2.0km radius from the Site. This broader area is necessary to identify and evaluate all potential receptors that could be affected by the Proposed Development, either directly or indirectly. The distinction between the Site and the study area is crucial. The Site of the Proposed Development is the focal point of the Proposed Development, while the study area includes any potential hydrogeological / hydrological connections to sensitive receptors including habitats that might experience secondary effects.

2.3.1.2 Conceptual Site Model

A CSM represents the characteristics of the site and identifies the possible relationship and potential risk between contaminant sources (i.e., characteristics of the Proposed

Development), pathways and receptors (receiving environment) These three essential elements of the CSM are described as:

- A **source –** a substance that is in, on or under the land and has the potential to cause harm or pollution.
- A **pathway** – a transport route or means by which a receptor can be exposed to, or affected by, a contaminant source.
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.

The term pollutant linkage is used to describe a particular combination of source-pathway-receptor. Each of these elements can exist independently, but they create a risk only where they are linked together so that a particular contaminant affects a particular receptor through a particular pathway (i.e., a pollutant linkage).

The preliminary CSM for the site of the Proposed Development is initially defined and this is then revised throughout the risk-based assessment process.

2.3.2 Risk Based Impact Assessment

A risk-based and receptor-focussed approach was adopted to include an assessment of any impact to the receiving hydrological and hydrogeological (water) environment associated with the Proposed Development.

The basis for a risk assessment is the CSM or Source-Pathway-Receptor (SPR) model which underpins the Directive 2000/60/EC (Water Framework Directive) amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU. These directives have been transposed into Irish legislation through the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) and subsequent amendments, as well as the European Communities (Environmental Objectives) Surface Water Regulations, 2009 (SI 272 of 2009, as amended, and the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010) (as amended). Additionally, the assessment follows the EPA Guidance on the Authorisation of Discharges to Groundwater (EPA, 2011) and the EPA Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA, 2013) on the protection of groundwater and surface water resources.

A risk assessment is undertaken to provide an understanding of the risk associated with the presence of any potentially contaminating materials and/or activities on a site. This is informed by the assessment of potential for viable pollutant linkage(s) to be present. A pollutant linkage is established when there is a viable or potentially viable **S**ource, a **P**athway and a **R**eceptor (refer to Section 2.4 below).If one or more of the three elements are missing, the exposure pathway is considered incomplete and there is no risk associated with the activity or contaminant source (i.e., a viable means of exposure is not considered to be present or is unlikely to be present).

The objective of the Water Framework Directive (WFD) is to ensure no deterioration of the water quality status, and the “prevent or limit” objective is a key element of achieving that WFD status for all water bodies regardless of their current water quality status. The ‘prevent or limit’ objective involves measures to avoid and mitigate impacts, serving as the first line of defence in restricting pollutant inputs from a development (i.e., "source" removal) and preventing any potential impact or deterioration of the water quality status or WFD status of the receiving water body.

This assessment considers potential effects on the constituent sub-parameters that comprise waterbody status (e.g., hydromorphology, aquatic flora and fauna, physio chemical and priority chemicals). A significant adverse effect in any of these sub-parameters that reduces the status of the sub-parameter or prevents the attainment of good status is considered to contravene the objectives of the WFD.

In this assessment all three elements of the Source-Pathway-Receptor model will be identified to develop a CSM, and any potential linkages evaluated and assessed to determine if the development could potentially impact upon the WFD Status of the water bodies associated with the site and not have any impact on compliance with the EU Water Framework Directive, the European Communities (Environmental Objectives) Surface Water Regulations, 2009 (SI 272 of 2009, as amended, and the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010) (as amended).

3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The Proposed Development forms part of an overall three phase Development Framework, in the form of the Corrib Causeway Development Framework. The overall Development Framework site extends to 1.78 hectares and is located to the northeast of the city centre, within walking distance from Eyre Square and is within the Headford Road area. The development frameworks aims to deliver a residential-led, mixed-use development. Phase 1, relates to the current, subject proposal; Phase 2, an existing car park south of the site, is intended to be redeveloped for a mix of uses such as civic, commercial, and cultural uses; and Phase 3 is intended to provide additional residential units. The current Phase 1 development, subject of this planning application, has the potential to act as a catalyst to kick-start the regeneration of this three phase development framework but also the redevelopment of the wider area. This particular site has been brought forward for the first phase of development on the basis that the Draft Headford Road Framework Plan (2009) envisioned residential development at this particular location with the more civic and commercial uses to be located further south on the Phase 2 site. The current Development Framework has been prepared to align with this vision.

The Proposed Development (i.e., the Phase 1 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.
- 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.

The layout of the Proposed Development is presented in Figure 3-1.

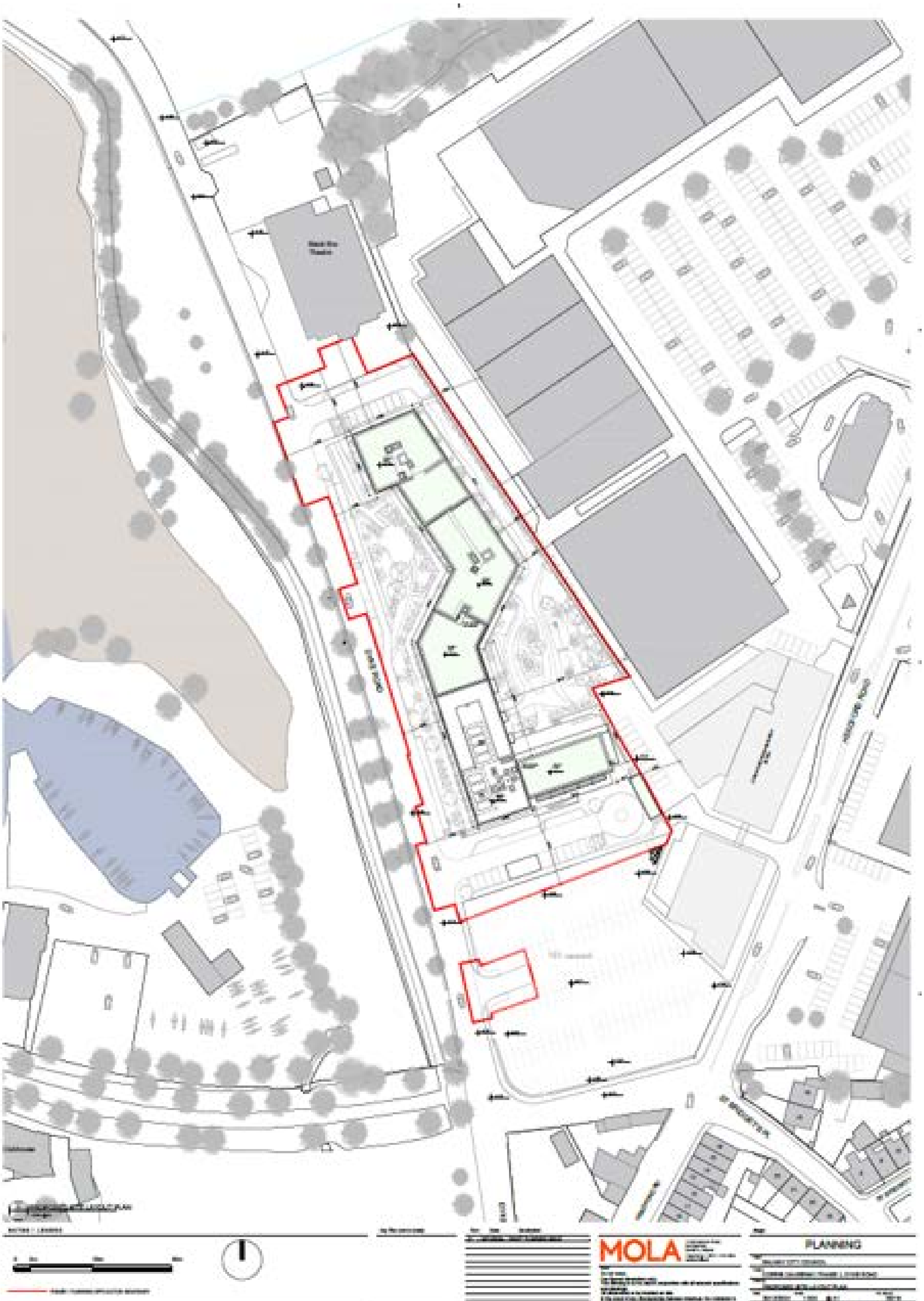

Figure 3-1. Proposed Development Site Layout (MOLA, 2024)

3.1 Construction Phase

The Construction Phase of the Proposed Development will include:

- It is understood that the foundation design will consist of 640mm diameter ODEX piles with reinforced in-situ concrete ground beams between pile caps and suspended slab.
- Stripping of existing macadam layers and road buildup (approximately 3,3037m^3).
- Excavation of soil and subsoil to formation level with the excavation of approximately 2,219m^3 of soils
- Excavation of soil and subsoil for the construction of building foundations, drainage and other infrastructure with excavation of 7,500m^3 of soils.
- It is anticipated that there will be no requirement for the excavation of bedrock during the construction phase of the Proposed Development.
- Where possible, it is intended to reuse suitable excavated soil and subsoil for landscaping and engineering use. However, where required, surplus materials will require removal offsite in accordance with all statutory legislation.
- Temporary stockpiling of excavated material pending re-use onsite or export offsite.
- The importation of 3,750m^3 of aggregate fill materials will be required for the construction of the piling matt.
- The importation of 3,072m^3 of aggregate fill materials will also be required for the construction of the Proposed Development (e.g., granular material beneath road pavement, under floor slabs and for drainage and utility bedding / surrounds etc.).
- Based on the findings of the ground investigation (GII, 2024) and the design requirements for the Proposed Development, it is anticipated that granular deposits may be encountered during excavations for building foundations, drainage and other infrastructure. Any excavations which penetrate the granular deposits will be required to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages.
- There may be a requirement for management of surface water (rainwater) and shallow groundwater (recorded at levels ranging between 0.17mbGL and 2.25mbGL), where encountered during groundworks.
- Construction of new foul and mains water connections in accordance with UE Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03), UE's Code of Practice for Water Infrastructure (IW-CDS-5020-03).
- Construction of new surface water drainage designed in accordance with the principles and objectives of Sustainable Drainage Systems (SuDS) and the requirements of Galway City Council (GCC).
- Diversion of exiting surface water pipes within the Site from the footprint of proposed buildings.

3.2 Operational Phase

3.2.1 Surface Water Drainage

As documented in the Infrastructure Report (AECOM, 2025a), the proposed surface water drainage network, which will accommodate surface water runoff from impermeable surfaces in the Proposed Development (including roadways, roofs, and parking areas), will be managed in accordance with the policy requirements of Galway City Council Development Plan 2023-2029 and the principles and objectives of Sustainable Drainage Systems (SuDS) and the

Greater Dublin Strategic Drainage Study (GDSDS) to treat and attenuate surface water prior to discharging offsite as follows:

- It is proposed to install a new surface water piped gravity network which will discharge, at a restricted rate agreed with GCC of 25l/s, to the existing 600mm diameter concrete pipe which runs from south to north along the western boundary of the site and ultimately discharges to the Terryland Stream located approximately 0.13km north of the site at its closest point.
- As part of the Proposed Development, the LDA on behalf of GCC proposes to install a new separate gravity surface water drainage network to service the Proposed Development, which will discharge into the existing GCC 600mm Ø surface water concrete pipe. GCC confirms this pipe runs south-north along the western boundary of the Proposed Development, and discharges into the Terryland Stream. Preliminary investigations undertaken by LDA and GCC indicate sections of the pipe north of the Proposed Development (i.e., on Phase 3 development lands) may require repairs. GCC advises it will consider any potential future repairs in conjunction with LDA contribution from Phase 1, to ensure the Phase Proposed Development can connect to the existing surface water infrastructure.

The proposed surface water drainage network has been designed to convey run-off associated with a 1 in 5-year return period event without surcharge and a 1 in 100-year return period event without flooding. An additional 20% has been allowed for climate change in relation to rainfall intensities.

As detailed in the Infrastructure Report (AECOM, 2025a), the following attenuation and SuDS measures will be incorporated into the Proposed Development:

- Intensive green roof, providing a maximum storage volume of 131.2m^3.
- Exfiltration permeable paving car parking spaces
- Extensive linear rain gardens / swales (incorporating impermeable liner).
- Two (2No.) shallow reinforcement concrete attenuation tanks (providing a combined storage of 72.8m^3) with a hydrobrake installed at the outfall manhole.
- Class I By-Pass hydrocarbon separator.

The proposed surface water drainage layout and SuDS design are presented Figure 3-2.

Figure 3-2. Proposed Drainage Layout (AECOM, 2025a. Proposed Drainage Keyplan)

3.2.2 Foul Drainage

As documented in the Infrastructure Report (AECOM, 2025a), the estimated peak wastewater loading generated by the Proposed Development is estimated at 2.97 l/s.

Uisce Éireann (UE) have confirmed that the existing wastewater pumping station (WWPS) was designed to cater only for the Black Box Theatre and that it doesn't have capacity to cater for any additional flows. Therefore, it is proposed to relay the gravity foul sewer serving the Black Box Theatre and install a new gravity sewer network to serve the Proposed Development. The existing wastewater pumping station (WWPS) that serves the Black Box Theatre is to be decommissioned and a new WWPS constructed (AECOM, 2025a). The new WWPS has been positioned based on the flood extents within the site and to maximize the separation from buildings. The pumping station is located so that it is above the 1 in 100-year return period event water level and as far away from all buildings as possible. In addition, the above ground elements (kiosk and control room) are located above the 1:200-year return period. UE's minimum separation distance to be provided between pumping stations and habitable buildings is 15m which can be achieved within the site. An emergency tank with 24-hour storage capacity at Dry Weather Flow (DWF) has been provided to serve the Proposed Development and the Black Box Theatre (AECOM, 2025a).

As documented in the Infrastructure Report (AECOM, 2025a), the UE Confirmation of Feasibility (CoF) letter states that the proposed foul water connection is feasible subject to upgrades.

The existing 150mm rising main serving the existing WWPS is to be retained and reused. Uisce Éireann (UE) have confirmed that a 20m upgrade of a 150mm diameter sewer from Dyke Road to Wood Quay will be required. These works will be funded by the Applicant (AECOM, 2025a). Furthermore, the Applicant will also investigate the separation of storm water and foul on the site lands and ensure that any existing storm water which is entering into the Uisce Eireann (UE) combined system is eliminated. The Applicant will ensure that there is no storm water discharge to the UE network.

A Statement of Design Acceptance (SoDA) has subsequently been issued by UE (AECOM, 2025a).

The proposed foul drainage will be designed in accordance with the Technical Guidance Document – Part H of the Building Regulations, UE's Code of Practice for Wastewater Infrastructure (IW-CDS-5030-03), BS EN 752 – Drains and sewer systems outside buildings, Sewers for Adoption, 6th Edition and Micro Drainage Software Pipeline Design (AECOM, 2025a).

It is understood that foul water from the Proposed Development will be treated in the Galway Wastewater Treatment Plant (WWTP) (Discharge Licence No. D0050-01) before ultimately discharging to the Corrib Estuary transitional waterbody (EU Code: IE_WE_170_0700).

3.2.3 Water Supply

As documented in the Infrastructure Report (AECOM, 2025a), it is proposed to take a connection off the existing 300mm watermain on the Headford Road. The new watermain will pass through the Phase 2 lands and loop around all 4 sides of the Proposed Development (i.e., Phase 1).

The internal water supply network is based on the requirements of the Uisce Éireann Code of Practice for Water Supply (IW-CDS-5030-02) and the Technical Guidance Document – Part B of the Building Regulations.

Firefighting water supplies and fire hydrants will be provided as required in accordance with the Building Regulations and the requirement of Galway City Fire Service.

The UE CoF letter states that the proposed water supply connection is feasible without infrastructure upgrade from UE (AECOM, 2025a). A SoDA has subsequently been issued by UE (AECOM, 2025a).

4 SITE SETTING AND RECEIVING ENVIRONMENT

4.1 Site Location and Description

The site of the Proposed Development is located at Dyke Road, Terryland, Co. Galway. The site, which extends to 1.144 hectares (Ha), is accessed by the Dyke Road and is located within the Headford Road area, to the northeast of the city centre and approximately 0.65km walking distance from Eyre Square.

The current land use at the site of the Proposed Development comprises a surface car park of approximately 311No. car parking spaces.

The site of the Proposed Development is bound to the north by the Black Box Theatre (i.e., Phase 3 of the overall Development Framework) which adjoins Terryland Forest Park to the south by Dyke Road Car Park comprising approximately 243No. car parking spaces (i.e., Phase 2 of the overall Development Framework) which adjoins local road Bóthar Na Dige, to the east by Galway Retail Park, and to the west by Dyke Road which adjoins the future greenway that intends to re-establish the old Clifden Railway Bridge and provide a greenway running from Galway City to Moycullen.

The surrounding lands are mainly comprised of low density, low grade commercial buildings with extensive surface car parking.

The Site Location is presented in Figure 4-1 and the current layout of the Site is presented in Figure 4-2.

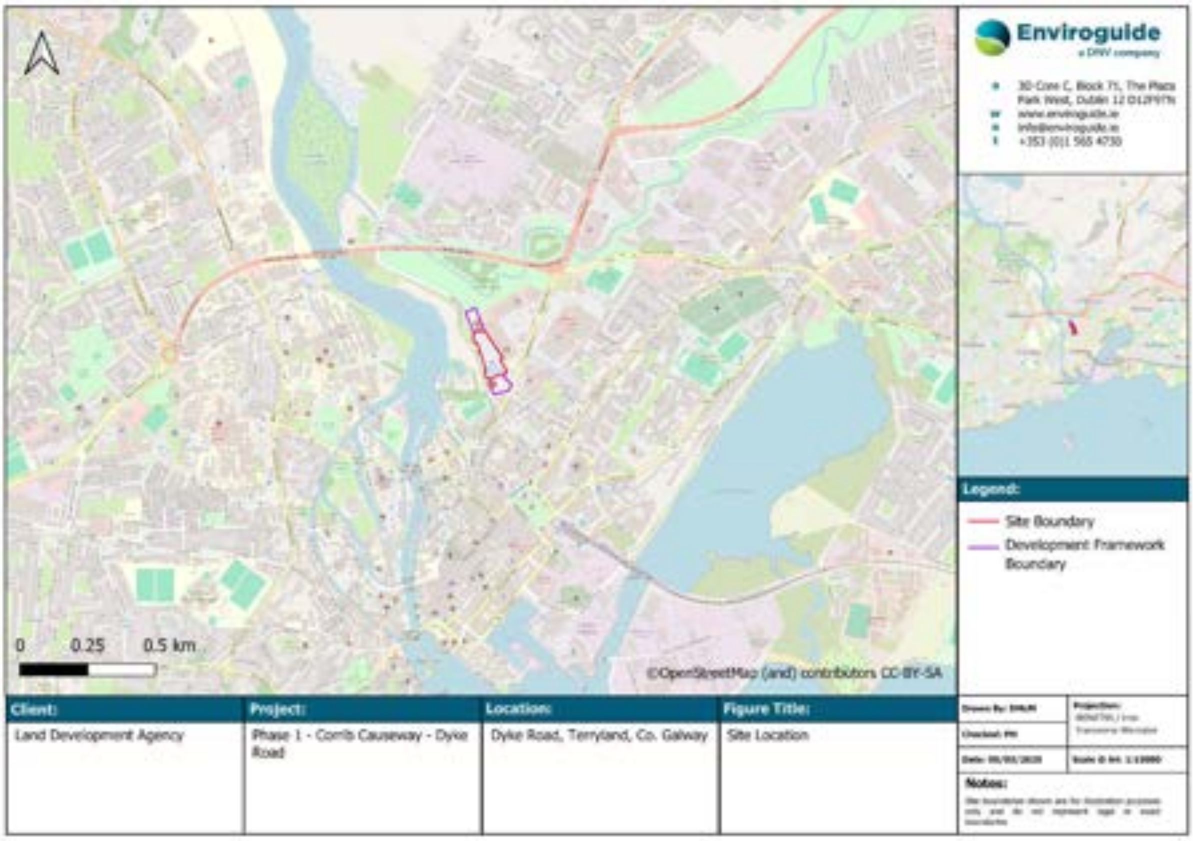

Figure 4-1. Site Location

Figure 4-2. Current Site Layout

4.2 Topography

As detailed in the Infrastructure Report (AECOM, 2025a), a topographical survey undertaken by Apex Surveys in October 2023 of the overall Development Framework site indicates that ground levels range from 3.84 meters above Ordnance Datum (mOD) at the northern end of the site to 7.12mOD 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 6.0mOD to approximately 7.0mOD.

The ground levels at the site of the Proposed Development typically range from 4.8mOD to 5.9mOD with the level in the centre of the site typically being around 5.3mOD.

4.3 Hydrology

The site is mapped by the EPA (EPA, 2025) as within the Corrib WFD Catchment (Catchment I.D.: 30), the Corrib_SC_010 WFD Sub-catchment (Sub-catchment I.D.: 30_18) and the Terryland_010 WFD River Sub-Basin (River Waterbody Code: IE_WE_30T010500).

The closest surface water feature is recorded on the EPA database (EPA, 2025) as the Terryland Stream (River Waterbody Code: IE_WE_30T010500), which is located approximately 0.13km north of the site at its closest point.

As detailed in the Galway City County Geological Site Report (GSI, 2020), the Terryland Stream originates from a narrow channel on the east side of Jordan’s Island, just north of the ruins of Terryland Castle, and approximately 0.62km northwest of the site. Typically, the Terryland Stream flows eastward toward two stream sinks, which are situated approximately 2.18km northeast of the site at their closest point (refer to Section 4.4.1). Although these sinks are near limestone outcrops, the Terryland Stream continues its course through a low-lying area characterised by substantial overburden. The subsoil's low permeability facilitates the conveyance of surface water across the valley until encountering limestone on the southern side. During periods of elevated groundwater levels, these sinks undergo a transformation into resurgences, releasing groundwater into the Terryland Stream. This augmented flow eventually converges with the Corrib River (River Waterbody Code: IE_WE_30C020600), located approximately 0.07km west of the site at its closest point. This shift from sink to resurgence categorises these features as estavelles. It is understood that these estavelles are connected to Galway Bay or Lough Atalia (i.e., the Corrib Estuary) through an underground conduit system, although the precise discharge locations remain unknown.

The Corrib River flows south before discharging to the Corrib Estuary transitional waterbody (EU Code: IE_WE_170_0700) approximately 0.99km southwest of the site at its closest point. The Corrib Estuary ultimately discharges to the Inner Galway Bay North coastal waterbody (EU Code: IE_WE_170_0000) located approximately 3.32km southeast of the site at its closest point.

The local surface waterbodies within a 2km radius of the site are presented in Figure 4-3.

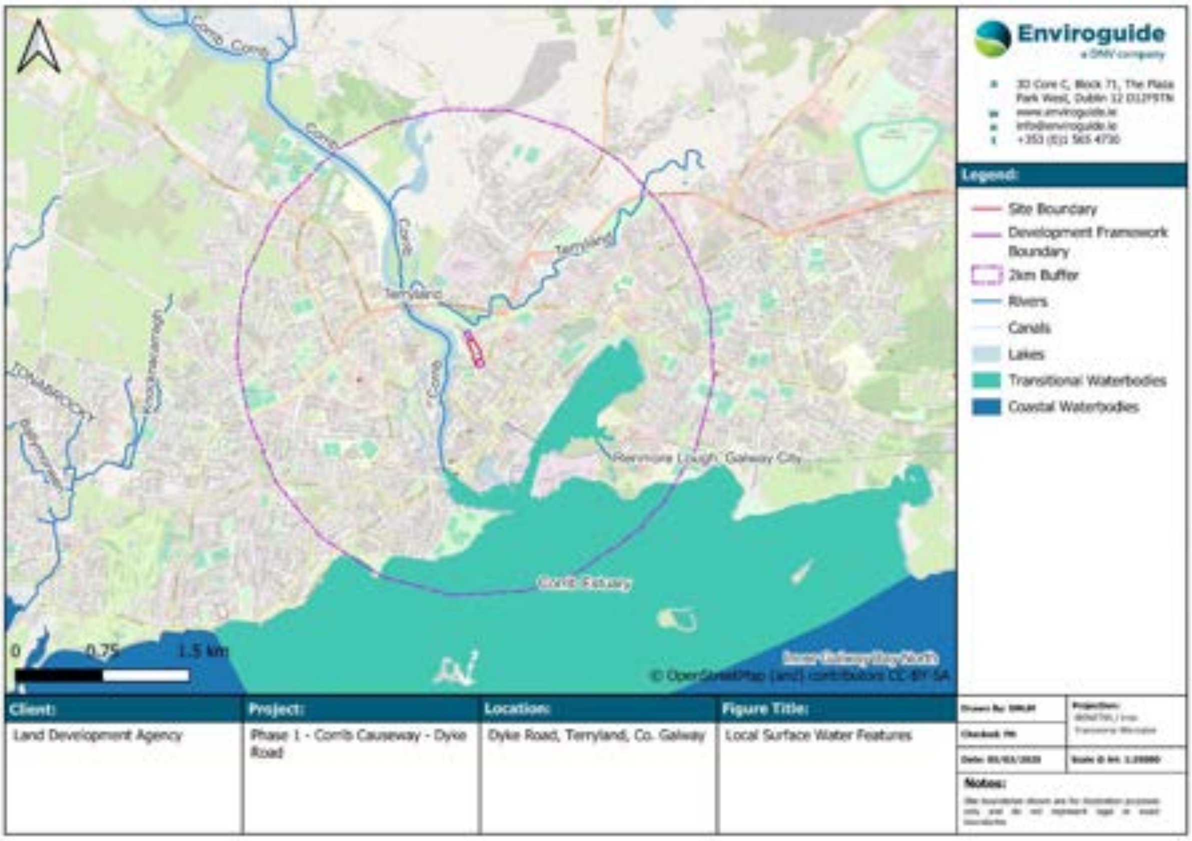

Figure 4-3. Local Surface Water Features

4.3.1 Existing Surface / Storm Drainage

As documented in the Infrastructure Report (AECOM, 2025a), the main surface water pipe running south to north along the western boundary of the site is a 450mm Ø concrete pipe. The pipe starts at an invert level of 5.8m on Bóthar Na Dige Road and falls to an invert level of 3.73m around the middle of the site, where it increases in size to a 525mm Ø concrete pipe and continues northwards until the discharge point. There is also a surface water pipe running through the site which serves the retail development on the Headford Road to the east of the Proposed Development which discharges into this surface water pipe (refer to Figure 4-4).

Based on the information shown on the record mapping (refer to Figure 4-4), and as confirmed by GCC, the existing network runs in a northerly direction along the western boundary of the site before discharging to the Terryland Stream. The bed level of the anticipated discharge point is approximately 2.9mOD (AECOM, 2025a). As part of the Phase 1 Corrib Causeway Development project, The LDA on behalf of Galway City Council (GCC) proposes to install a new separate gravity surface water drainage network to service the development, which will discharge into the existing GCC 600mm Ø surface water concrete pipe. GCC records shows that this pipe runs south-north along the western boundary of the Phase 1 site, and discharges into the Terryland Stream. Preliminary investigations undertaken by GCC in 2025 indicate sections of the pipe south of the Phase 1 site (on Phase 3 lands) may require repairs. GCC advises it will consider any potential future repairs in conjunction with LDA contribution from Phase 1, to ensure the Phase 1 development can connect to the existing surface water infrastructure.

The carpark site is nearly 100% impermeable and unattenuated flows discharges to the Terryland Steam. The unattenuated run-off rate from the site at 80mm/hour is estimated to be 216 l/s (AECOM, 2025a).

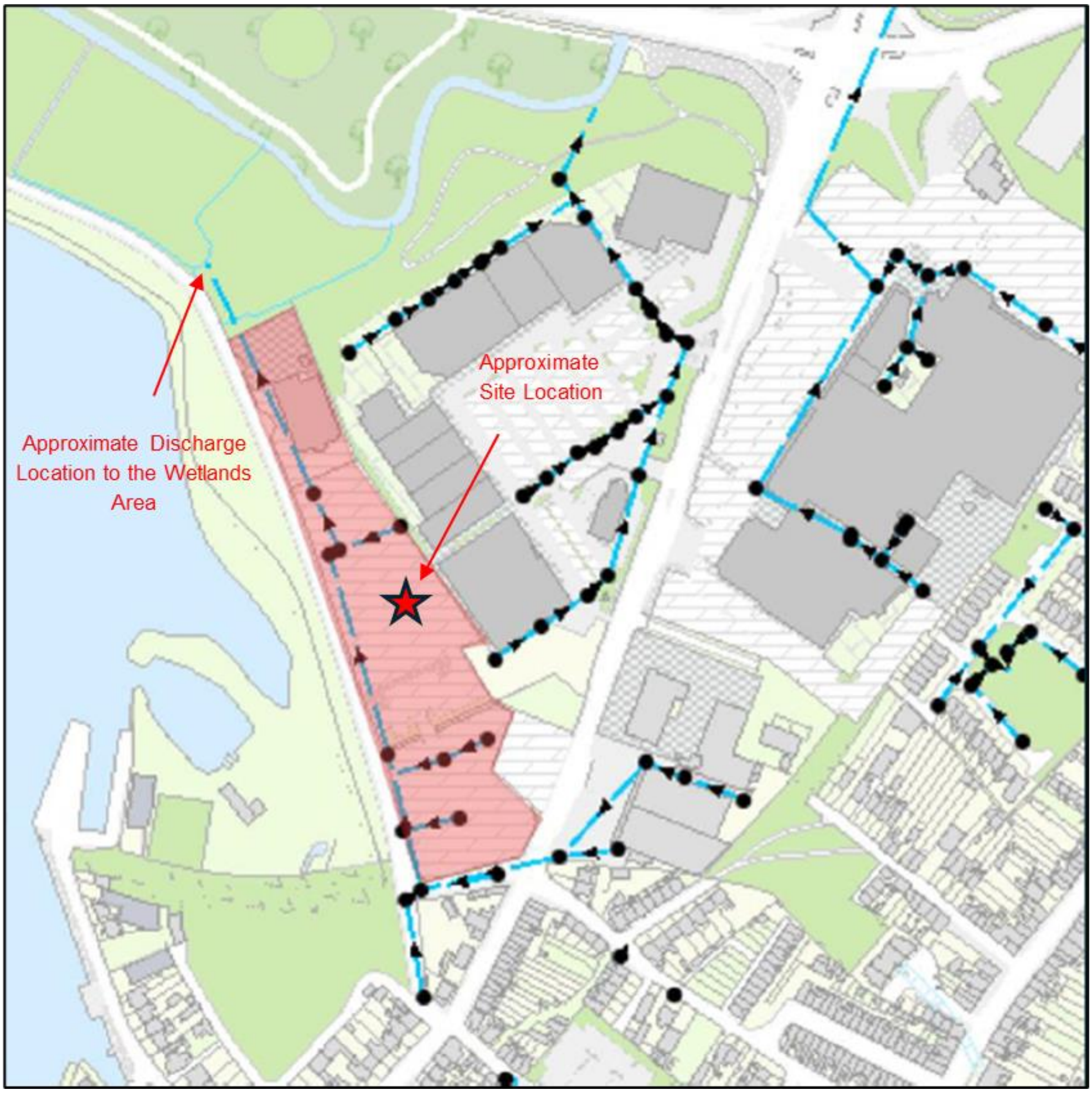

Figure 4-4. Drainage Infrastructure (AECOM, 2025a)

4.4 Hydrogeology

4.4.1 Groundwater Body and Flow Regimes

The EPA (EPA, 2025) maps the groundwater body (GWB) beneath the site as the Clare-Corrib GWB (EU Code: IE_WE_G_0020). The Clare-Corrib GWB covers some 642 km2 and occupies an area across Co. Galway, Co. Mayo and Co. Roscommon (GSI, 2025).

The Clare-Corrib GWB Report (GSI, 2025) identifies that diffuse recharge occurs over the GWB via rainfall percolating through the permeable subsoil and point recharge to the underlying aquifer occurs by means of swallow holes and collapse features/dolines.

Groundwater primarily discharges into rivers, large springs, and Lake Corrib (EU Code: IE_WE_30_666a), located approximately 3.55m north of the site at its closest point. During winter, it contributes to turloughs and is directed through artificial channels to manage flooding. Contributions to the River Corrib (River Waterbody Code: IE_WE_30C020600), located approximately 0.07km west of the site at its closest point, and the Terryland Stream, located approximately 0.13km north of the site at its closest point, are also considered likely.

The karstic systems within the Clare-Corrib GWB exhibit high levels of interconnection, facilitating regional-scale flow systems. Groundwater can bypass surface water catchments by flowing beneath surface water channels and across catchment divides. Flow paths within karst areas can extend up to 10km in length.

Groundwater flow occurs through various geological features such as fissures, faults, joints, and bedding planes. Notably, in limestone formations, karstification significantly enhances permeability, particularly along structural elements like fold axes and faults. This intricate network of pathways complicates predictions of groundwater flow. While the overall groundwater flow direction generally trends towards the River Clare and Lake Corrib, the highly karstified bedrock introduces significant local variability in flow directions. In the vicinity of the site groundwater flow likely follows a path that ultimately leads towards the River Corrib.

4.4.2 Aquifer Classification

The GSI (GSI, 2025) has classified the bedrock of the Burren Formation beneath the site and within the surrounding areas as a ‘Regionally Important Aquifer - Karstified (conduit) (RKc).

Regionally important aquifers are capable of supplying regionally important abstractions (e.g. large public water supplies), or ‘excellent’ yields (>400 m3/d). ‘Karstification’ is the process whereby limestone is slowly dissolved away by percolating waters. Karstification frequently results in the uneven distribution of permeability through the rock, and the development of distinctive karst landforms at the surface (e.g. swallow holes, caves, dry valleys), some of which provide direct access for recharge/surface water to enter the aquifer.

The bedrock aquifer beneath the Site is presented in Figure 4-5 below.

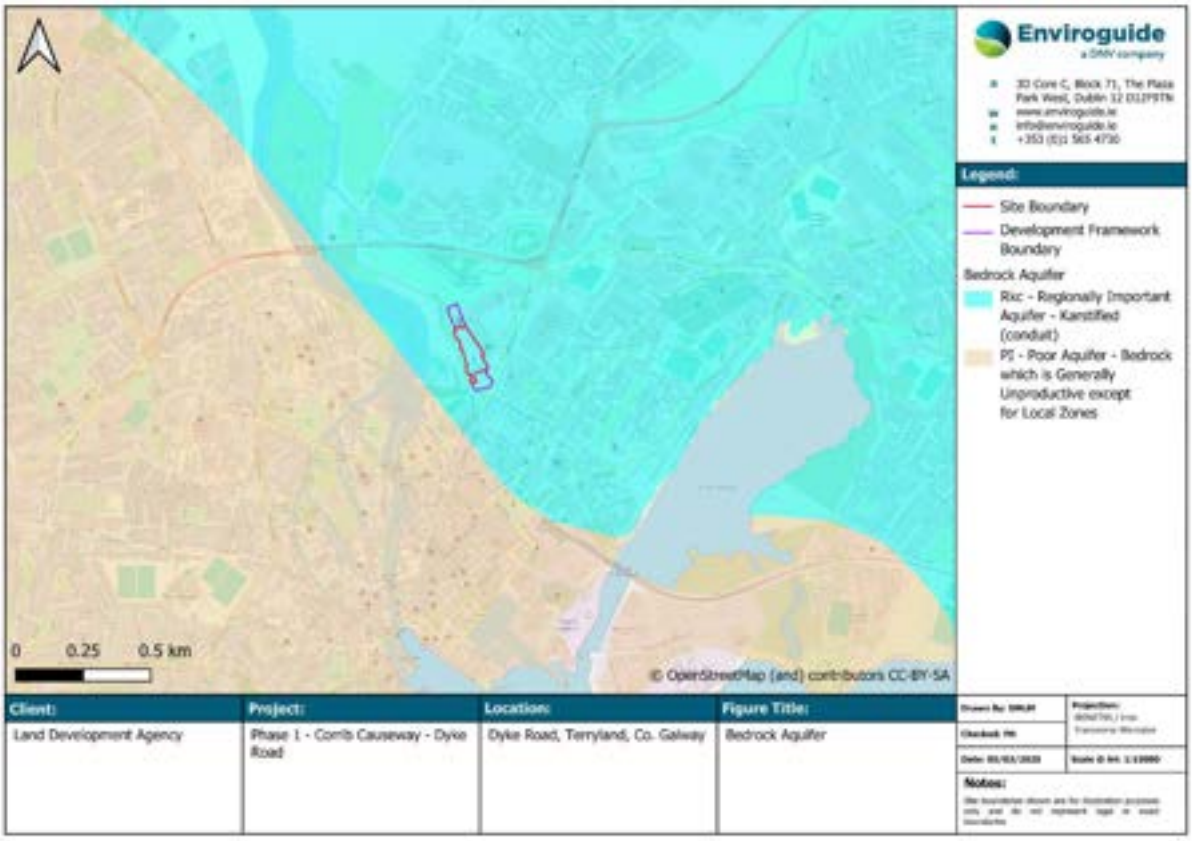

Figure 4-5. Bedrock Aquifer

4.4.3 Groundwater Vulnerability

The vulnerability categories, and methods for determination, are presented in the Groundwater Protection Schemes publication (DEHLG/EPA/GSI, 1999) and summarised in Table 4-1. The publications state that *'as all groundwater is hydrologically connected to the land surface, it is the effectiveness of this connection that determines the relative vulnerability to contamination. Groundwater that readily and quickly receives water (and contaminants) from the land surface is considered to be more vulnerable than groundwater that receives water (and contaminants) more slowly and in lower quantities. The travel time, attenuation capacity and quantity of contaminants are a function of the following natural geological and hydrogeological attributes of any area'.*

Table 4-1. Vulnerability Mapping Criteria

Subsoil Thickness	**Hydrogeological Requirements**				
	Diffuse Recharge			**Point recharge**	**Unsaturated Zone**
	Subsoil Permeability & Type			**(Swallow holes, losing streams)**	**(sand & gravel aquifers only)**
	High permeability (sand & gravel)	**Moderate permeability (sandy subsoil)**	**Low permeability (clayey subsoil, clay, peat)**		
0-3m	*Extreme*	*Extreme*	*Extreme*	*Extreme (30m radius)*	*Extreme*
3-5m	*High*	*High*	*High*	*N/A*	*High*
5-10m	*High*	*High*	*Moderate*	*N/A*	*High*
>10m	*High*	*Moderate*	*Low*	*N/A*	*High*
Notes: (i) N/A = not applicable (ii) Permeability classifications relate to the material characteristics as described by the subsoil description and classification method.					

The GSI (GSI, 2025) has assigned a groundwater vulnerability rating of ‘High’ for the groundwater beneath the site. The anticipated depth to bedrock based on the high groundwater vulnerability rating and moderate permeability subsoils beneath the site is between 3.0mbGL and 5.0mbGL.

Site Investigations (GII, 2024) recorded a depth to bedrock ranging from 6.1mbGL to 15.3mbGL. Considering the moderate permeability subsoils encountered this indicates a vulnerability rating of ‘High’.

The groundwater vulnerability rating map is provided in Figure 4-6.

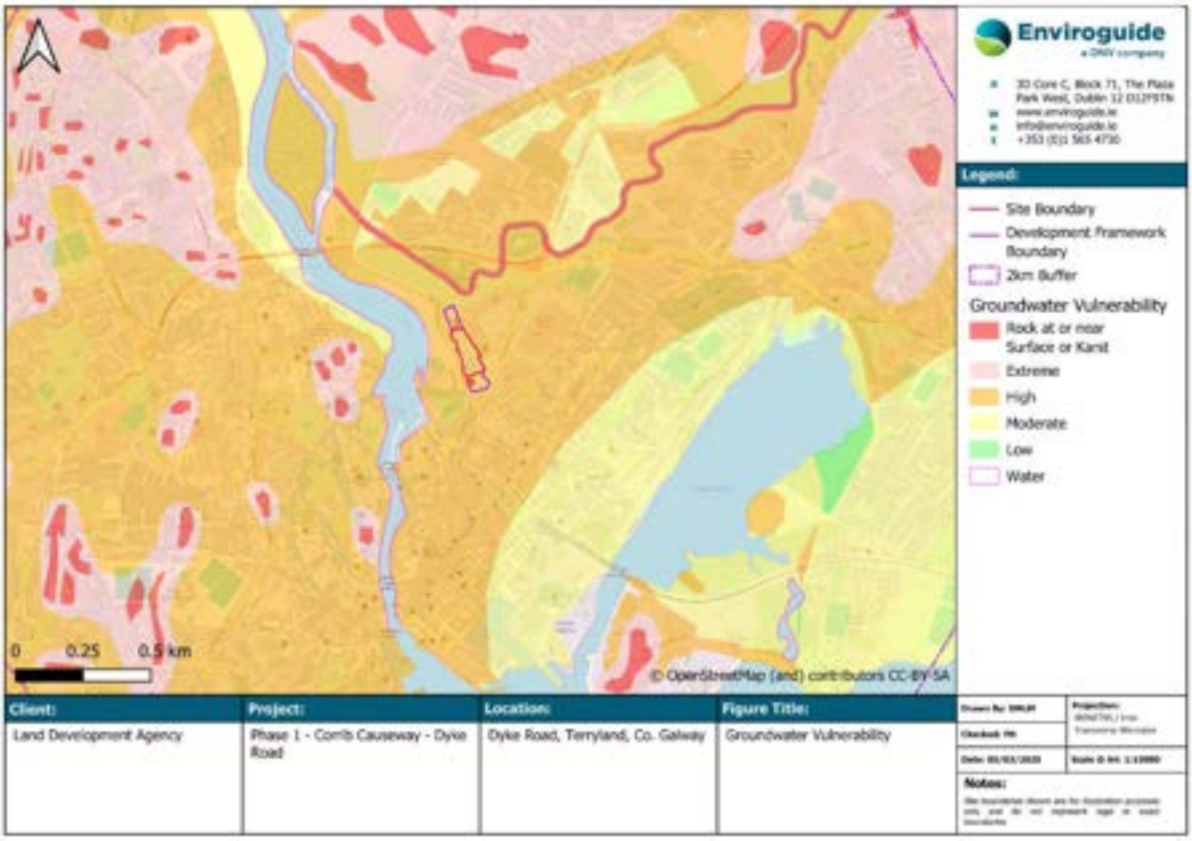

Figure 4-6. Groundwater Vulnerability

4.5 Site Investigation Results

4.5.1 Intrusive Ground Investigations

As documented in the Ground Investigation Report (GII, 2024), the ground conditions across the stie comprise the following:

- SURFACING: Tarmac surfacing was present typically to a depth of 0.06 meters below ground level (mbGL).
- MADE GROUND: Made Ground deposits were encountered beneath the surfacing and were generally present to depths of between 0.5mbGL and 1.0mbGL and a maximum of 3.4mbGL in BRC04. These deposits were described generally as grey Sand and Gravel FILL and contained occasional fragments of tarmacadam occasionally overlying grey slightly sandy gravelly Clay and brownish black gravelly Peat with occasional red brick, ceramic and rubbish fragments.
- ORGANIC DEPOSITS: Organic deposits were generally encountered beneath the Made Ground and were described typically as brownish black slightly clayey slightly gravelly PEAT. The secondary constituents varied across the site, with silt and clay lenses occasionally present in the peat. The strength of the deposits was typically very soft based on SPT N values.
- SOFT COHESIVE DEPOSITS: Soft Cohesive deposits were encountered beneath the organic deposits and were generally described as beige or cream clayey SILT with frequent shell fragments occasionally onto light grey slightly sandy slightly gravelly

clayey SILT with occasional cobbles. The secondary sand and gravel constituents varied across the site and with depth, and peat lenses were occasionally present within the deposits. The strength of the soft cohesive deposits was typically very soft to soft.
- COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the soft cohesive deposits at some locations and were described typically as light grey to grey slightly sandy slightly gravelly silty CLAY with occasional cobbles. The secondary sand and gravel constituents varied across the site and with depth. The strength of the cohesive deposits typically increased with depth and was stiff or very stiff below 6.0m BGL in the majority of the exploratory holes. These deposits had some occasional cobble content, where noted on the exploratory hole logs.
- GRANULAR DEPOSITS: Granular deposits were occasionally encountered at the base of the cohesive deposits and were typically described as grey very sandy subangular to subrounded fine to coarse GRAVEL with occasional cobbles. The secondary sand constituents varied across the site while occasional cobble content was also present were noted on the exploratory hole logs. Based on the SPT N values the deposits are typically medium dense to dense and become dense with depth. Groundwater strikes were occasionally noted in the boreholes on encountering the granular deposits.
- BEDROCK: The rotary core boreholes recovered strong thinly to medium bedded grey fine to medium grained fossiliferous LIMESTONE, with the exception of BRC04 which recovered strong to very strong thinly to thickly banded dark green medium to coarsely crystalline METAGABBRO. Occasional calcite veins were noted during logging. The depth to rock increases to the southeast from 11.2mbGL in BH01 in the north-western corner of the site to a maximum depth of 15.3mbGL in BRC03 in the centre. The depth to rock decreases to 9.4mbGL in BRC06, and further decreases to between 6.6mbGL and 6.1mbGL respectively in BRC04 and BRC05 in the southeastern portion of the site.

As documented in the Ground Investigation Report (GII, 2024), groundwater strikes were recorded between 1.30mbGL and 9.5mGL during borehole drilling. Four (4No.) groundwater monitoring wells were installed at the site (BRC1, BRC02, BRC04 and BRC05) to allow the equilibrium groundwater level to be determined. Groundwater level measurements ranged from 0.17mbGL to 2.25mbGL.

It is noted that the Ground Investigation Report (GII, 2024) did not identify any karst features at the site.

4.5.2 Geophysical Survey Results

Minerex Geophysics Ltd. (MGX) carried out a geophysical survey (Minerex, 2024) consisting of 2D-Resistivity (ERT), seismic refraction (p-wave) and MASW (s-wave) surveying for the site. The findings of the geophysical survey are summarised as follows:

- The seismic refraction survey was modelled with a total of four layers:
    - Layer 1 is mainly affected by the road construction. High resistivities near the surface indicate road construction material such as gravel and tarmac. This layer would also contain urban made ground and peat.

  - Layer 2 is interpreted as soft to firm clay and silt or urban made ground or peat. This layer extends down to an elevation of approximately 0mOD across much of the site but extends deeper in the northwest.
  - Layer 3 is described as very stiff or very dense overburden. This layer is only present in the northwest of the site. It may contain some very weathered rock.
  - Layer 4 is interpreted as rock. The depth to the top of this layer is between 4mbGL to 9mbGL across most of the site but 11mbGL to 12mbGL in the northwest in RC BRC01 and BH01. Due to the interference the seismic modelling depth was limited here to around 10m.
- Some high resistivities at depth indicate that there is clean limestone present that is liable to karstification, but it does not have to be karstified (refer to Figure 4-7).

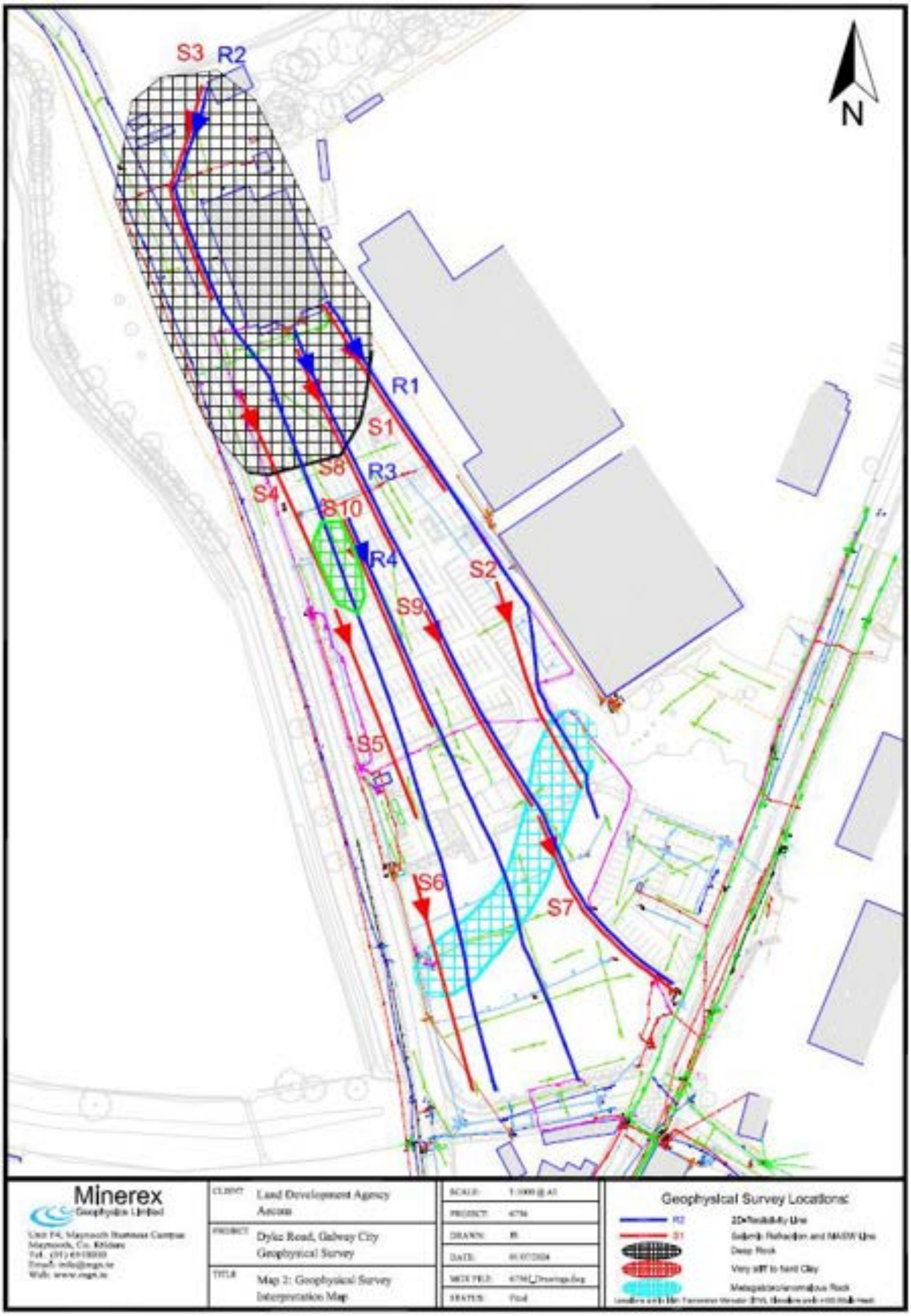

Figure 4-7. Geophysical Survey Interpretation Map (Minerex, 2024)

4.5.3 Soil Quality

Soil analytical data for soil samples collected across the site are provided in the ground investigation report (GII, 2024).

As documented in the ground investigation report (GII, 2024), a total of twenty-eight (28No.) soil samples collected were analysed for a suite of parameters suitable to determine the suitability of soils for disposal to a landfill. Soil analytical data for soil samples collected across the site are provided in the in the ground investigation report (GII, 2024). It is noted that a waste classification assessment of was not included within the ground investigation report (GII, 2024).

Based on a review of the results, there is evidence of low-level anthropogenic contamination in sampled soils across the site:

- Detectable concentrations of Polycyclic Aromatic Hydrocarbons (PAHs), ranging from 0.67mg/kg to 34.54mg/kg, were reported for ten (10No.) samples collected. The reported concentrations of PAHs at remaining sample locations were below the laboratory limit of detection (LOD).
- Detectable concentrations of Total Petroleum Hydrocarbons (TPH), ranging from 69mg/kg to 3192mg/kg, were reported for fifteen (15No.) samples collected. The reported concentrations of TPH at remaining sample locations were below the LOD.
- Detectable concentrations of Extractable Petroleum Hydrocarbons (EPH), ranging from 877mg/kg to 1033mg/kg, were reported for three (3No.) samples collected. The reported concentrations of EPH at remaining sample locations were below the LOD.
- Detectable concentrations of Mineral Oil, ranging from 52mg/kg to 1047mg/kg, were reported for twelve (12No.) samples collected. The reported concentrations of mineral oil at remaining sample locations were below the LOD.
- Detectable concentrations of toluene and/or m/p xylene, of 7ug/kg, were reported for two (2No.) samples collected. The reported concentrations of toluene and m/p xylene at remaining sample locations were below the LOD.
- The reported concentration of Polychlorinated Biphenyl (PCBs) were reported below the LOD.
- The reported concentration of benzene, ethylbenzene and o-xylene were less than the Limit of Detection (LOD).
- Asbestos was reported as ‘no asbestos detected’ for all samples

4.5.4 Groundwater Levels

As documented in the Ground Investigation Report (GII, 2024), groundwater strikes were recorded between 1.30mbGL and 9.5mGL during borehole drilling. Four (4No.) groundwater monitoring wells were installed at the site (BRC1, BRC02, BRC04 and BRC05) to allow the equilibrium groundwater level to be determined.

Groundwater level measurements at each of the monitoring wells were recorded by GII relative to ground level on the 26th of June 2024 and are presented in Table 4-2.

Table 4-2. Measured Water Levels (26/06/2024)

Monitoring Location ID	Measured Water Level (mbTOC)
BRC01	0.17
BRC02	0.87
BRC04	2.25
BRC05	1.30

4.6 Flood Risk

The Site-Specific Flood Risk Assessment (SSFRA) report produced by AECOM (AECOM, 2025b) evaluates the flood risks associated with the proposed residential development. The assessment identifies the primary sources of flood risk as fluvial flooding from the River Corrib and the Terryland Stream, with additional considerations for coastal, pluvial, and groundwater flooding. The site benefits from the Dyke Road flood protection embankment, which provides some defence against the 1% Annual Exceedance Probability (AEP) event, though it lacks sufficient freeboard and climate change allowances. The Proposed Development includes measures such as setting the finished floor level at 7.28m OD, above the 1% AEP level with climate change and freeboard allowances and maintaining flood storage volume by constructing the building on stilts.

The SSFRA (AECOM, 2025b) also outlines the flood risk management strategies, including the sequential approach to avoid, substitute, justify, and mitigate flood risks. The assessment incorporates the Galway City Council Development Plan 2023-2029, which emphasises the importance of flood risk management through policies and land use zoning. The Proposed Development will include flood mitigation measures such as watertight external services, anti-flood valves, and emergency evacuation routes above the design flood level. The hydraulic modelling conducted by Arup confirms that the Proposed Development will not significantly impact flood levels in the surrounding areas, with a maximum increase of approximately 3mm in water levels during the 1% AEP event. Additionally, the hydraulic model demonstrates that the permeability of the lower ground façade, which includes screens and louvres, does not impede the storage or flow of floodwaters below the building.

In conclusion, the SSFRA (AECOM, 2025b) demonstrates that the flood risks to the Proposed Development can be adequately managed through the implementation of appropriate mitigation measures and adherence to the guidelines set out in the Galway City Council Development Plan and the Planning System and Flood Risk Management Guidelines. The Proposed Development will not adversely impact flood risk in the surrounding areas, and the inclusion of flood compensatory storage and sustainable drainage systems will ensure that the flood risk to the development and adjacent properties is minimised.

4.7 Water Use and Source Protection

A search of the GSI groundwater well database (GSI, 2025) was conducted to identify registered wells and groundwater sources in the surrounding area. There are two (2No.) groundwater sources recorded at the site or within a 2km radius of the site. The source use for the supplies (GSI Name: 1121NEW005 and 1121NEW006), which are located approximately 0.66km and 2.0km northeast of the site respectively, is domestic. The yield for both supplies is classified as ‘Good’ with a reported yield of 141.8m^3/day (GSI, 2025). The location of the groundwater wells is presented in Figure 4-9.

The site of the Proposed Development is located within an area serviced by mains water supply. There is an existing 9” cast-iron watermain in Dyke Road to the west of the site (refer to Figure 4-8). A water connection feeds the Black Box theatre and the Headford Road shopping centre. It is noted that water supply to the Proposed Development will be via this existing 9” cast-iron watermain in Dyke Road. A 300mm asbestos-cement watermain also runs in Headford Road and Bóthar Na Dige Road, while a shorter section of 100mm uPVC water distribution main runs along a short section of Headford Road (AECOM, 2025a).

There are no groundwater source protection areas located within a 2km radius of the site (GSI, 2025).

The Corrib River, located approximately 0.07km west of the site at its closest point, is identified by the EPA (EPA, 2025) as a surface water drinking water sources, under Article 7 of the Water Framework Directive. There are no other surface water drinking water sources recorded within a 2km radius or hydraulically downstream of the site.

Figure 4-8. Water Supply Infrastructure (AECOM, 2025a)

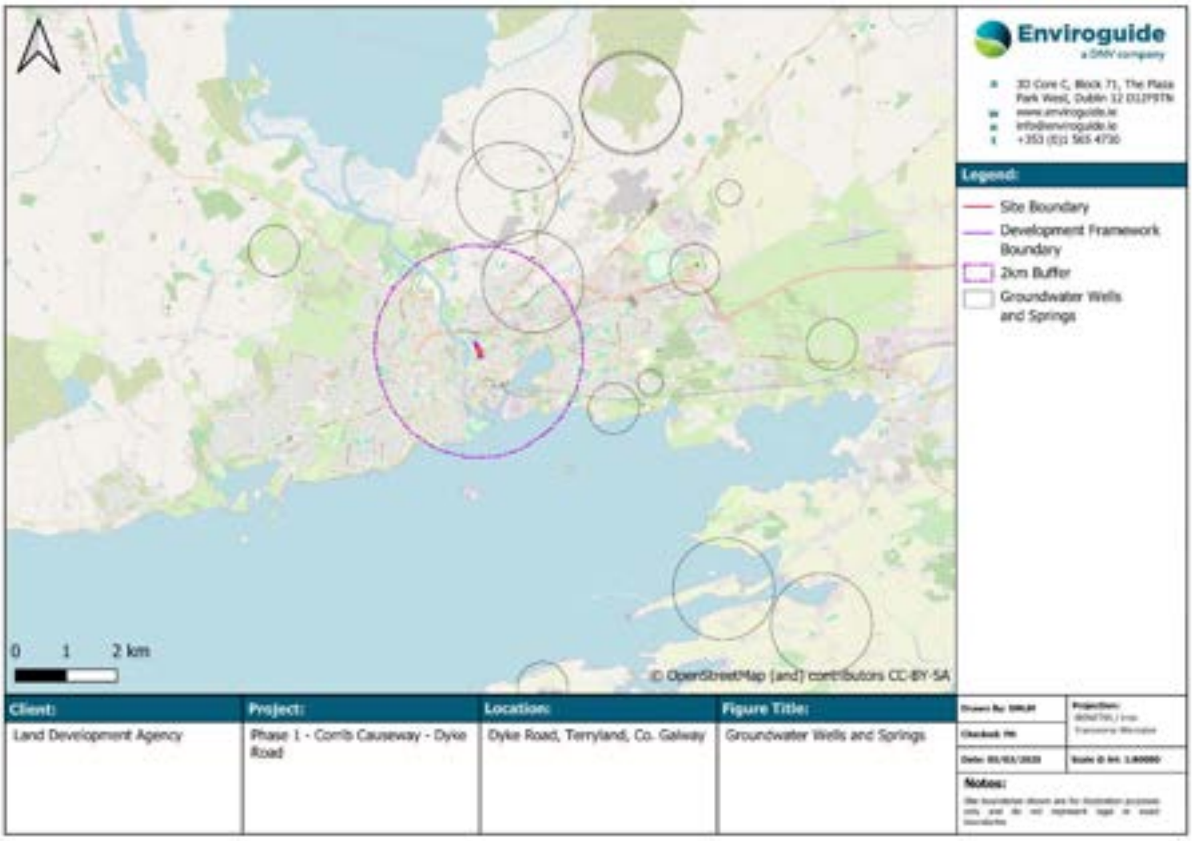

Figure 4-9. Groundwater Wells and Springs within a 2km Radius

4.8 Water Quality

4.8.1 Published Regional Surface Water Quality

The EPA surface water quality monitoring database (EPA, 2025) was consulted. A summary of the most recent published EPA water quality monitoring data (EPA, 2025) for waterbodies which have a potential hydraulic connection to the Site is presented in Table 4-3 below.

The Corrib River flows south before discharging to the Corrib Estuary transitional waterbody (EU Code: IE_WE_170_0700) approximately 0.99km southwest of the site at its closest point. The Corrib Estuary ultimately discharges to the Inner Galway Bay North coastal waterbody (EU Code: IE_WE_170_0000) located approximately 3.32km southeast of the site at its closest point.

Table 4-3. Surface Water Quality

River I.D. (Monitoring Station Location)	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2017)
Terryland Stream (At Terryland Castle -1.88km northeast)	Ammonia-Total (as N)	Annual	Moderate	Upwards	0.166mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Upwards	0.516mg/l
	ortho-Phosphate (as P) - unspecified	Annual	Good	Upwards	0.028mg/l

River I.D. (Monitoring Station Location)	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2017)
Terryland Stream (Bridge on Galway-Headford Rd – 1.58km northeast)	Ammonia-Total (as N)	Annual	Moderate	Upwards	0.150mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Upwards	0.516mg/l
	ortho-Phosphate (as P) - unspecified	Annual	Good	Upwards	0.026mg/l
Terryland Stream (50 m d/s Terryland Bridge – 0.75km northeast)	Ammonia-Total (as N)	Annual	Moderate	Upwards	0.110mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.398mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Upwards	0.016mg/l
Terryland Stream (Br d/s Terryland Br on ring road – 0.36km northwest)	Ammonia-Total (as N)	Annual	High	Downwards	0.032mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.288mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Downwards	0.007mg/l
Corrib River (Menlough Castle – 2.15km northwest)	Ammonia-Total (as N)	Annual	High	Downwards	0.016mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.337mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Downwards	0.005mg/l
Corrib River (Quincentennial Bridge – 0.58km northwest)	Ammonia-Total (as N)	Annual	High	Downwards	0.019mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.312mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Downwards	0.005mg/l
Corrib River (Waterside-Galway - 0.23km west)	Ammonia-Total (as N)	Annual	High	Downwards	0.017mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.328mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Downwards	0.005mg/l
Corrib River (Salmon Weir Bridge- Galway - 0.45km southwest)	Ammonia-Total (as N)	Annual	High	Upwards	0.018mg/l
	Total Oxidised Nitrogen (as N)	Annual	Good	Downwards	0.359mg/l
	ortho-Phosphate (as P) - unspecified	Annual	High	Downwards	0.005mg/l
Corrib Lower Lake (3.56km northwest)	Ammonia-Total (as N)	Annual	High	Upwards	0.026mg/l
	Chlorophyll	Annual	High	Downwards	2.104ug/l
	Total Phosphorus (as P)	Annual	High	Downwards	0.009mg/l

River I.D. (Monitoring Station Location)	EPA WFD Parameter Quality & Trend Analysis				
	Parameter	Period	Indicative Quality	Trend	Baseline Conc. (2017)
Corrib Estuary (0.99km south)	Chlorophyll	Summer	High	Upwards	2.5mg/m^3
		Winter	High	Downwards	1.4mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Summer	High	Upwards	0.035mg/l
		Winter	High	None	0.288mg/l
	ortho-Phosphate (as P)- unspecified	Summer	High	Upwards	5.9ug/l
		Winter	High	Downwards	7.4ug/l
Inner Galway Bay North (3.32km southeast)	Chlorophyll	Summer	High	Upwards	2.6mg/m^3
		Winter	High	Upwards	1.3mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Summer	High	Upwards	0.034mg/l
		Winter	High	Upwards	0.225mg/l
	ortho-Phosphate (as P)- unspecified	Summer	High	Upwards	5.5ug/l
		Winter	High	Downwards	8.0ug/l
Inner Galway Bay South (6.63km south	(No Chemical Monitoring data available)				
Outer Galway Bay (7.0km southwest)	Chlorophyll	Summer	High	Upwards	1.5mg/m^3
		Winter	High	Downwards	0.5mg/m^3
	Dissolved Inorganic Nitrogen (as N)	Summer	High	None	0.029mg/l
		Winter	High	Upwards	0.148mg/l
	ortho-Phosphate (as P)- unspecified	Summer	High	Downwards	2.5ug/l
		Winter	Good	Downwards	6.6ug/l
Aran Islands, Galway Bay, Connemara (HAs 29;31) (17.06km southwest)	(No Chemical Monitoring data available)				

4.8.2 Published Regional Groundwater Quality

The EPA (EPA, 2025) groundwater monitoring data was reviewed and there are no hydraulically connected groundwater quality monitoring stations within a 2km radius of the Site.

4.8.3 Receiving Water Quality – Galway City Wastewater Treatment Plant (WWTP)

Foul water from the site will discharge via the Galway City WWTP to the Corrib Estuary transitional waterbody (EU Code: E_WE_170_0700) and the Inner Galway Bay North coastal waterbody (EU Code: IE_WE_170_0000).

The Galway City WWTP is operated under relevant statuary approvals. The most recent available Annual Environmental Report (AER) for the Galway City WWTP is 2022 (UE, 2023). The AER identified that the final effluent was compliant with the Emission Limit Values (ELVs) specified in the discharge license (EPA Licence No. D0050-01). The 2022 AER notes that the following in relation to ambient monitoring in the Corrib Estuary transitional waterbody and the Inner Galway Bay North coastal waterbody:

'The coastal/transitional ambient monitoring results meet the required EQS. The EQS relates to the Oxygenation and Nutrient Conditions set out in the Surface Water Regulations 2009.

The WWTP discharge was compliant with the ELV's set in the wastewater discharge licence.

The discharge from the wastewater treatment plant does not have an observable impact on the water quality.

The discharge from the wastewater treatment plant does not have an observable negative impact on the Water Framework Directive status.'

4.9 Water Framework Directive

The WFD status for river, lake, groundwater, transitional and/or coastal water bodies that have a potential hydraulic connection to the subject site as recorded by the EPA (EPA, 2025) in accordance with European Communities (Water Policy) Regulations 2003 (SI no. 722/2003) are provided in Table 4-4 and shown in Figure 4-10.

Table 4-4. Water Framework Directive Status

WFD Waterbody Name (EPA Name)	Waterbody EU Code	Location from Site	Distance from Site (km)	Current WFD Status (2016-2021)	WFD Risk	Hydraulic Connection to the Site
River Waterbodies						
Terryland_010 (Terryland Stream)	IE_WE_30T010500	North	0.13	Moderate	At Risk	Yes, receives surface water drainage from the site.
Corrib_020 (Corrib River)	IE_WE_30C020600	West	0.07	Good	Not at Risk	Yes, downstream of the Terryland Stream (diurnal flow) and receives groundwater from the site.
Corrib_010 (Corrib River)	IE_WE_30C020300	Northwest	3.22	Good	Not at Risk	No, hydraulically upstream of the site.
Lake Waterbodies						
Corrib Lower	IE_WE_30_666a	Northwest	3.56	Good	Not at Risk	No, hydraulically upstream of the site.
Transitional Waterbodies						
Corrib Estuary	IE_WE_170_0700	South	0.99	Moderate	Review	Yes, downstream of

WFD Waterbody Name (EPA Name)	Waterbody EU Code	Location from Site	Distance from Site (km)	Current WFD Status (2016-2021)	WFD Risk	Hydraulic Connection to the Site
						the Terryland Stream (via through an underground conduit system) and the Corrib River. Also receives treated effluent from the Galway City WWTP
Coastal Waterbodies						
Inner Galway Bay North	IE_WE_170_0000	Southeast	3.32	Good	Not at Risk	Yes, downstream of the Corrib Estuary and receives treated effluent from the Galway City WWTP
Inner Galway Bay South	IE_WE_160_0000	South	6.63	High	Not at Risk	Yes, downstream of the Inner Galway Bay North coastal waterbody
Outer Galway Bay	IE_WE_100_0000	Southwest	7.00	High	Not at Risk	Yes, downstream of the Inner Galway Bay North coastal waterbody
Aran Islands, Galway Bay, Connemara (HAs 29;31)	IE_WE_010_0000	Southwest	17.06	High	Review	Yes, downstream of the Outer Galway Bay coastal waterbody
Groundwater Bodies						
Clare-Corrib	IE_WE_G_0020	Underlying Aquifer	n/a	Good	Not at risk	Yes, Underlying Aquifer

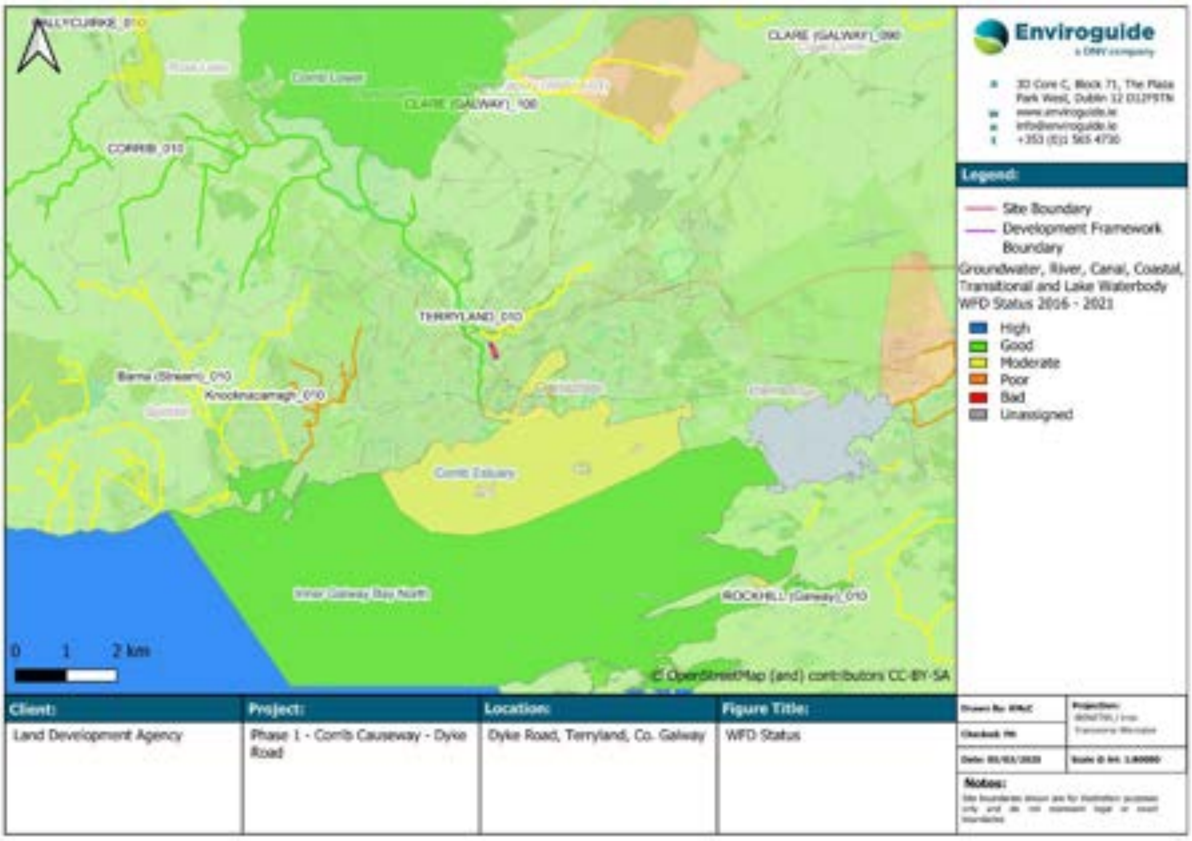

Figure 4-10. Water Framework Directive Status

4.9.1 Register of Protected Areas

The WFD Register of Protected Areas is a comprehensive list of areas designated under the Water Framework Directive (WFD) that require special protection due to their environmental significance. These areas include:

I. Drinking Water Protected Areas: Areas designated for the abstraction of water intended for human consumption.

II. Areas for the Protection of Economically Significant Aquatic Species: Such as shellfish waters.

III. Recreational Waters: Including bathing waters.

IV. Nutrient-Sensitive Areas: Such as nitrate vulnerable zones.

V. Areas for the Protection of Habitats and Species: Including those designated under the Habitats Directive and Birds Directive.

The register helps ensure that these areas are managed and their integrity protected as to meet the Article No.4 objectives set out in the WFD.

4.9.1.1 Nature Conservation

The Habitats Directive (92/43/EEC) seeks to conserve natural habitats and wild fauna and flora by the designation of Special Areas of Conservation (SACs) and the Birds Directive (2009/147/EC) seeks to protect birds of special importance by the designation of Special

Protection Areas (SPAs). SACs and SPAs are collectively known as Natura 2000 or European sites (referred to hereafter as Natura 2000 site).

National Heritage Areas (NHAs) are designations under the Wildlife Acts to protect habitats, species, or geology of national importance. The boundaries of many of the NHAs in Ireland overlap with SAC and/or SPA Sites. Although many NHA designations are not yet fully in force under this legislation (referred to as 'proposed NHAs' or pNHAs), they are offered protection in the meantime under planning policy which normally requires that planning authorities give recognition to their ecological value.

As documented in the AA Screening Report prepared by Scott Cawley (Scott Cawley, 2025a) and submitted with the planning application, the identification of source-pathway-receptor connection(s) between the Proposed Development and European sites essentially is the process of identifying which European sites are within the Zone of Influence (ZoI) of the Proposed Development, and therefore potentially at risk of significant effects. The ZoI is defined as the area within which the Proposed Development could affect the receiving environment such that it could potentially have significant effects on the QI habitats or QI/SCI species of a European site, or on the achievement of their conservation objectives (as defined in CIEEM, 2022).

There are four (4No.) Natura 2000 Sites that are identified with a potential hydraulic connection to the site and located within the ZoI whereby the Proposed Development could affect the receiving environment such that it could potentially have significant effects on the Natura 2000 site or on the achievement of their conservation objectives

- Lough Corrib SAC (Site Code: 000297) – approximately 0.015km west of the Site.
- Lough Corrib SPA (Site Code: 004042) – approximately 2.80km north of the Site.
- Galway Bay Complex SAC (Site Code: 000268) – approximately 0.70km south of the Site.
- Inner Galway Bay SPA (Site Code: 004031) – approximately 0.70km south of the Site.

Other Natura 2000 Sites that are identified with a potential hydraulic connection to the Site but are considered to be located outside of the ZoI include:

- Black Head-Poulsallagh Complex SAC (Site Code: 000020).
- Inisheer Island SAC (Site Code: 001275).
- Inishmaan Island SAC (Site Code: 000212).
- Inishmore Island SAC (Site Code: 000213).
- Inishmore Island SPA (Site Code: 004152).
- Kilkieran Bay And Islands SAC (Site Code: 002111).

There are two (2No.) proposed NHAs identified with a potential hydraulic connection to the Site and considered to be located within the ZoI:

- Lough Corrib (Site Code: 000297).
- Galway Bay Complex (Site Code: 000268).

Other proposed NHAs that are identified with a potential hydraulic connection to the Site but are considered to be located outside of the ZoI include:

- Black Head-Poulsallagh Complex (Site Code: 000020).

- Inisheer Island (Site Code: 001275).
- Inishmaan Island (Site Code: 000212).
- Inishmore Island (Site Code: 000213).

The SACs, SPAs, and pNHAs with a potential hydraulic connection to the Site are presented in Figure 4-11.

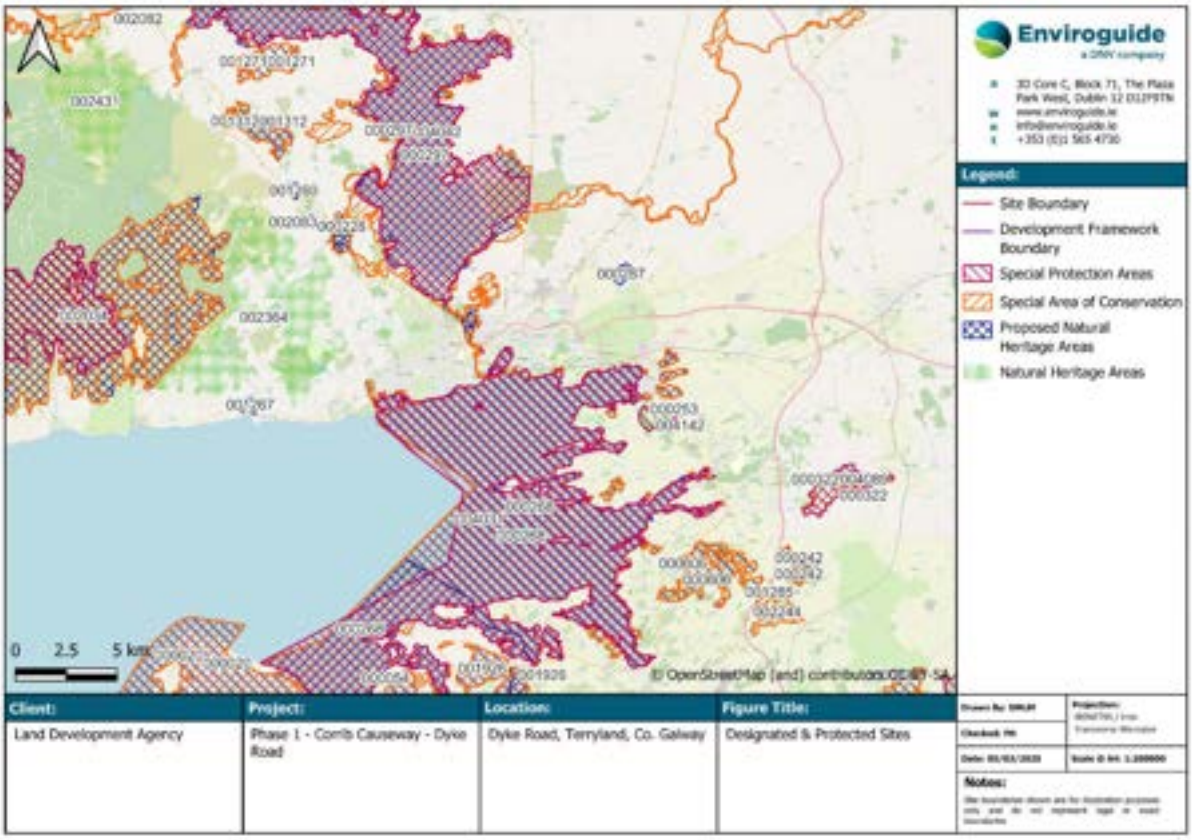

Figure 4-11. Designated and Protected Areas

4.9.1.2 Drinking Water

The river drinking water protected areas (DWPA) are represented by the full extent of the WFD river waterbodies from which there is a known qualifying abstraction of water for human consumption as defined under Article 7 of the WFD.

As stated in Section 4.7, the CORRIB_020 river ~120m to the west is identified by the EPA (EPA, 2025) as a surface water drinking water sources, under Article 7 of the Water Framework Directive. There are no other surface water drinking water sources recorded within a 2km radius or hydraulically downstream of the site.

4.9.1.3 Shellfish Areas

Although the Shellfish Waters Directive (SWD) has been repealed, areas used for the production of shellfish that were designated under the SWD, are protected under the WFD as ‘areas designated for the protection of economically significant aquatic species’.

The requirement from a WFD perspective is to ensure that water quality does not impact on the quality of shellfish produced for human consumption. In Ireland, 64 areas have been designated as shellfish waters (S.I. No. 268 of 2006, S.I. No. 55 of 2009, S.I. 464 of 2009).

The closest designated Shellfish Area location is Clarinbridge/Kinvara Bay approximately 7.5km downstream of the site across Galway Bay. There are also two SWD along the southern shore of Galway Bay, Ballyvaughan/Poulnaclough Bay and The Bay at Aughinish.

4.9.1.4 Nutrient Sensitive Areas

EU member states are required under the Urban Wastewater Treatment Directive (91/271/EEC) to identify nutrient-sensitive areas. These have been defined as “natural freshwater lakes, other freshwater bodies, estuaries and coastal waters which are found to be eutrophic or which in the near future may become eutrophic if protective action is not taken”.

There are no Nutrient Sensitive Areas directly upstream, downstream or within 2km of the Site.

4.9.1.5 Bathing Waters

Bathing waters are designated under Regulation 5 of Directive 2006/7/EC. Designated Bathing Waters exist under S.I. No. 79/2008 and S.I. No. 351/2011 Bathing Water Quality (Amendment) Regulations 2011. The EC Bathing Water Profiles - Best Practice and Guidance 2009 provides additional guidelines for maintaining and improving bathing water quality.

Ballyloughane Beach and Grattan Road Beach are located approximately 2.5km and 5.3km downstream of the Site respectively with Grattan Road Beach being located 1.5km from the primary emission point for the Galway City WWTP. Salthill Beach is approximately 5.3km downstream of the Site, to the west of Grattan Road Beach, and approximately 2.1km from the primary emission point for the Galway City WWTP. The EPA bathing water quality monitoring database (EPA, 2025) classifies the current water quality of Ballyloughane Beach and Salthill Beach as ‘excellent’ and of Grattan Road Beach as ‘good’.

4.9.2 Water Action Plan (WAP) 2024 Programme of Measures

The Water Action Plan (WAP) provides information on the status and planned actions for surface waterbodies in Ireland. These entries offer insights into the specific measures being considered or implemented to improve the ecological status of the surface waterbodies.

The WAP identifies several key pressures impacting water quality in surface waterbodies across the country:

- Nutrient Pollution: Excessive levels of phosphorus and nitrogen from agricultural runoff are a significant concern. These nutrients can lead to eutrophication, which depletes oxygen in the water and harms aquatic life
- Urban Pollution: Inadequately treated wastewater and stormwater runoff from urban areas contribute to the degradation of water quality. This includes pollutants such as heavy metals, oils, and other contaminants
- Physical Modifications: Changes to the river's natural flow and structure, such as barriers and drainage works, disrupt the ecosystem and affect water quality

- Climate Change: Altered weather patterns and increased frequency of extreme weather events exacerbate existing pressures on water quality.

The WAP identifies several suggested actions to protect and restore water quality in surface waterbodies ensuring a sustainable and healthy aquatic environment. The actions include:

- Nutrient Management: Implementing stricter controls on agricultural practices to reduce nutrient runoff. This includes promoting the use of buffer strips, cover crops, and precision farming techniques
- Improving Wastewater Treatment: Upgrading wastewater treatment facilities to ensure that effluents meet higher standards before being discharged into waterbodies
- Restoring Natural Ecosystems: Removing or modifying barriers to restore natural river flow and habitat connectivity. This also involves re-naturalizing riverbanks and floodplains
- Integrated Catchment Management: Developing and implementing catchment-specific management plans that address local pressures and involve stakeholders in decision-making processes
- Climate Adaptation Measures: Enhancing resilience to climate change by incorporating adaptive management strategies and investing in green infrastructure.

5 WFD ASSESSMENT

5.1 Screening of Potential Effects

5.1.1 Surface Waterbodies

For the purpose of this assessment, immediate downstream waterbodies have been screened in due to their proximity. These are the Terryland_010, the Corrib_020, the Corrib Estuary and the Inner Galway Bay North. These waterbodies were considered because they are directly downstream and could be impacted by the Proposed Development. Additionally, the Corrib Estuary and Inner Galway Bay North receive treated waste water from the Galway City WWTP to which the Proposed Development will contribute.

Conversely, the Corrib_010 and Corrib Lower have been screened out for further assessment as they are upstream of site and Proposed Development and there are no proposed construction or operational activities that could propagate upstream and adversely affect the waterbody. The Inner Galway Bay South, Outer Galway Bay and Aran Islands, Galway Bay, Connemara (HAs 29;31) have also been excluded based on the substantial water volumes associated with coastal waterbodies and their significant distance from the site and Proposed Development. The Proposed Development is anticipated to have no potential to cause a deterioration in the status of these waterbodies or hinder the future attainment of good surface water quality objectives.

In conclusion, the full list of screened-in surface waterbodies is summarised as follows:

- Terryland_10.
- Corrib_020.
- Corrib Estuary.
- Inner Galway Bay North.

5.1.2 Groundwater Bodies

The underlying Clare-Corrib GWB has been screened in due to its proximity to the works. No other groundwater bodies are seen as seen to be sufficiently close or hydraulicly connected to have their status impacted as a result of the Proposed Development.

In conclusion, the full list of screened-in groundwater bodies is summarised as follows:

- Clare-Corrib GWB.

5.1.3 Protected Areas

The scoping and assessment process for protected areas is inherently integrated into the overall WFD assessment. The methodology and legislative context outlined in Section 2 ensure that protected areas are considered through the following mechanisms:

- **Integrated Catchment Management:** The PoM uses an integrated catchment management approach, focusing on identifying the right measures for specific locations, including protected areas, to maximize effectiveness. This approach ensures that the specific needs and sensitivities of protected areas are addressed within the broader catchment management strategy.

- **Collaboration:** Implementation involves collaboration between various government departments, local authorities, the EPA, and other stakeholders. This collaborative approach ensures that protected areas are considered in the planning and execution of measures, leveraging the expertise and resources of multiple entities to safeguard these areas.
- **Monitoring and Reporting:** An enhanced monitoring and reporting programme tracks the implementation progress and assesses the effectiveness of the measures, including those affecting protected areas. Regular monitoring ensures that any potential impacts on protected areas are identified and addressed promptly.
- **Environmental Assessment:** All measures and projects arising during the RBMP cycles are subject to further environmental assessments, including Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA). These assessments specifically address impacts on protected areas, ensuring that any potential adverse effects are thoroughly evaluated and mitigated.

The WFD and its associated directives provide a robust framework for the protection of water bodies, including protected areas. Guidance documents, such as the CIS guidance (European Commission, 2021. Common Implementation Strategy) on the delineation of water bodies and groundwater monitoring, clarify the requirements for protected areas and their integration into the overall water management strategy.

Given this integrated approach, a separate screening / risk evaluation for protected areas is not required. The existing assessment process already encompasses the necessary considerations and measures to protect these areas. The assessment ensures compliance with the WFD objectives including protected areas.

5.2 Scoping of Further Investigations

Based on availability of existing baseline information assessed as part of the Screening for Potential Effects, it was considered that there was sufficient information available regarding the Proposed Development and the hydrological and hydrogeological conditions in the vicinity of the site to inform the assessment and no further investigations are required.

5.3 Risk Evaluation of Source-Pathway-Receptor Linkages

A risk-based assessment of the Source-Pathway-Receptor Model and the potential risk linkages associated with the Construction Phase and Operational Phase of the Proposed Development was undertaken. The results were evaluated to determine if the Proposed Development could potentially impact any potential receptors associated with the Site.

Table 5-1. Conceptual Site Model (Source- Pathway Receptor) and Risk Evaluation

Source	Pathway	Receptor	Risk Evaluation
Construction Phase			
Discharge of Contaminants to Ground / Groundwater	Vertical and Lateral Groundwater Migration in Bedrock Aquifer	Water Quality, Physio-Chemical and Aquatic Flora & Fauna of: Clare-Corrib GWB	**Low to Moderate Risk (worst-case unmitigated scenario)** During groundworks and excavations, groundwater vulnerability will increase, creating a direct pathway for surface contaminants to enter the bedrock

Source	Pathway	Receptor	Risk Evaluation
		Receiving WFD Surface Waterbodies (i.e., the Terryland_10, the Corrib_020, the Corrib Estuary and the Inner Galway Bay North) Protected Areas	aquifer and migrate towards downgradient surface water bodies. The Clare-Corrib GWB has high interconnection between groundwater and surface water, with limited potential for attenuation of dissolved contaminants, which can rapidly migrate towards watercourses. In a worst-case scenario during the Construction Phase (e.g., accidental release of fuels, chemicals, or oils), without mitigation measures, contaminants could discharge to groundwater. This would impact the Clare-Corrib GWB, posing an indirect risk to downstream waterbodies (Terryland_10, Corrib_020, and Corrib Estuary). Given the significant dilution that will occur there is no perceived impact on the Inner Galway Bay North.
Piling	Introduction of Preferential Pathways During Piling	Water quality, Physio-Chemical Hydromorphology and Aquatic Flora & Fauna of: Clare-Corrib GWB Receiving WFD Surface Waterbodies (i.e., the Terryland_10, the Corrib_020, the Corrib Estuary and the Inner Galway Bay North) Protected Areas	**Low to Moderate Risk** Piling during the construction phase of the Proposed Development, may potentially create pathways for contaminants to enter underlying groundwater. Pilling also has the potential to alter karstic flow paths linking downstream waterbodies with pollutants. In the worst-case scenario drilling fluids used during piling could potentially be introduced to the subsurface and groundwater and rapidly migrate to the receiving waterbodies including the Terryland_10, Corrib_020, and Corrib Estuary and associated Protected Areas. Given the significant dilution that will occur there is no perceived impact on the Inner Galway Bay North.
Discharge of Entrained Sediment or Other Contaminants in Surface Runoff	Lateral Migration at the Site to the Onsite Drainage and Migration Offsite	Water quality, Physio-Chemical Hydromorphology and Aquatic Flora & Fauna of: Receiving WFD Surface Waterbodies (i.e., the Terryland_10, the Corrib_020, the Corrib	**Low to Moderate Risk** Potential risk of runoff with contaminants migrating offsite via existing surface water drainage within the site. Potential impact to water quality and WFD status of the the Terryland_10, the Corrib_020, the Corrib Estuary and downstream waterbodies and associated Protected Areas.

Source	Pathway	Receptor	Risk Evaluation
		Estuary and the Inner Galway Bay North) Protected Areas	
Dewatering During Excavation	Changes to Hydrogeological Regime	Water quality, Physio-Chemical Hydromorphology and Aquatic Flora & Fauna of: Clare-Corrib GWB	**Low Risk to Moderate Risk** Where water must be pumped from the excavations, it is considered that there will be a temporary drawdown of local groundwater levels during the dewatering operations. However, the extent of the impact is considered to be temporary and localised to the immediate area surrounding the excavations.
Dewatering During Excavation	Discharge of water (groundwater / surface water runoff) to ground, sewer or watercourses	Water quality, Physio-Chemical and Aquatic Flora & Fauna of: Receiving WFD Surface Waterbodies (i.e., the Terryland_10, the Corrib_020, the Corrib Estuary and the Inner Galway Bay North) Protected Areas	**Low Risk** There will be no discharge of groundwater to ground. Unauthorised discharge of water (groundwater / surface water runoff) to sewers or watercourses will also not be permitted. The appointed Contractor will ensure that the discharge of water to sewers or watercourses will be in accordance with the necessary discharge licences issued by UE under Section 16 of the Local Government (Water Pollution) Acts and Regulations for any water discharges to sewer or from Galway County Council under Section 4 of the Local Government (Water Pollution) Act 1977, as amended in 1990 for discharges to surface water and ultimately discharged to the receiving surface waterbodies (i.e., the Terryland_10, or the Corrib Estuary and the Inner Galway Bay North via Galway City WWTP).
Foul Water Discharge	Discharge to Mains Sewer	Water quality, Physio-Chemical Hydromorphology and Aquatic Flora & Fauna of: Receiving WFD Surface Waterbodies (i.e., the Corrib Estuary and the Inner Galway Bay North) Protected Areas	**Low Risk** Foul water during the Construction Phase of the Proposed Development will be either removed by tanker in accordance with waste management legislation and managed accordingly or discharged under consent to the mains UE drainage network and ultimately discharged to the receiving surface waterbodies (i.e., the Corrib Estuary and the Inner Galway Bay North via Galway City WWTP).

Source	Pathway	Receptor	Risk Evaluation
			Foul water from the Site will only be discharged to the UE network under the appropriate consents from UE and therefore, the Proposed Development will not cause a potential impact to the WFD status of any receiving waterbody and associated Protected Areas.
Operational Phase			
Discharge of Surface Water Runoff	Discharge to Surface Water Drainage Network	Water quality, Physio-Chemical Hydromorphology and Aquatic Flora & Fauna of: Receiving WFD Surface Waterbodies (i.e., the Terryland_10, the Corrib_020, the Corrib Estuary and the Inner Galway Bay North) Protected Areas	**Low to Moderate Risk (worst-case unmitigated scenario)** During the Operational Phase of the Proposed Development, there is limited potential for discharge of any contaminated runoff to the receiving waterbodies associated with surface water runoff from the site. However, in a worst-case scenario during the Operational Phase (e.g., failure of SuDS) in the absence of any mitigation measures there is potential for discharge of contaminants to receiving surface water receptors (i.e., the Terryland_10, the Corrib_020, the Corrib Estuary). Given the significant dilution that will occur there is no perceived impact on the Inner Galway Bay North.
Discharge of Contaminants to Ground / Groundwater	Vertical and Lateral Groundwater Migration in Bedrock Aquifer	Water quality, Physio-Chemical Hydromorphology and Aquatic Flora & Fauna of: Clare-Corrib GWB Receiving WFD Surface Waterbodies (i.e., the Terryland_10, the Corrib_020, the Corrib Estuary and the Inner Galway Bay North) Protected Areas	**No Identified Risk** Based on the design of the Proposed Development there is limited potential sources of contamination during the Operational Phase and there will be limited potential for discharge of contaminants associated with surface water runoff to ground via unpaved, permeable areas due to the low infiltration potential at the Site. Furthermore, the proposed attenuation design does not allow for infiltration due to poor ground conditions, a high-water table and the potential presence of karst features beneath the site. Surface water will be managed in accordance with the principles and objectives of SuDS to treat and attenuate water prior to discharging offsite. Ongoing regular operational monitoring and maintenance of drainage and the SuDS measures will be incorporated into the overall

Source	Pathway	Receptor	Risk Evaluation
			management strategy for the Proposed Development. This will ensure that there are no impacts to the WFD status of any receiving waterbody and associated Protected Areas during the Operational Phase of the Proposed Development.
Foul Water Discharge	Discharge to Mains Sewer	Water quality, Physio-Chemical and Aquatic Flora & Fauna of: Receiving WFD Surface Waterbodies (i.e., the Corrib Estuary and the Inner Galway Bay North) Protected Areas	**Low Risk** Foul water during the Operational Phase of the Proposed Development will be discharged to the UE drainage network and ultimately discharged to the Corrib Estuary and the Inner Galway Bay North via Galway City WWTP. Foul water from the Site will only be discharged to the UE network under the appropriate consents from UE. The Galway City WWTP (EPA Licence No. D0050-01) was identified by UE to have sufficient capacity to accept foul water from the Proposed Development subject to provision of the new WWPS and upgrade works to the existing 150mm diameter sewer from Dyke Road to Wood Quay, which will be completed in advance of any connection from the site. Therefore, the Proposed Development will not cause a potential impact to the WFD status of any receiving waterbody and associated Protected Areas.

The risk to WFD status and potential change is summarised below in Table 5-2.

Table 5-2. Summary of WFD Status for Unmitigated Scenario

WFD Waterbody I.D.	WFD Status (2016-2021)	Unmitigated Risk to Status	Unmitigated Status Change
Construction Phase			
Terryland_010 (Terryland Stream)	Moderate	Low to Moderate	Poor
Corrib_020 (Corrib River)	Good	Low to Moderate	Poor
Corrib Estuary	Moderate	Low to Moderate	Poor
Inner Galway Bay North	Good	Low	Good
Clare-Corrib GWB	Good	Low to Moderate	Poor
Operational Phase			
Terryland_010 (Terryland Stream)	Moderate	Low to Moderate	Poor
Corrib_020 (Corrib River)	Good	Low to Moderate	Moderate

WFD Waterbody I.D.	WFD Status (2016-2021)	Unmitigated Risk to Status	Unmitigated Status Change
Corrib Estuary	Moderate	Low	Moderate
Inner Galway Bay North	Good	Low	Good
Clare-Corrib GWB	Good	Low	Good

5.3.1 Water Action Plan (WAP) 2024 Programme of Measures

The proposed development has been assessed to ensure alignment with the objectives of the Water Action Plan Programme of Measures. The development incorporates nutrient management practices such as SuDS, the development will effectively minimise nutrient runoff, thereby preventing eutrophication and safeguarding receiving water quality and aquatic flora and fauna. Additionally, climate adaptation measures have also been integrated into the development to enhance resilience to climate change, ensuring long-term sustainability and protection of water quality. Overall, the proposed development is in keeping with the Water Action Plan Programme of Measures and will not adversely affect the implementation of any proposed measures.

6 DESIGN AVOIDANCE AND MITIGATION

The assessment of the potential impacts on the receiving environment takes account of the embedded design avoidance measures and standard good practice construction methods to reduce the potential for impacts to the water environment. These are outlined below together with additional specific measures based on the findings of this assessment.

6.1 Construction Phase

During the Construction Phase, all works will be undertaken in accordance with the Construction Environmental Management Plan (CEMP) (AECOM, 2025c). Following appointment, the contractor will be required to further develop the CEMP to provide detailed construction phasing and methods to manage and prevent any potential emissions to ground and surface water with regard to the relevant industry standards (e.g., Guidance for Consultants and Contractors, CIRIA-C532', CIRIA, 2001). The CEMP will be implemented for the duration of the Construction Phase, covering construction and waste management activities that will take place during the Construction Phase of the Proposed Development. Mitigation works will be adopted as part of the construction works for the Proposed Development. These measures will address the main activities of potential impact which include:

- Control and Management of surface water runoff.
- Control and management of shallow groundwater during excavation and dewatering.
- Management and control of soil and materials.
- Appropriate fuel and chemical handling, transport and storage.
- Management of accidental release of contaminants at the site.
- Control and handling of cementitious materials.

The main contractor will produce a Pollution Prevention Plan (or similar document). This will include procedures and diagrams for:

- Dewatering of excavations.
- Temporary soil storage.
- Fuel storage/refuelling.
- Concrete wash-out area.
- Controlling surface water entering Site.
- Preventing existing drainage features becoming pathways for construction run-off.
- Reducing soil exposure and reinstating as rapidly as possible.
- Contingency measures.

Surface water runoff management will be required to prevent runoff entering excavations during construction. Surface water will require diversion around the open excavations using standard temporary drainage methods to ensure that surface water is effectively conveyed around works areas.

The dewatering methodology to be implemented by the main contractor will ensure that any dewatering is confined to the localised zone and does not extend towards the Site boundaries. Where required, shallow recharge wells will be utilised to ensure the existing hydrogeological regime is maintained by allowing water to infiltrate back into the ground, ensuring that groundwater levels remain stable.

There will be no authorised discharge of water to ground during the construction phase. Where water must be pumped from the excavations, water will be discharged by the contractor, following appropriate treatment (e.g., settlement or hydrocarbon interceptor) to sewer in accordance with the necessary discharge licences issued by UE under Section 16 of the Local Government (Water Pollution) Acts and Regulations for any water discharges to sewer or from GCC under Section 4 of the Local Government (Water Pollution) Act 1977, as amended for discharges to surface water. Under no circumstances will any untreated wastewater generated onsite (from equipment washing, road sweeping etc.) be released offsite. Where required, all existing drainage channels and public sewers will be protected to ensure that any untreated wastewater generated onsite does not enter the public sewers. Drainage channels will be clearly identified on site and shown on method statements and site plans.

Where required, standard design and construction measures (i.e., groundwater drainage around impermeable subsurface structures) will ensure that groundwater flow across the site is maintained and that there will be no impact on groundwater levels.

During the construction phase, fuelling and lubrication of equipment will be carried out in accordance with the procedures outlined in the CEMP in a designated area of the site away from any watercourses and drains (where not possible to carry out such activities offsite). Any diesel, fuel or hydraulic oils stored onsite will be stored in designated areas. These areas will be bunded and located away from surface water drainage and features. Bunds will have regard to Environmental Protection Agency guidelines ‘Amendment to IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities’ (EPA, 2013). The main contractor will maintain an emergency response action plan and emergency procedures will be developed by the main contractor in advance of any works commencing.

Strict supervision of contractors will be adhered to in order to ensure that all plant and equipment utilised on-site is in good working condition. Any equipment not meeting the required standard will not be permitted for use within the Proposed Development site. Only emergency breakdown maintenance will be carried out on-site. Drip trays and spill kits will be available on-site to ensure that any spills from vehicles are contained and removed off-site.

There may also be the requirement for use of portable generators or similar fuel containing equipment during the construction phase of the Proposed Development, which will be placed on suitable drip trays. Regular monitoring of drip tray content will be undertaken to ensure sufficient capacity is maintained at all times.

Emergency procedures will be developed by the main contractor in advance of works commencing and spillage kits will be available on-site including in vehicles operating on-site. Construction staff will be familiar with emergency procedures in the event of accidental fuel spillages. Remedial action will be immediately implemented to address any potential impacts in accordance with best practice standards and legislative requirements including but not limited to the Environmental Protection Agency Act, 1992 (as amended), Waste Management Act, 1996 (as amended) and the Safety, Health and Welfare at Work Act, 2005 (as amended):

- Any required emergency vehicle or equipment maintenance work will take place in a designated impermeable area within the site.
- Emergency response procedures will be put in place, in the unlikely event of spillages of fuels or lubricants.

- Spill kits including oil absorbent material will be provided so that any spillage of fuels, lubricants or hydraulic oils will be immediately contained.
- In the event of a leak or spill from equipment in the instance of a mechanical breakdown during operation, any contaminated soil will be removed from the Proposed Development site and compliantly disposed of off-site. Residual soil will be tested to validate that all potentially contaminated material has been removed. This procedure will be undertaken in accordance with industry best practice procedures and standards.
- All construction works staff will be familiar with emergency procedures in the event of accidental fuel spillages.
- All construction works staff on-site will be fully trained on the use of equipment.

Pumping of concrete will be monitored to ensure that there is no accidental discharge. All work will be carried out in the dry and effectively isolated from any onsite drains. A suitable risk assessment for wet concreting will be completed prior to works being carried out. There will be no mixer washings or excess concrete discharged onsite. All excess concrete is to be removed from site and all washout of concrete chutes to be captured in a tank which will be removed offsite for disposal at an authorised waste facility.

Given the vulnerability of the underlying groundwater at the Site, the shallow groundwater table, the potential presence of karst landforms and the detectable concentrations of hydrocarbons in shallow soils (GII, 2024), a piling risk assessment will be completed by the main contractor at detailed design stage and in advance of construction works commencing onsite. The proposed piling methodology, will give cognisance to the Environment Agency’s (EA) guidance on ‘Piling into Contaminated Sites’ (EA, 2002) and ‘Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention’ (EA, 2001), (or similar best practice) in order to minimise the potential for the introduction of any temporary conduit between any potential sources of contamination at the ground surface and underlying groundwater. The piling method will also include procedures to ensure any potential impact to water quality is prevented including preventing surface runoff or other piling/drilling fluids from entering the pile bores and surrounding formation. Where there is a requirement to use lubricants, drilling fluids or additives the contractor will use water-based, biodegradable, and non-hazardous compounds under controlled conditions.

All below ground drainage infrastructure will be constructed in accordance with current UE requirements to ensure that there are no potential impacts to groundwater quality.

The main contractor will prepare method statements for weather and tide/storm surge forecasting and continuous monitoring of water levels in the River Corrib and Corrib Estuary. These will be made available to the local authority where requested. The Contractor will also provide method statements for the removal of site materials, fuels, tools, vehicles, and persons from flood zones in order to minimise the risk to persons working on the Site as well as potential input of sediment or construction materials into the waterbodies during flood events

Welfare facilities have the potential, if not managed appropriately, to release organic and other contaminants to ground or surface water courses. Foul drainage from temporary welfare facilities during the construction phase of the Proposed Development will either be discharged to temporary holding tank(s), the contents of which will periodically be tankered off site to a licensed facility or discharged to public sewer in accordance with the necessary temporary discharge licences issued by UE. The Galway City WWTP is operated in accordance with relevant statutory approvals issued by UE. The increase discharge to the Galway City WWTP as a result of the Proposed Development is considered to be insignificant in terms of the overall scale of the facility. The increased load does not have the capacity to alter the effluent released from the WWTP to such an extent as to result in likely significant effects on its receiving waters. Therefore, there will be no potential impact on water quality and the WFD status of receiving waterbodies associated with discharges from the Site.

6.2 Operational Phase

Based on the design of the Proposed Development there is limited potential sources of contamination during the operational phase. Furthermore, the proposed attenuation design does not allow for infiltration to ground. Surface water will be managed in accordance with the principles and objectives of SuDS and the GDSDS to treat and attenuate water prior to discharging offsite. Ongoing regular operational monitoring and maintenance of drainage and the SuDS measures will be incorporated into the overall management strategy for the Proposed Development. This will ensure that there are no impacts on water quality and quantity (flow regime) during the operational phase of the Proposed Development.

Foul water during the operational phase of the Proposed Development will ultimately discharge via the Galway City WWTP to the Corrib Estuary and the Inner Galway Bay North under the appropriate consents from UE. As mentioned above, the Galway City WWTP, which is operated in accordance with relevant statutory approvals issued by UE. Foul water from the site will only be discharged to the UE network under the appropriate consents from UE, and therefore, the Proposed Development will not cause a potential impact on water quality and the WFD status of receiving waterbodies associated with discharges from the Site.

6.3 Residual Risk to Waterbody Status

The effect of the design avoidance and mitigation measures have been assessed and summarised in Table 6-1. In all cases the proposed measures are sufficient to meet WFD objectives.

Table 6-1. Summary of WFD Status for Unmitigated and Mitigated Scenarios

WFD Waterbody I.D.	WFD Status (2016-2021)	Unmitigated Status Change	Mitigated Status Change
Construction Phase			
Terryland_010 (Terryland Stream)	Moderate	Poor	Moderate
Corrib_020 (Corrib River)	Good	Poor	Good
Corrib Estuary	Moderate	Poor	Moderate
Inner Galway Bay North	Good	Good	Good
Clare-Corrib GWB	Good	Poor	Good
Operational Phase			
Terryland_010 (Terryland Stream)	Moderate	Poor	Moderate
Corrib_020 (Corrib River)	Good	Moderate	Good
Corrib Estuary	Moderate	Moderate	Moderate
Inner Galway Bay North	Good	Good	Good
Clare-Corrib GWB	Good	Good	Good

6.4 Potential Impact on Protected Areas Objectives

Based on the findings of this assessment that there are to be no adverse impacts on the waterbodies supporting Protected Areas, it is considered that in applying the precautionary principle and assessing a worst-case scenario there is no identified potential negative impact associated with the Proposed Development on the Protected Areas individually or cumulatively.

6.5 Potential Impact on Water Action Plan Programme of Measures

Based on the findings of this assessment, it is considered that in applying the precautionary principle and assessing a worst-case scenario the Proposed Development will have no adverse impacts on the implementation of the WAP Programme of Measures. Adverse impacts associated with historic urbanisation will be negated through the implementation of SuDS and appropriate treatment of foul effluent from the site.

7 CONCLUSIONS

The findings of the risk-based assessment identified that in the absence of any mitigation and avoidance measures there could be a potential impact on the waterbody status within receiving water bodies associated with the Proposed Development, specifically within a local zone of the Clare-Corrib GWB, and receiving waterbodies including the Terryland_010, the Corrib_020, the Corrib Estuary and the Inner Galway Bay North.

The mitigation measures as outline above will prevent any impact on the receiving groundwater and surface water environment. Hence, the Proposed Development will not have any impact on compliance with the EU Water Framework Directive, European Communities (Environmental Objectives) Surface Water Regulations, 2009 (SI 272 of 2009, as amended 2012 (SI No 327 of 2012), and the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010) (as amended) 2012 (SI 149 of 2012) and 2016 (S.I. No. 366 of 2016).

The Proposed Development will not cause a deterioration in the status of waterbodies hydraulically connected with the Proposed Development, taking account of design avoidance and mitigation measures that will be implemented. The Proposed Development will not jeopardise the objective to achieve ‘good’ surface water status or good ecological potential.

There will be no impact to the existing WFD status of waterbodies associated with the Proposed Development including the Clare-Corrib GWB, the Terryland_010, the Corrib_020, the Corrib Estuary and the Inner Galway Bay North and downstream surface waterbodies as a result of the Proposed Development taking account of embedded design avoidance and mitigation measures.

7.1 WFD Article 4 Objectives Compliance Statement

The assessment contained within this report has comprehensively demonstrated that the proposed development adheres to the Article 4 objectives of the Water Framework Directive (WFD). Applying the precautionary principle and evaluating a worst-case scenario, it is evident that there are no adverse impacts to the Status of waterbodies, thus aligning with the objective to protect, enhance, and restore all bodies of surface water and groundwater, with the aim of achieving good surface water status by 2027.

Furthermore, the proposed development incorporates measures, such as Sustainable Drainage Systems (SuDS) and the appropriate treatment of foul effluent, which will prevent any deterioration in waterbody status and maintain high status where it already exists. Moreover, the necessary measures are being implemented with the aim of progressively reducing pollution in surface waters and groundwater, thereby fulfilling the objective of reducing pollution incrementally.

Finally, the development ensures that waterbodies associated with Protected Areas will not be subject to significant adverse effects, thereby safeguarding the environmental objectives set forth for such areas. Consequently, the proposed development is in full compliance with the overarching goal of achieving good surface water status by 2027 and maintaining the integrity of the water environment.

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Environmental Consultancy Services

Appendix 8-3

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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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.

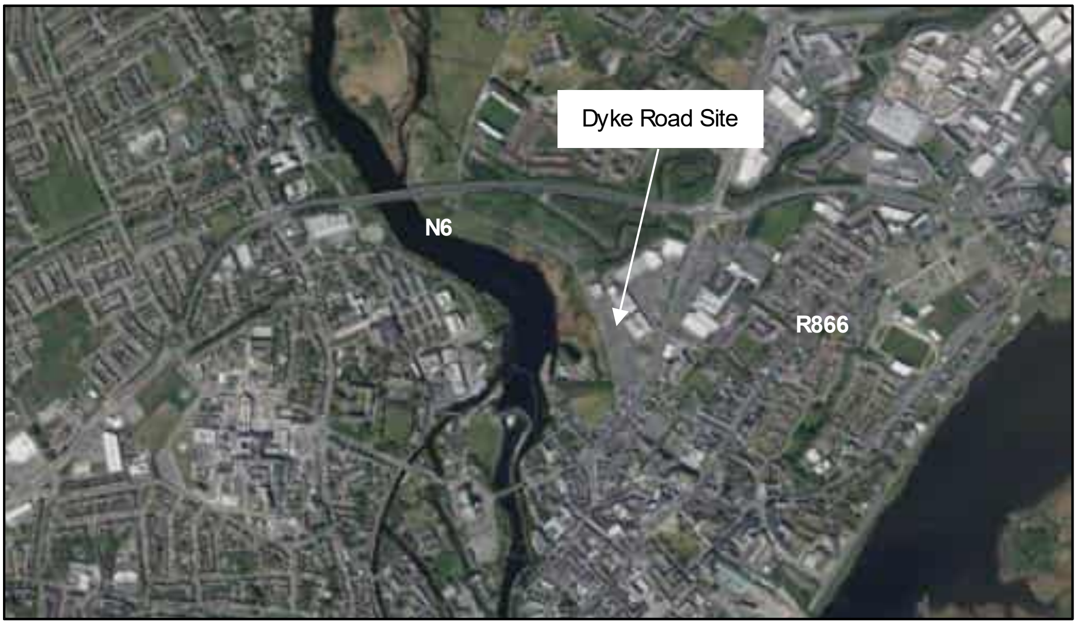


Figure 1-1: Site Location Map

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).

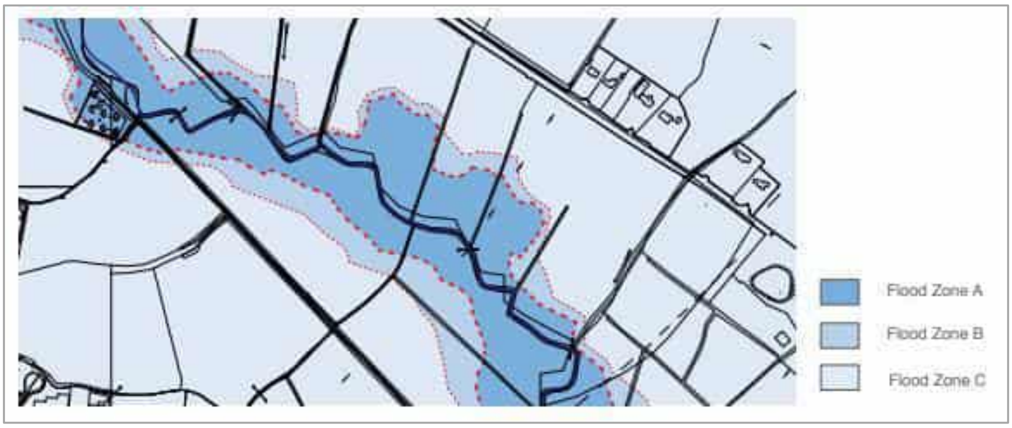


Figure 2-1: Indicative Flood Zone Map (Extract from the Guidelines, Figure 2.3)

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.**

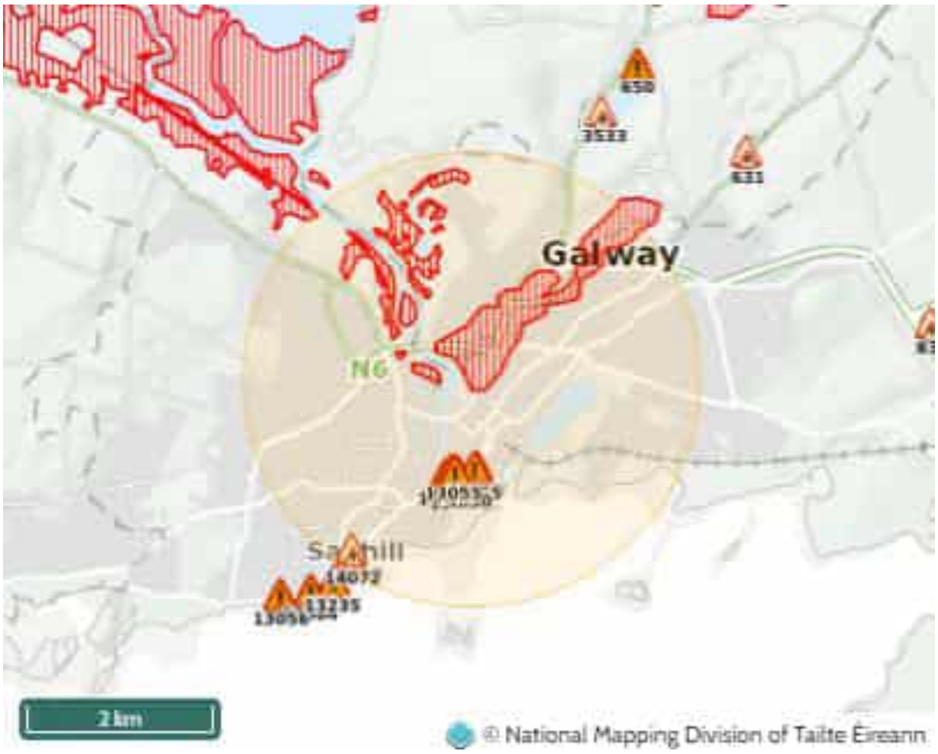


Figure 3-1: OPW Recorded Events – Benefitting Areas Shown in Red

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.

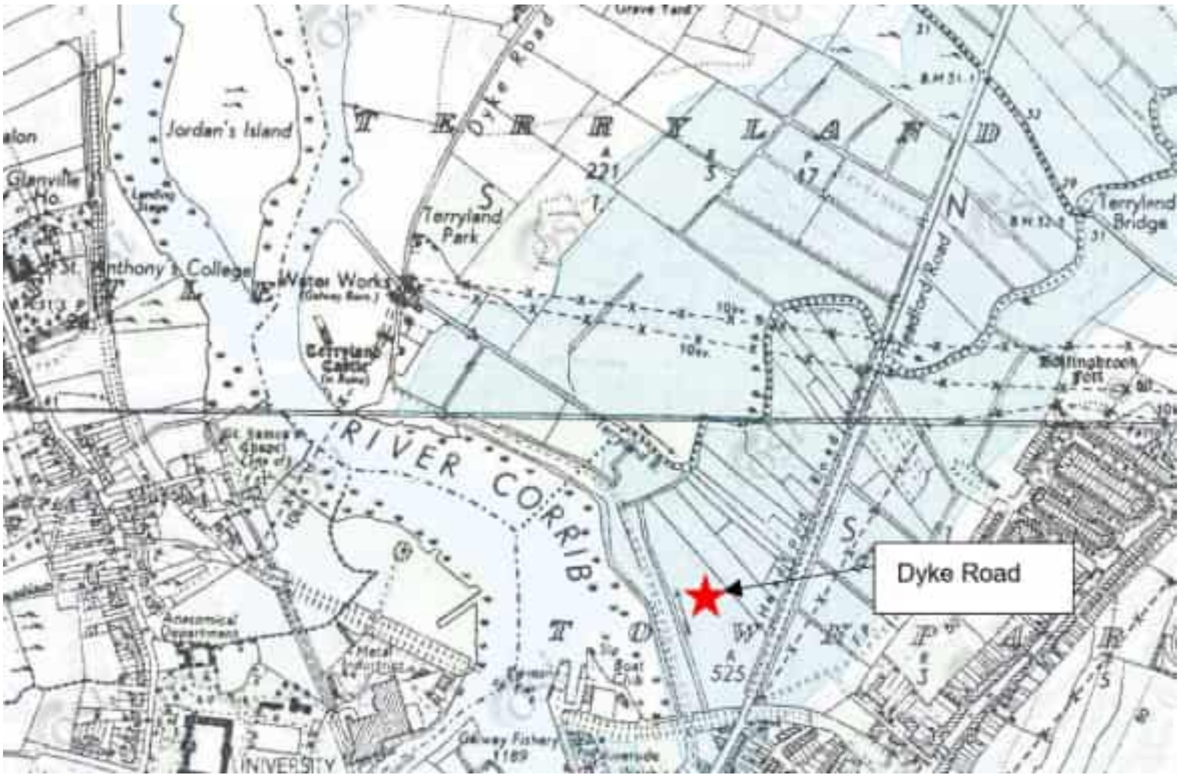


Figure 3-2: Historical Flood Plains Indicated in Blue Hatch

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).

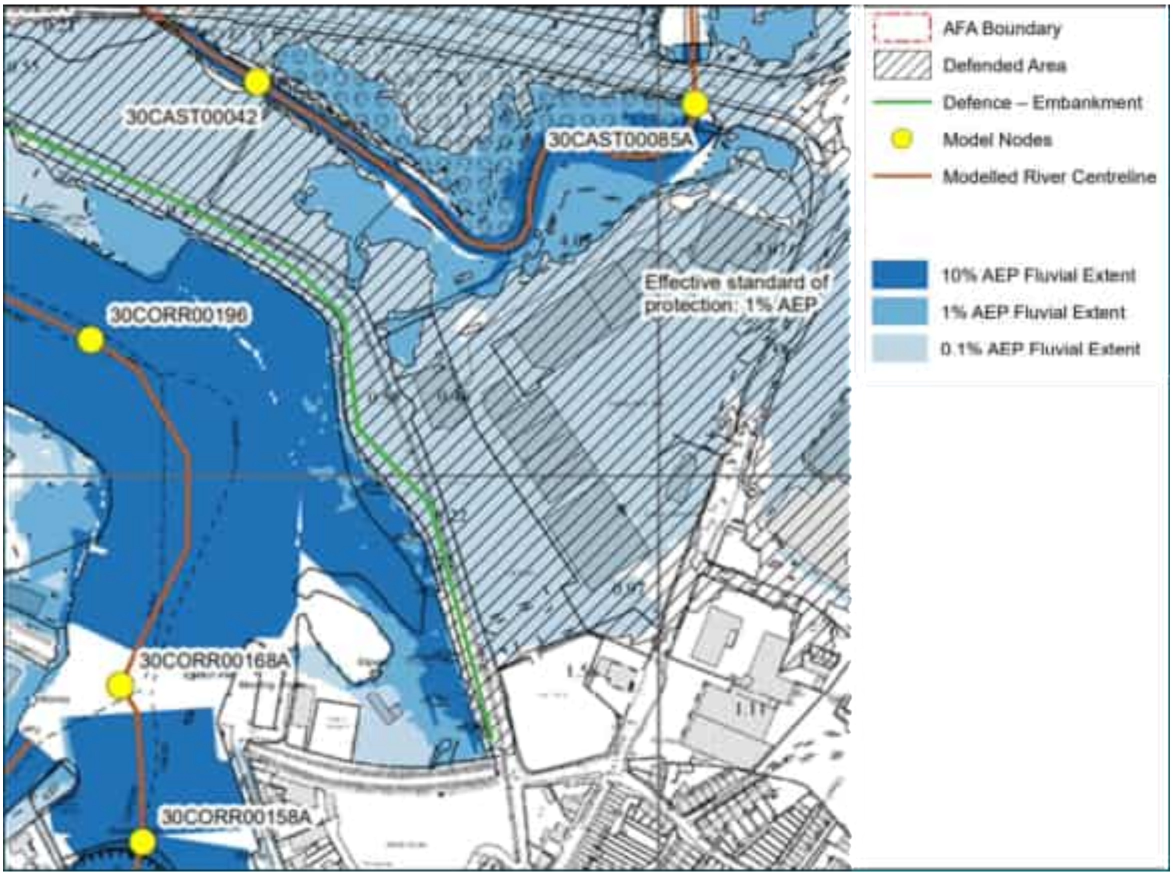


Figure 3-3: Extract from CFRAM Map: W30GLW_EXFCD_F4_08 (December 2017) Western CFRAM Study

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.

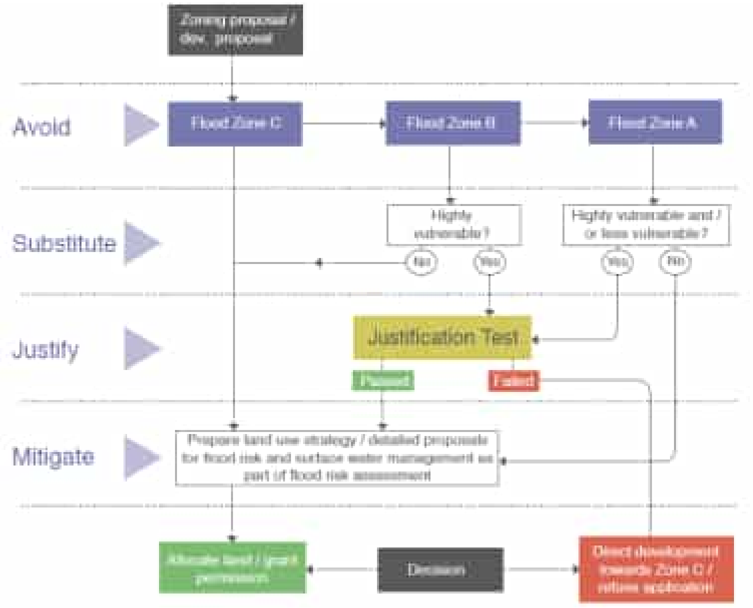


Figure 5-1: Sequential Approach Mechanism in the Planning Process

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:

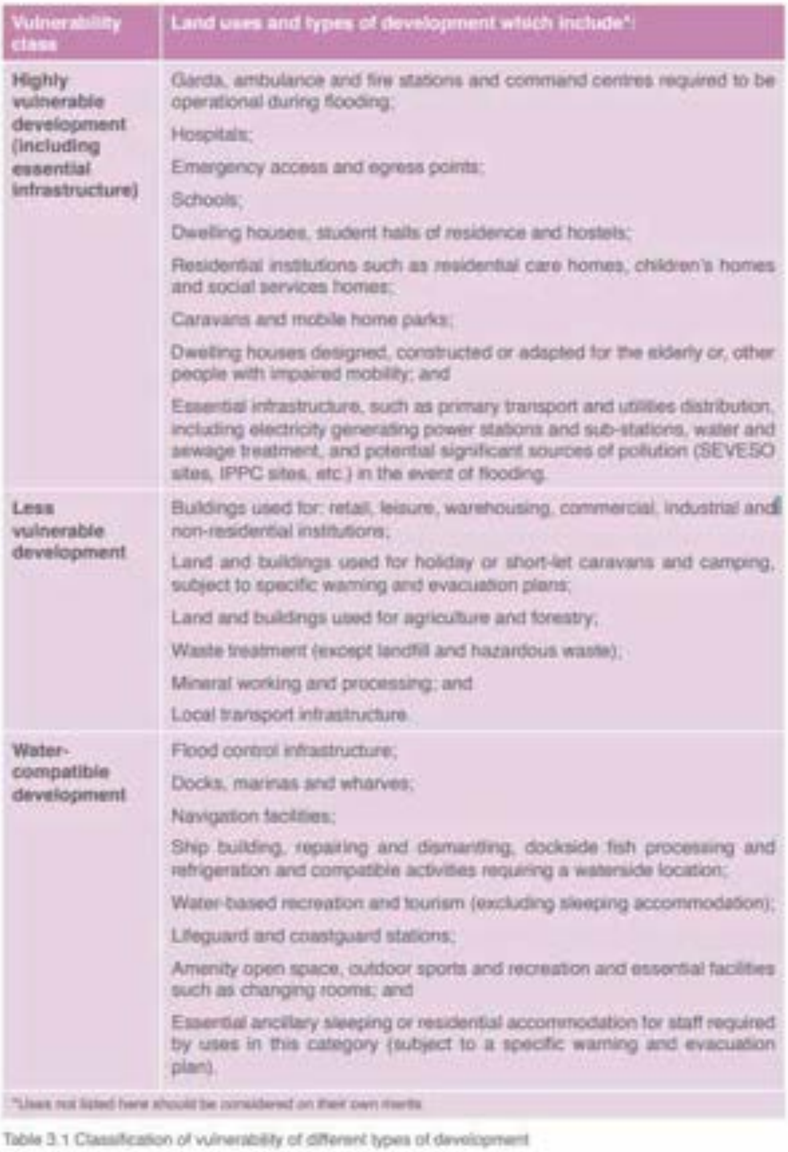
Flood Zone A – High probability of flooding: most types of development would be considered inappropriate in this zone. Development in this zone should be avoided or only considered in exceptional circumstances, such as in city and town centres where the Justification Test has been applied. Water compatible 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 embankment*". 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.

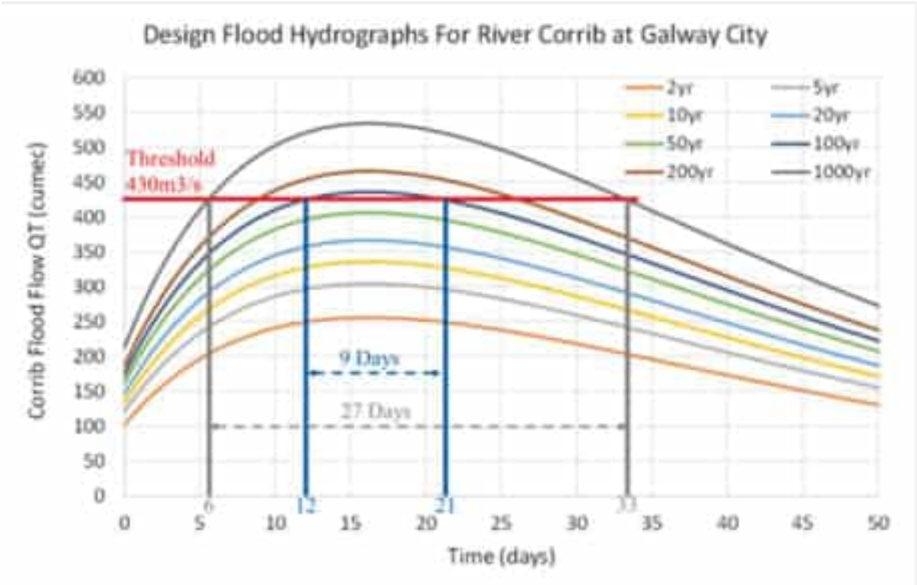


Figure 6-1 : Return Period Design Flow Hydrographs for River Corrib at Galway City (Hydro Environmental)

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.

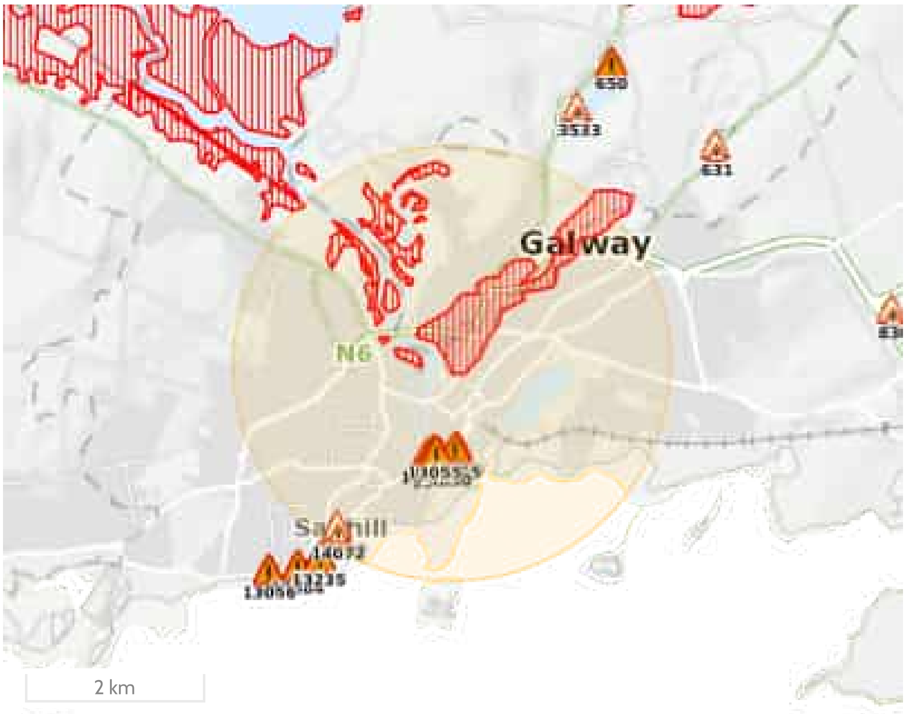
Appendix A OPW Flood Hazard Records

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*

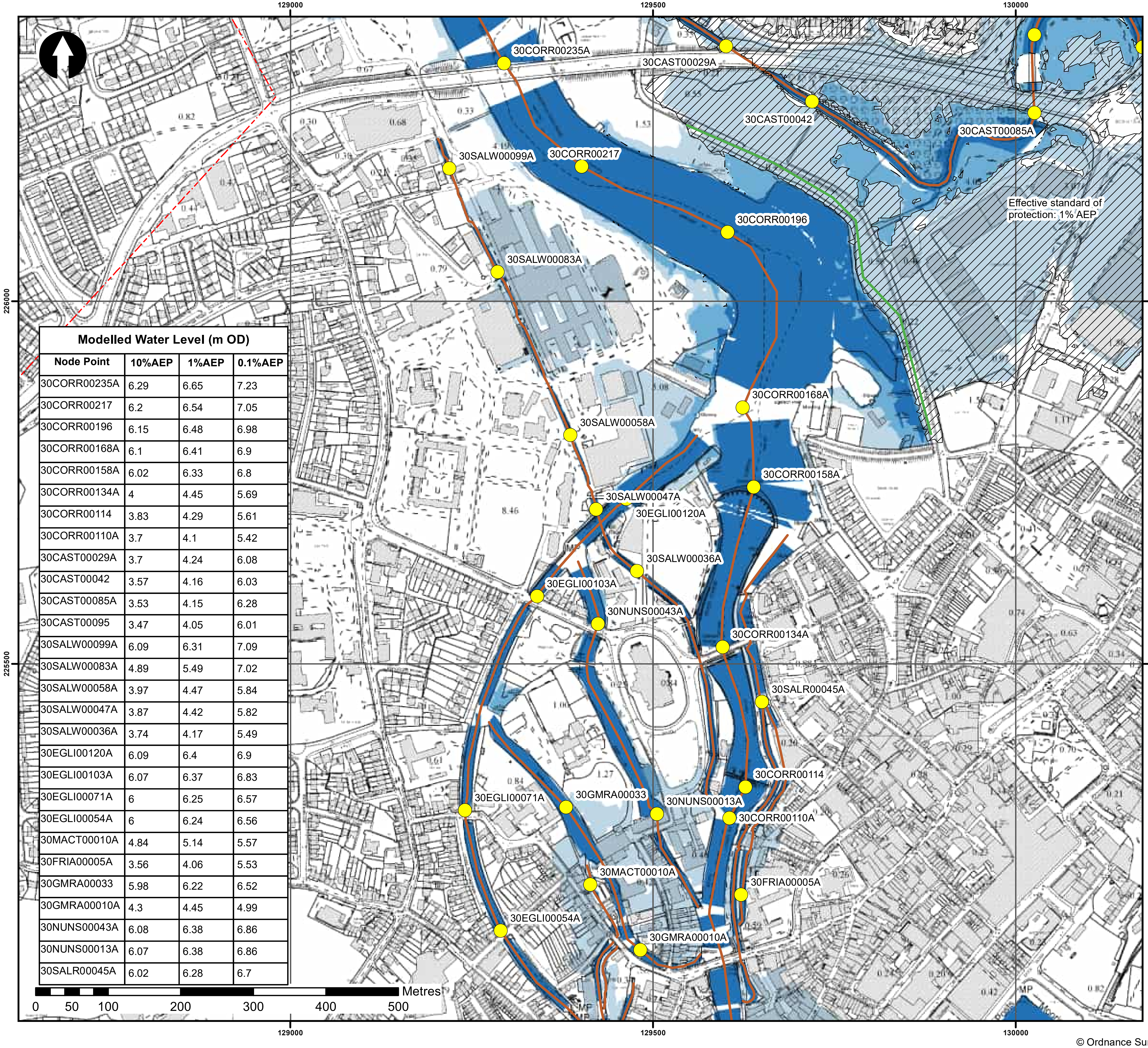
* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

15 Results

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

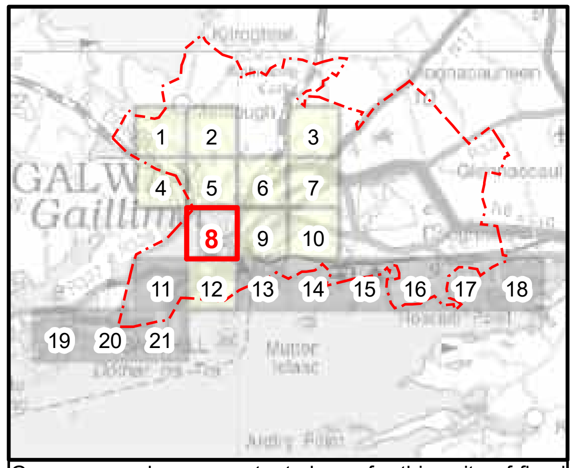
	Name (Flood_ID)	Start Date	Event Location
7.	⚠ Flooding at Galway City and Salthill on 05/12/2015 (ID-13373) **Additional Information:** Reports (0) Press Archive (0)	05/12/2015	Approximate Point
8.	⚠ Flooding at Galway City on 06/12/2015 (ID-13399) **Additional Information:** Reports (0) Press Archive (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



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



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.

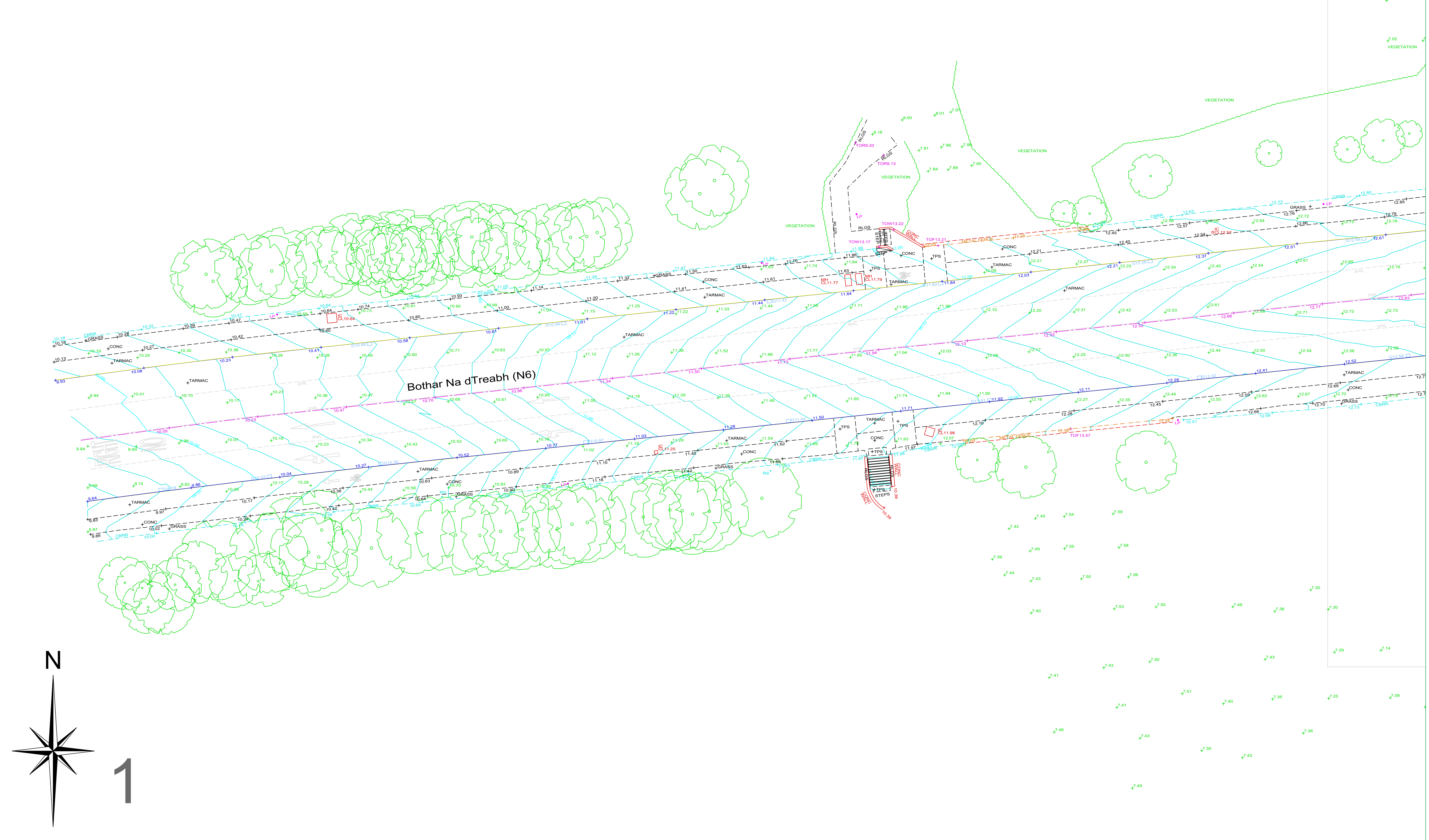
The Office of Public Works
Jonathan Swift Street
Trim
Co. Meath

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 Original @ A3	
Checked by: TS Date: Dec 2017		
Approved by: JC Date: Dec 2017		
Map No: W30GLW_EXFCD_F4_08	**Sheet:** 8 of 21	

Appendix C Topographic Survey



APEX SURVEYS

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info@apexsurveys.ie
00353 1 691 0156

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 ☐
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

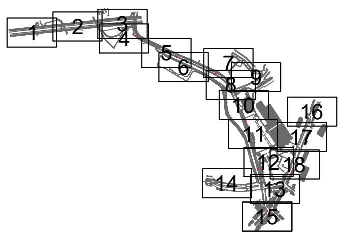
SERVICES :

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:

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CONTACT INFORMATION:

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Dunboyne, Co. Meath, Ireland
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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
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

SHEET: 1 of 18

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

APEX SURVEYS

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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 □
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 •

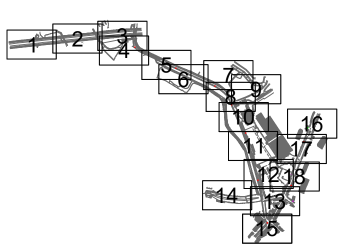
SERVICES :

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

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

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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

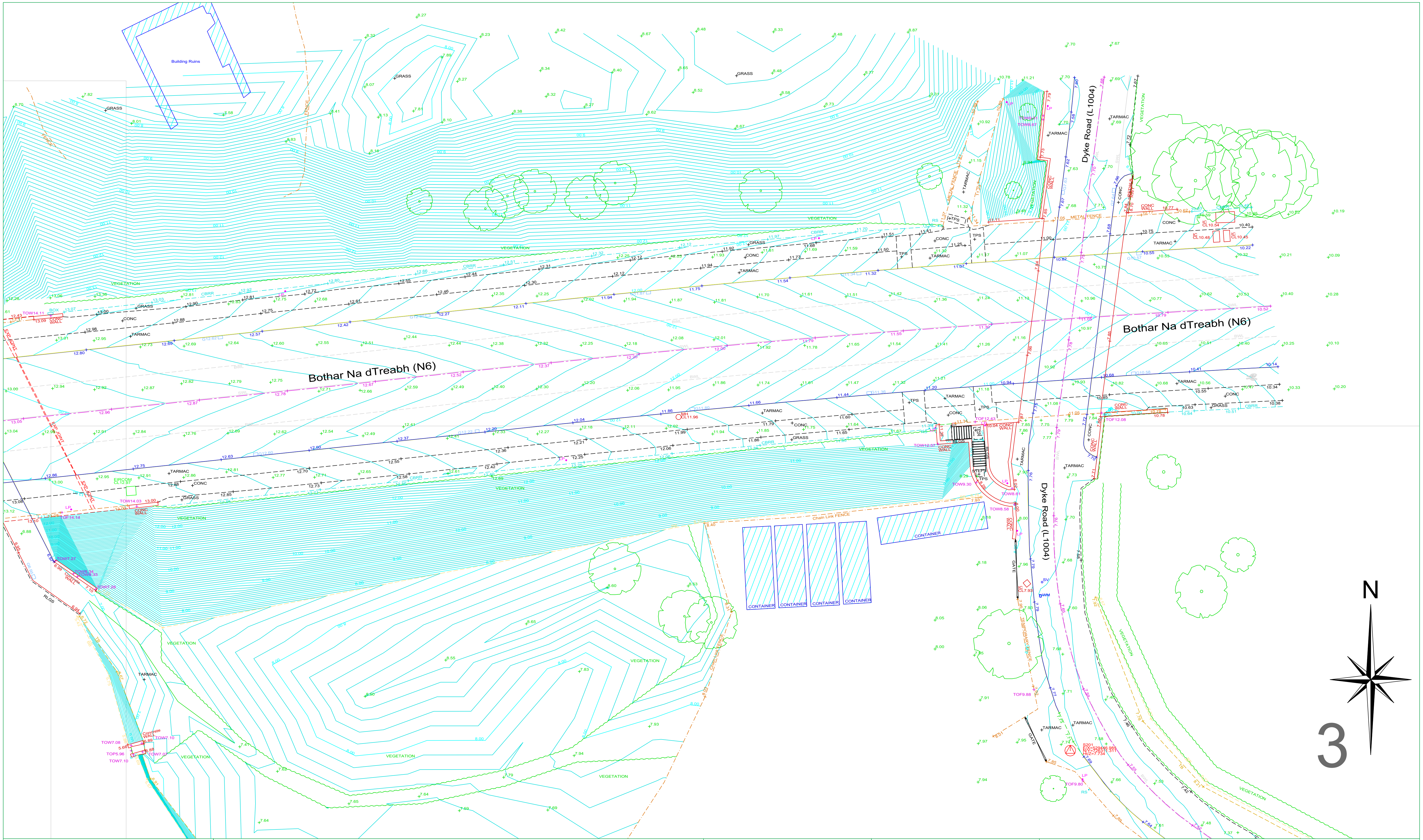
DESCRIPTION : 2D Topographical

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

PROCESSED BY : Jason Pringle

SHEET: 2 of 18

CHECKED BY : Alan Brady



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SURVEYS

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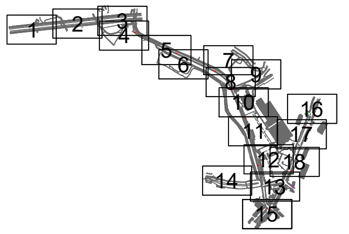
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	⊛

SHEET LAYOUT :



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NOTES: Drawing Contains Scale Factor

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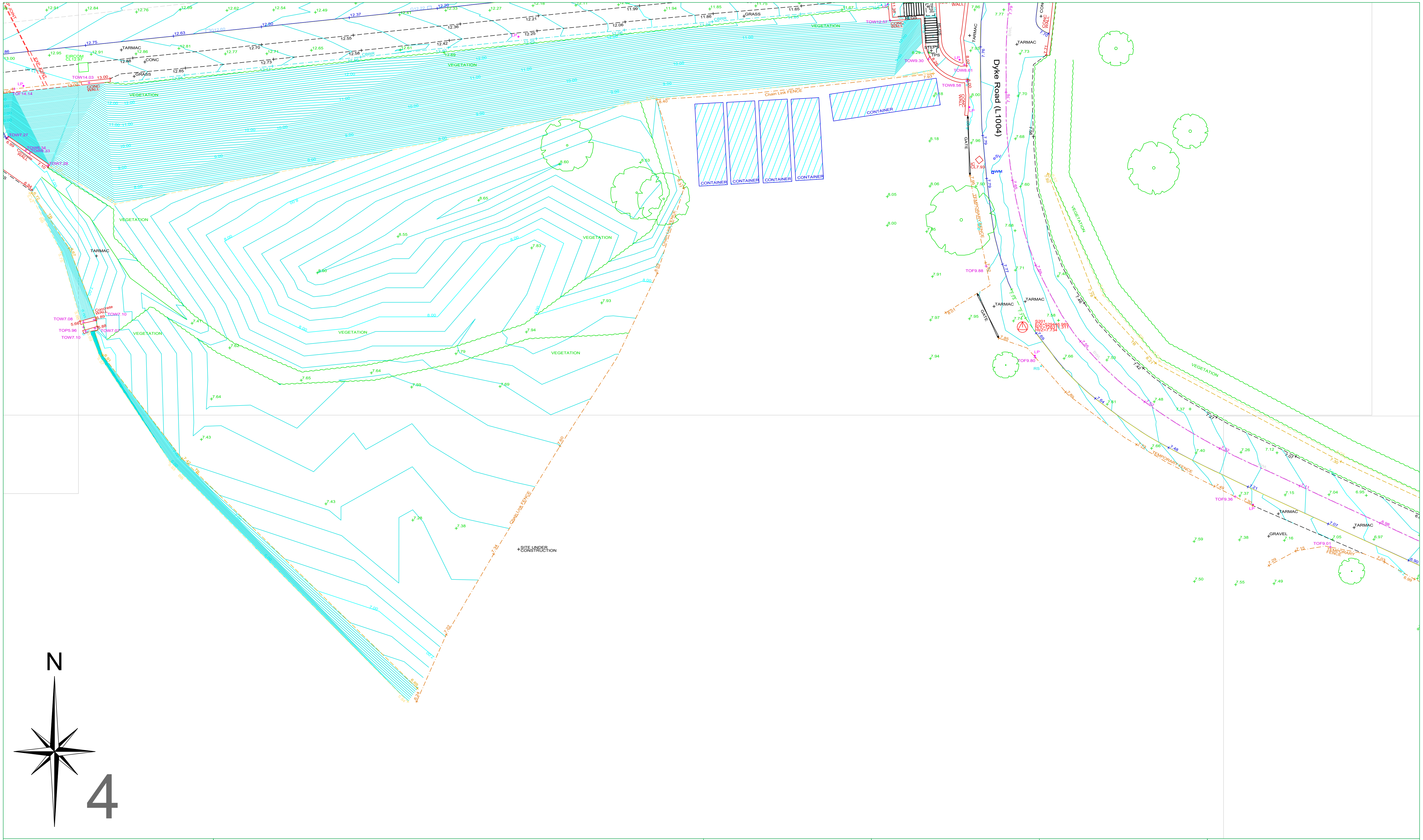
004	21/12/23	Contours Updated and Stations Added

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.
PROCESSED BY : Jason Pringle
SHEET: 3 of 18
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 ☐
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 •

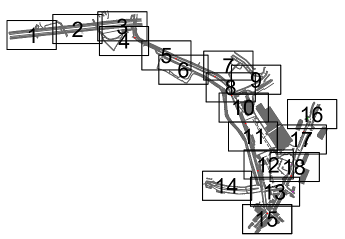
SERVICES :

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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CONTACT INFORMATION:

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00353 1 691 0156

CLIENT:

Client

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

PROJECT:

Dyke Road
Galway City

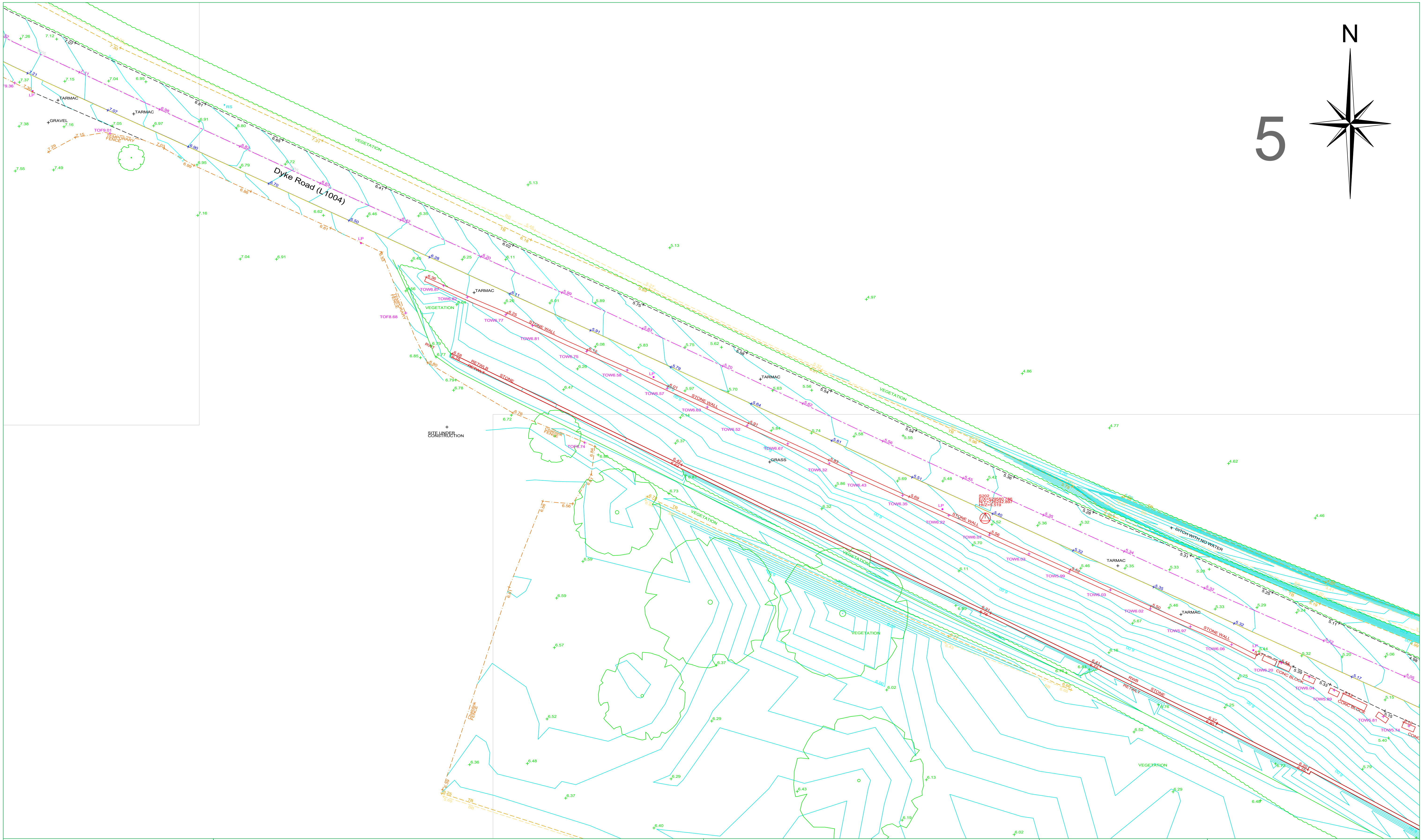
SCALE : 1/200 A1

DATE : 15/11/2023

DRG No: 5999

SHEET: 4 of 18

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



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00353 1 691 0156

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 ☐
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 ☐
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STOPCOCK	ST

SERVICES :

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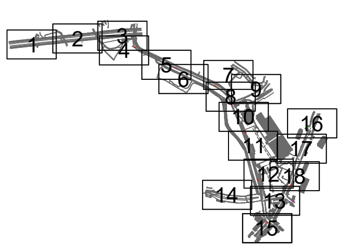
TRAFFIC COVER	TLIC ☐
VENT	VENT
WATER METER	WM +
UNABLE TO LIFT	UTO

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 :



PLAN PRODUCED BY:

APEX SURVEYS

CONTACT INFORMATION:

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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
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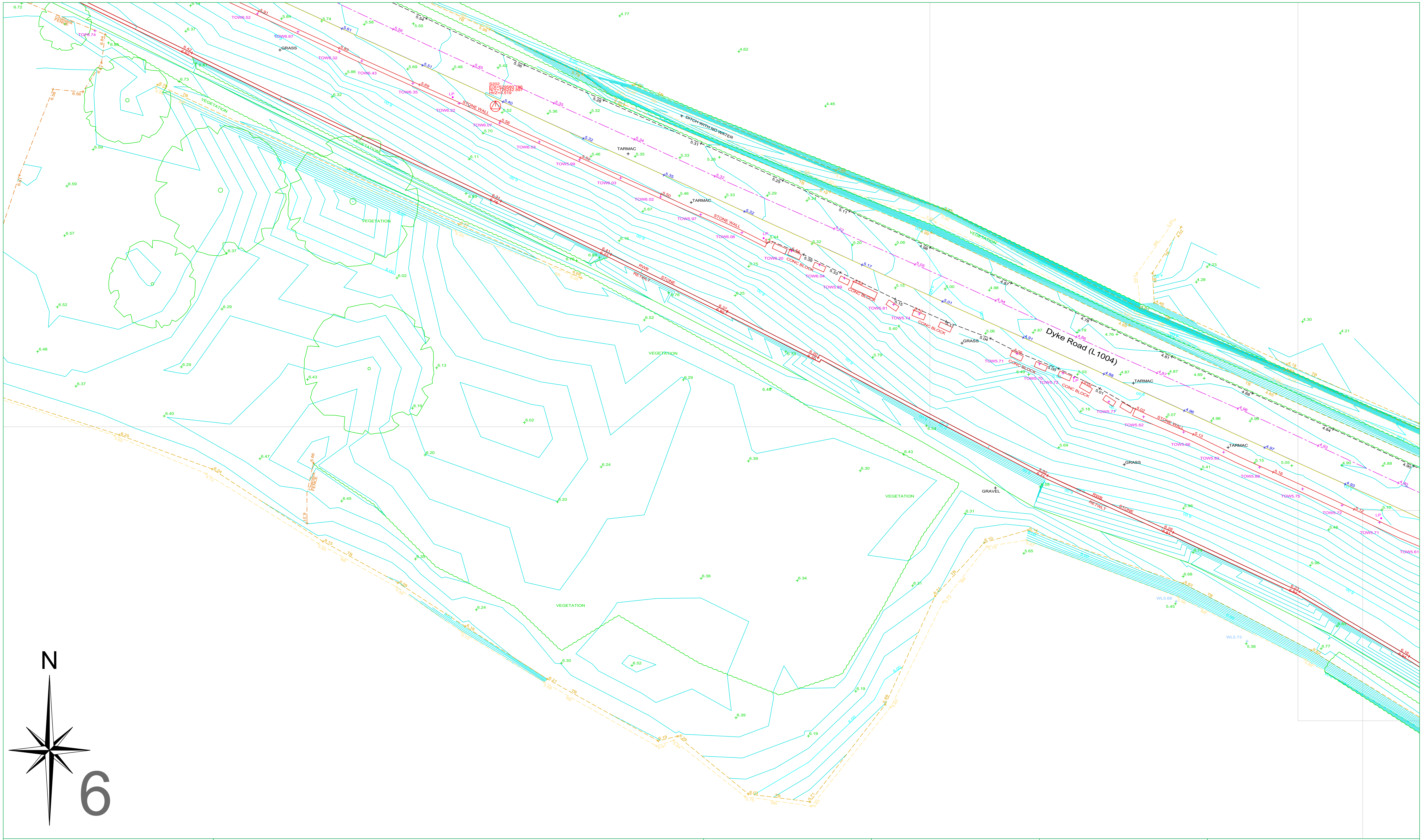
SCALE : 1/200 A1

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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RURAL/NATURAL FEATURES :

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SAPLING	●
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CATTLE GRID	GRID

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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

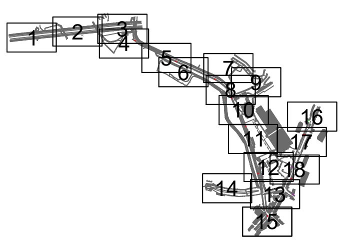
SERVICES :

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:

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

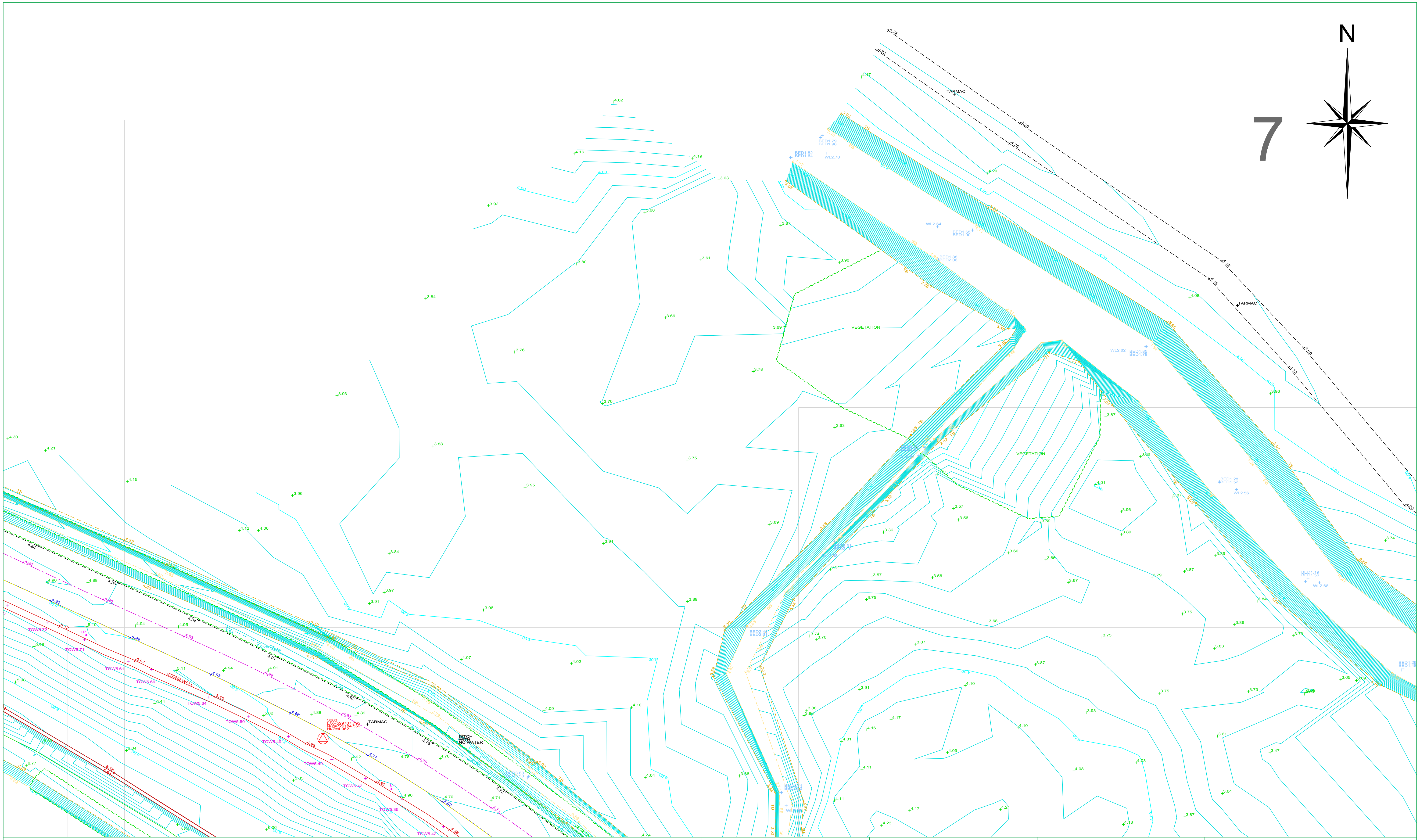
SCALE : 1/200 A1

DATE : 15/11/2023

DRG No: 5999

SHEET: 6 of 18

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

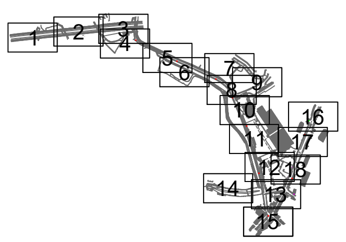
SERVICES :

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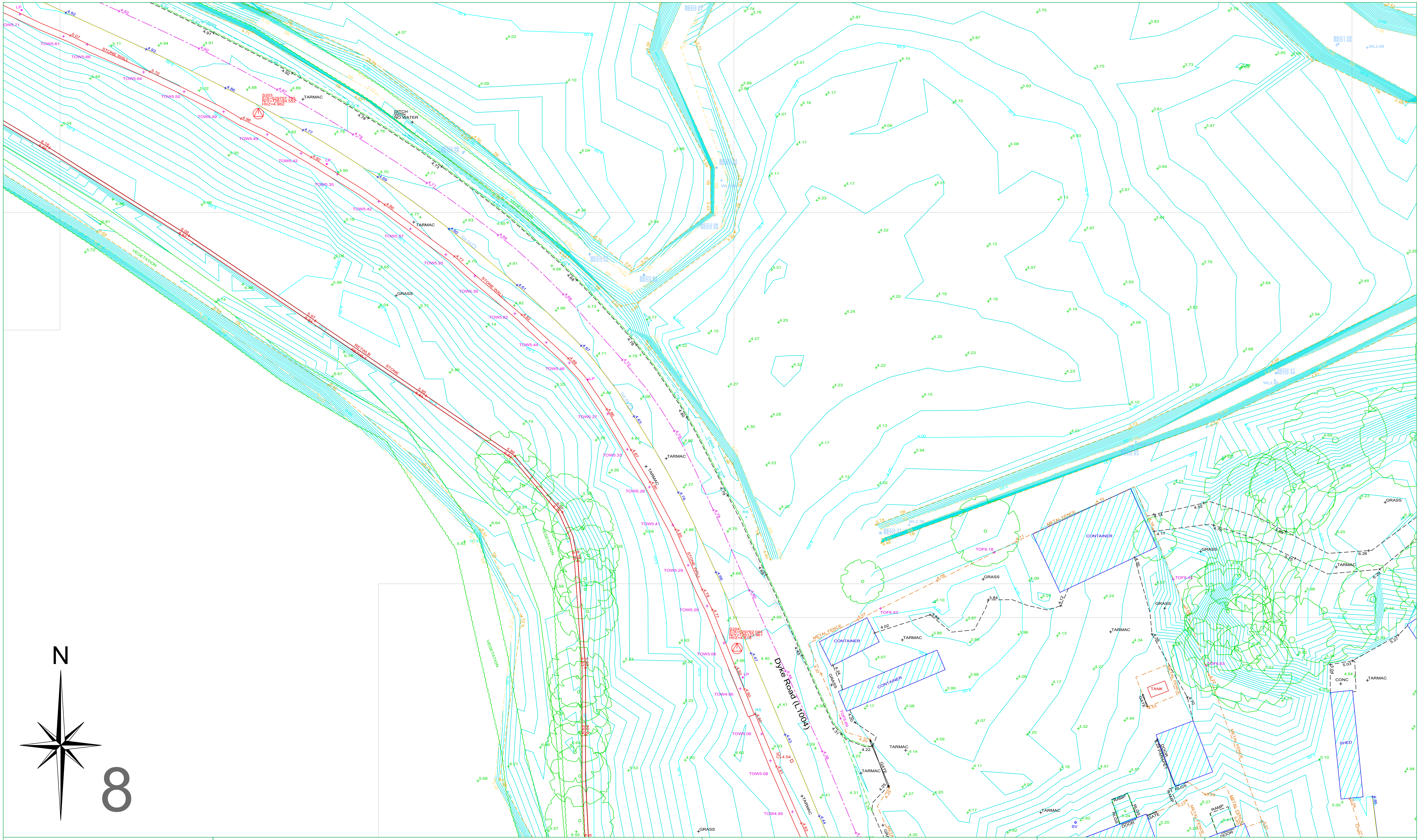
SCALE : 1/200 A1
DATE : 15/11/2023
DRG No: 5999
DESCRIPTION : 2D Topographical
SURVEYED BY : C.F. & R.D.
SHEET: 7 of 18
PROCESSED BY : Jason Pringle
CHECKED BY : Alan Brady



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SURVEYS

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00353 1 691 0156

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 ☐
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

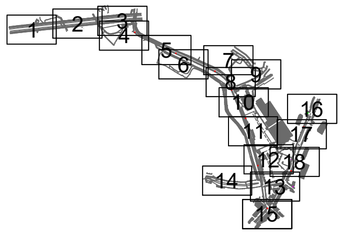
SERVICES :

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
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SCALE : 1/200 A1

DATE : 15/11/2023

DRG No: 5999

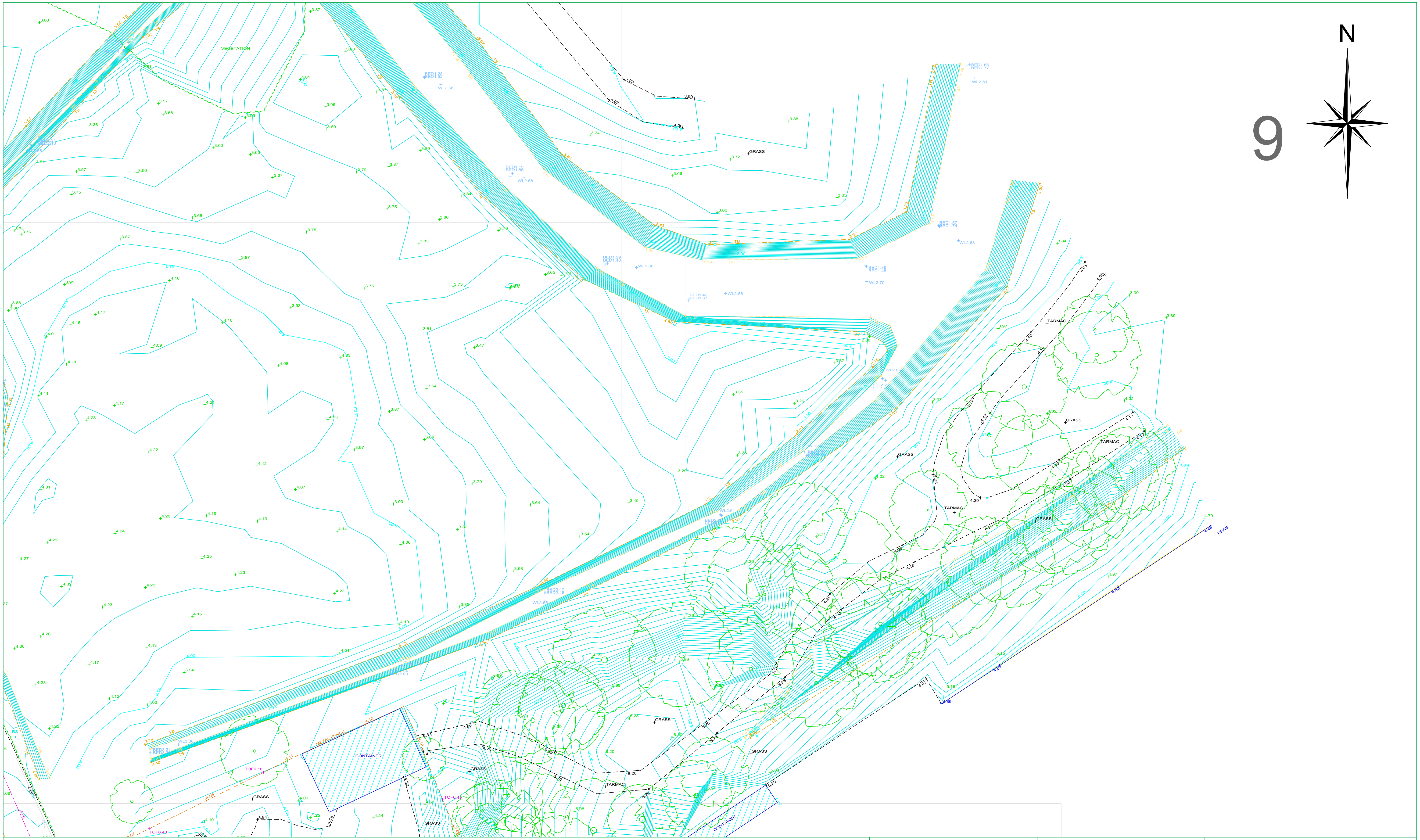
DESCRIPTION : 2D Topographical

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

PROCESSED BY : Jason Pringle

CHECKED BY : Alan Brady

SHEET: 8 of 18



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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 ☐
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

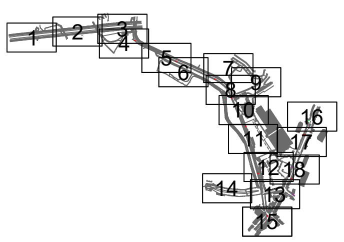
SERVICES :

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
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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

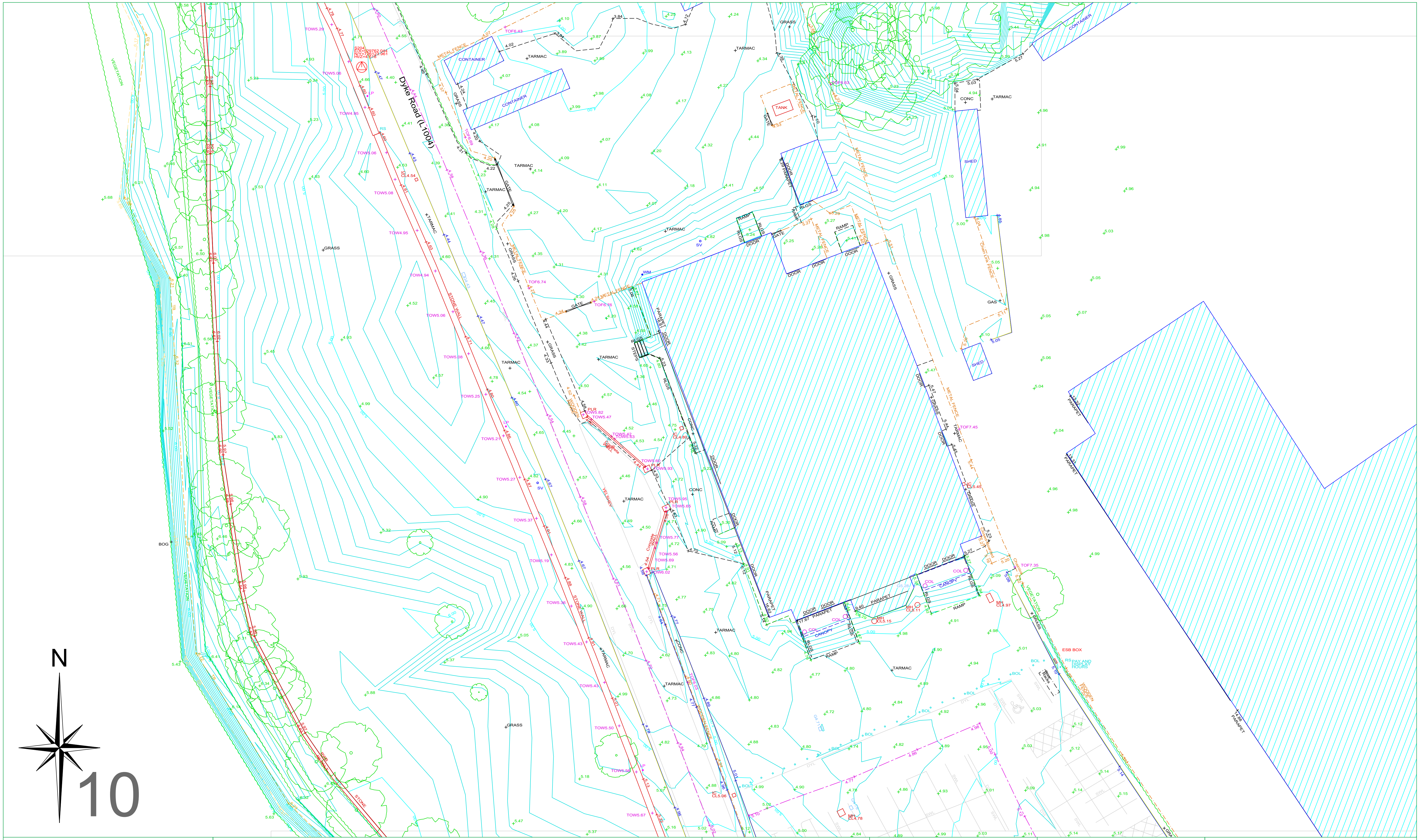
DESCRIPTION : 2D Topographical

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

SHEET: 9 of 18

PROCESSED BY : Jason Pringle

CHECKED BY : Alan Brady



APEX SURVEYS

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

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 ☐
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 •

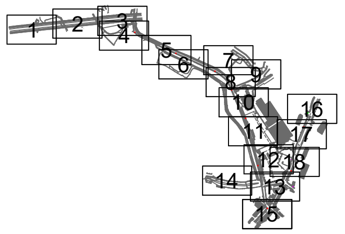
SERVICES :

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:

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00353 1 691 0156

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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004	21/12/23	Contours Updated and Stations Added

SCALE : 1/200 A1

DRG No: 5999

SHEET: 10 of 18

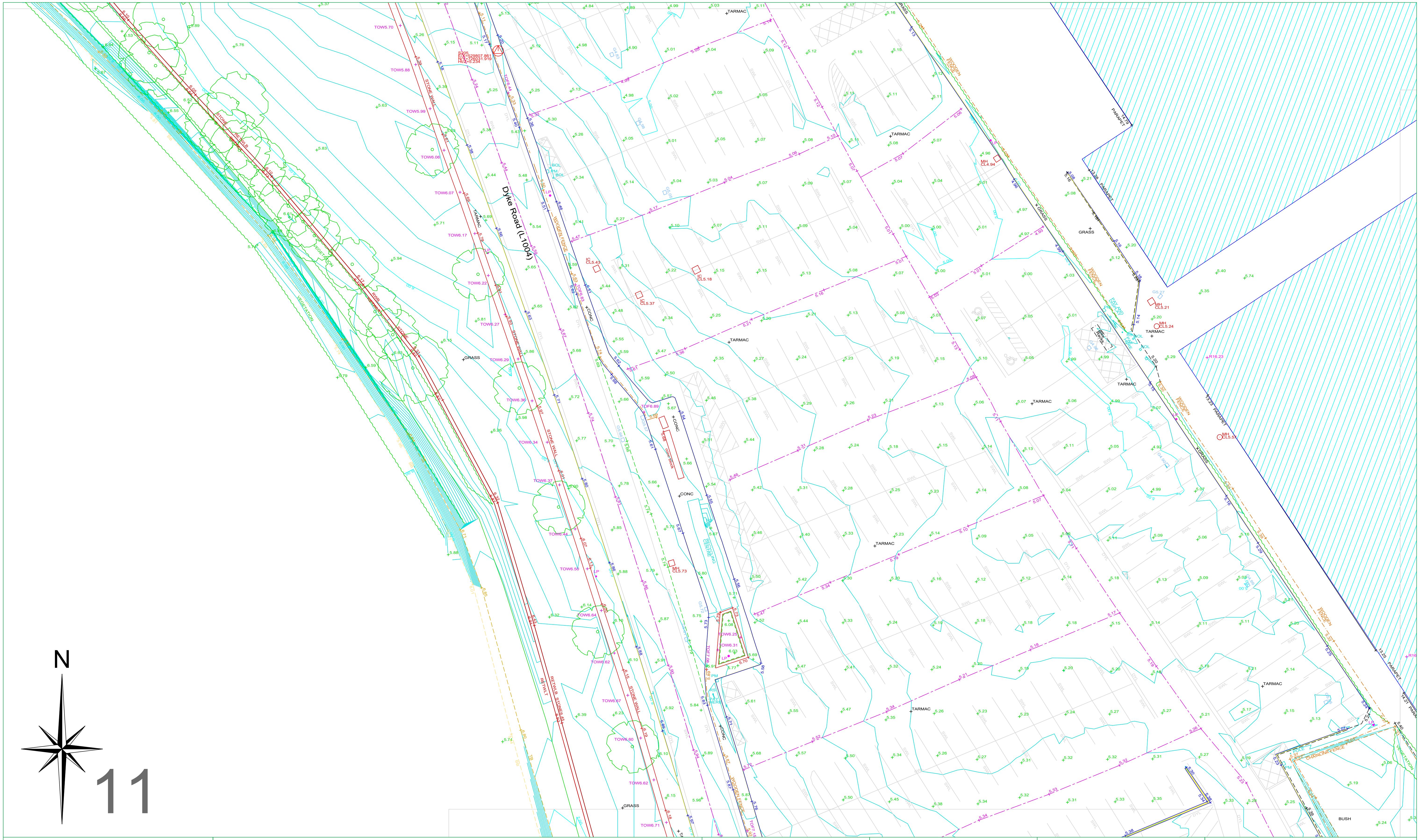
DATE : 15/11/2023

DESCRIPTION : 2D Topographical

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

PROCESSED BY : Jason Pringle

CHECKED BY : Alan Brady



APEX SURVEYS

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00353 1 691 0156

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 ☐
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 ○
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INSPECTION COVER	IC ☐
MANHOLE	MH
SEPTIC TANK	SEPTIC ☐
SLUICE VALVE	SV •
STOPCOCK	ST •

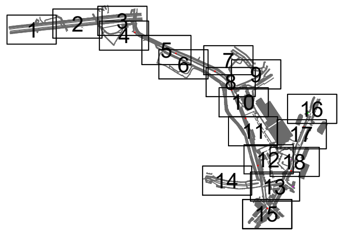
SERVICES :

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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PROJECT:

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GRID SYSTEM: Irish Transverse Mercator
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NOTES: Drawing Contains Scale Factor

REVISIONS:

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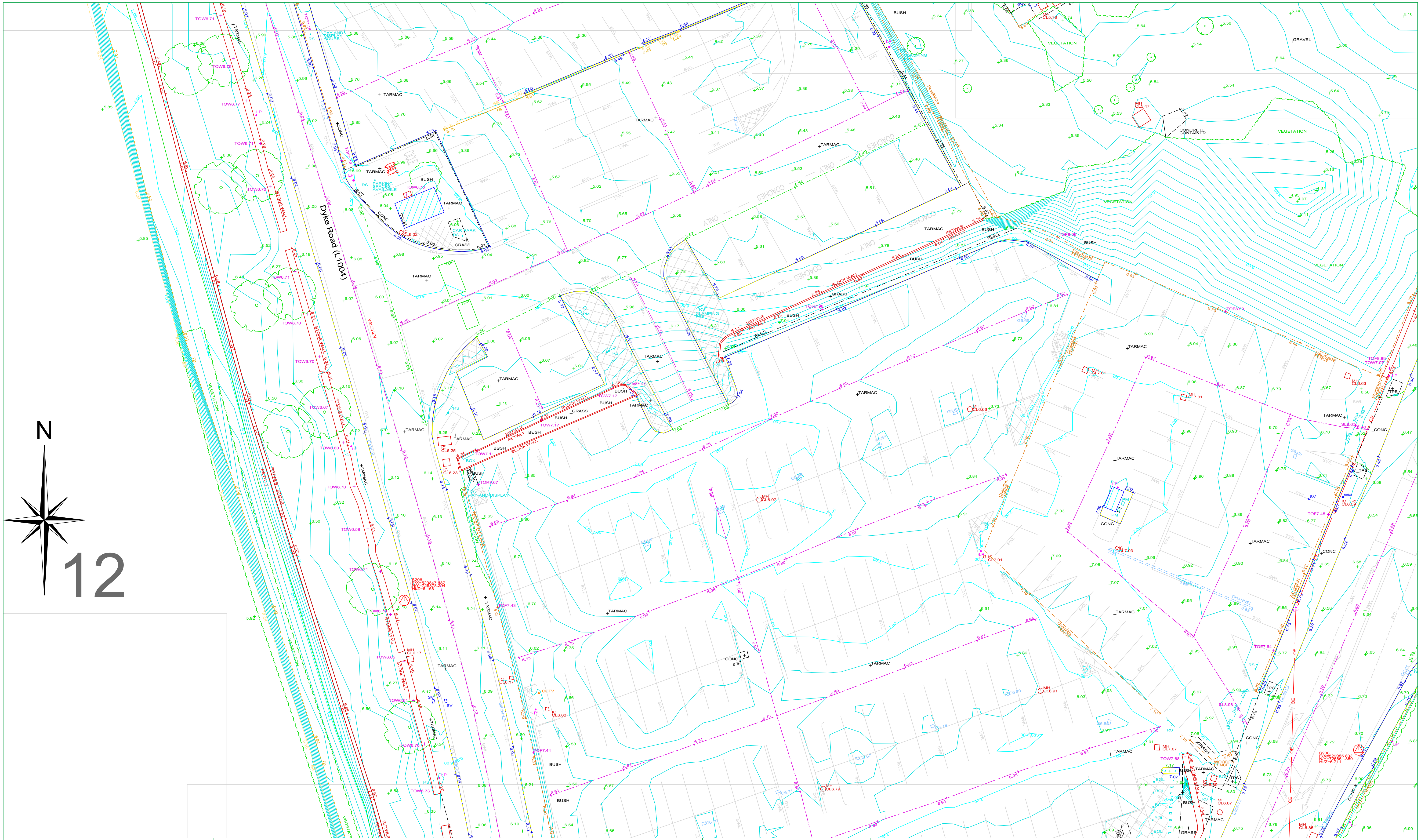
SCALE : 1/200 A1

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: 11 of 18



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00353 1 691 0156

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 ☐
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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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

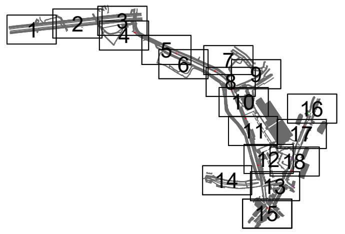
SERVICES :

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

CLIENT:

Client

PROJECT:

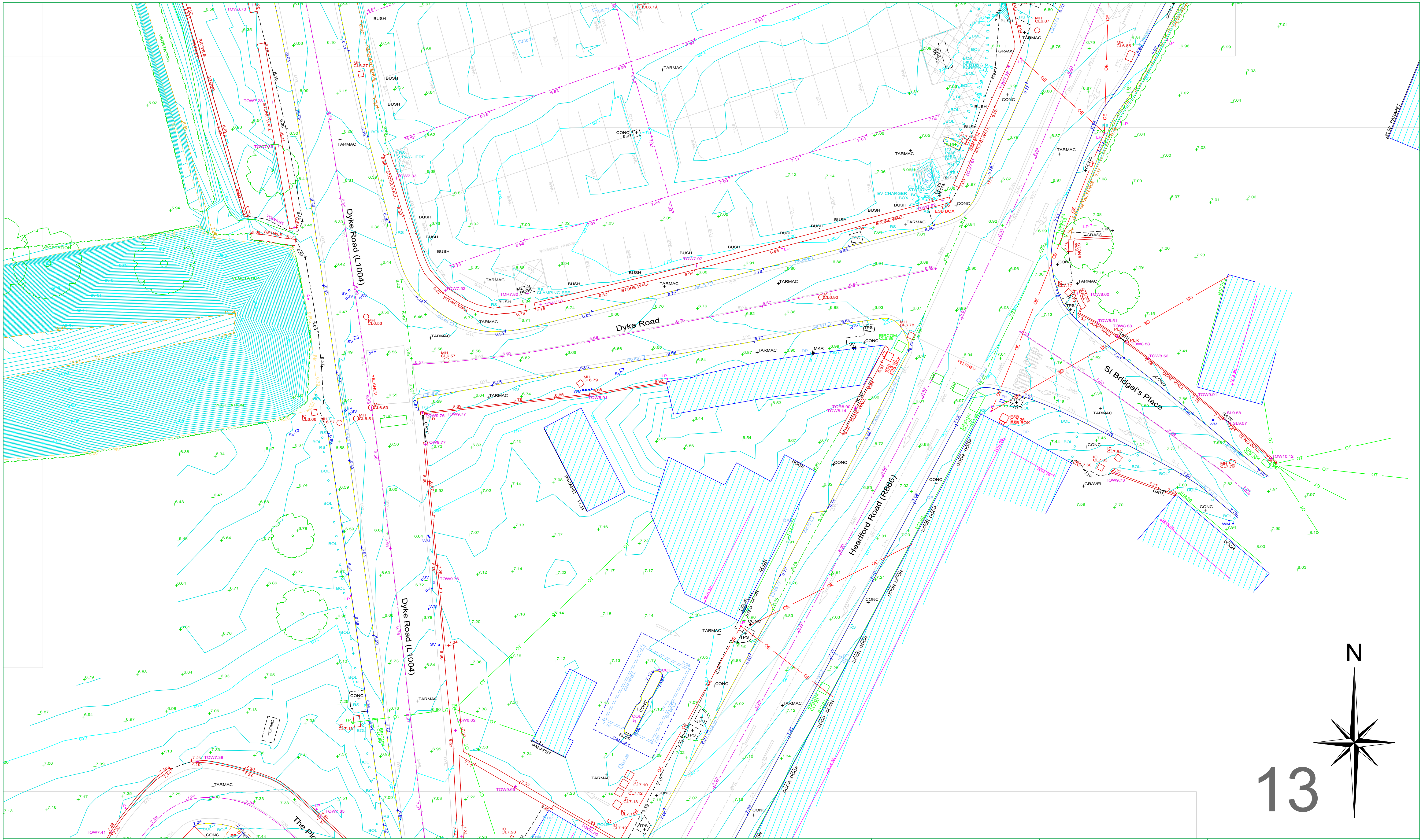
Dyke Road
Galway City

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: 12 of 18
PROCESSED BY : Jason Pringle
CHECKED BY : Alan Brady



APEX SURVEYS

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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 ☐
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 °

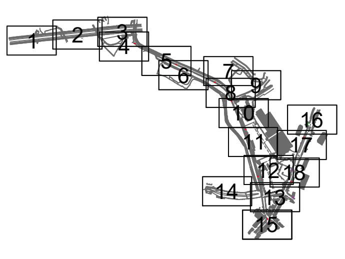
SERVICES :

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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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
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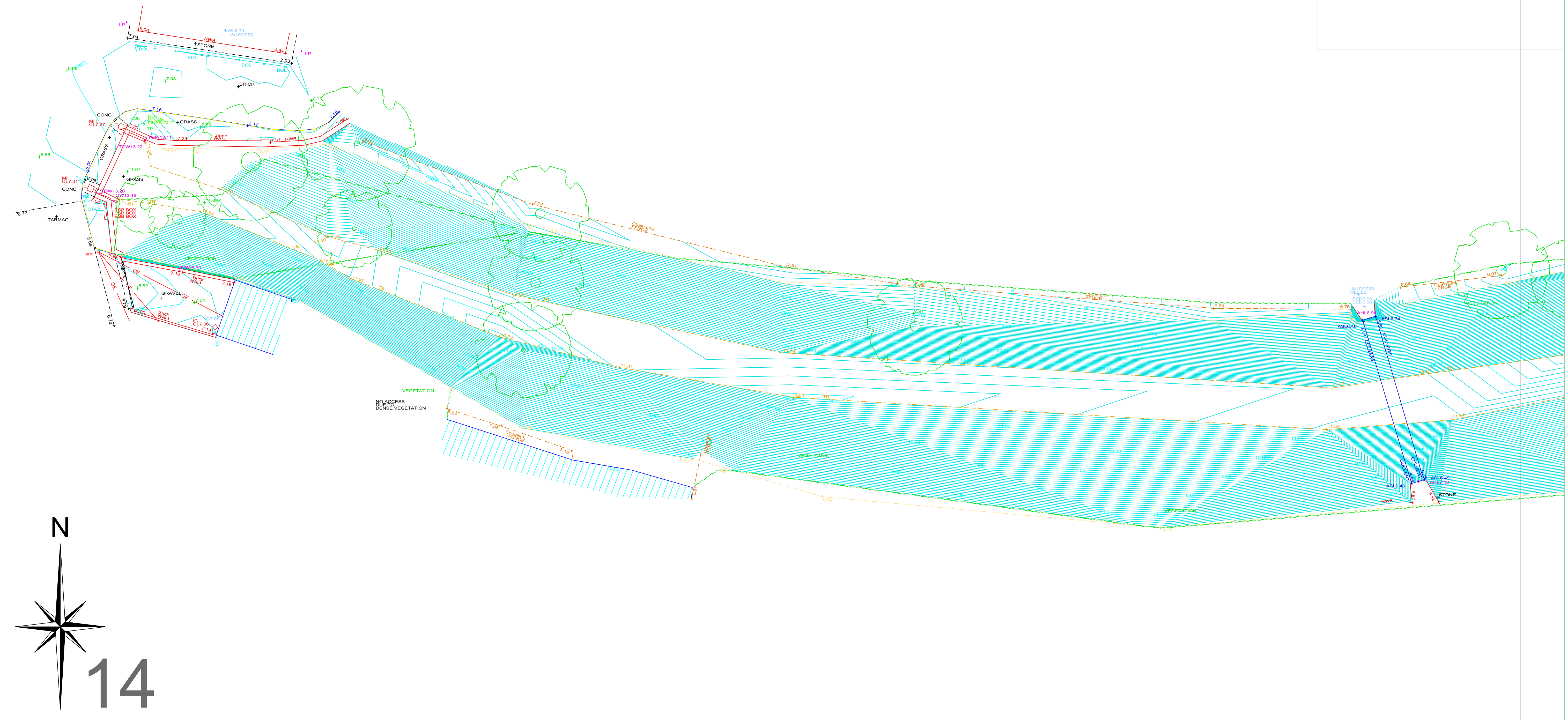
SCALE : 1/200 A1

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



APEX SURVEYS

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00353 1 691 0156

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 ☐
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

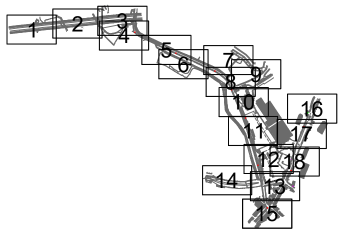
SERVICES :

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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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

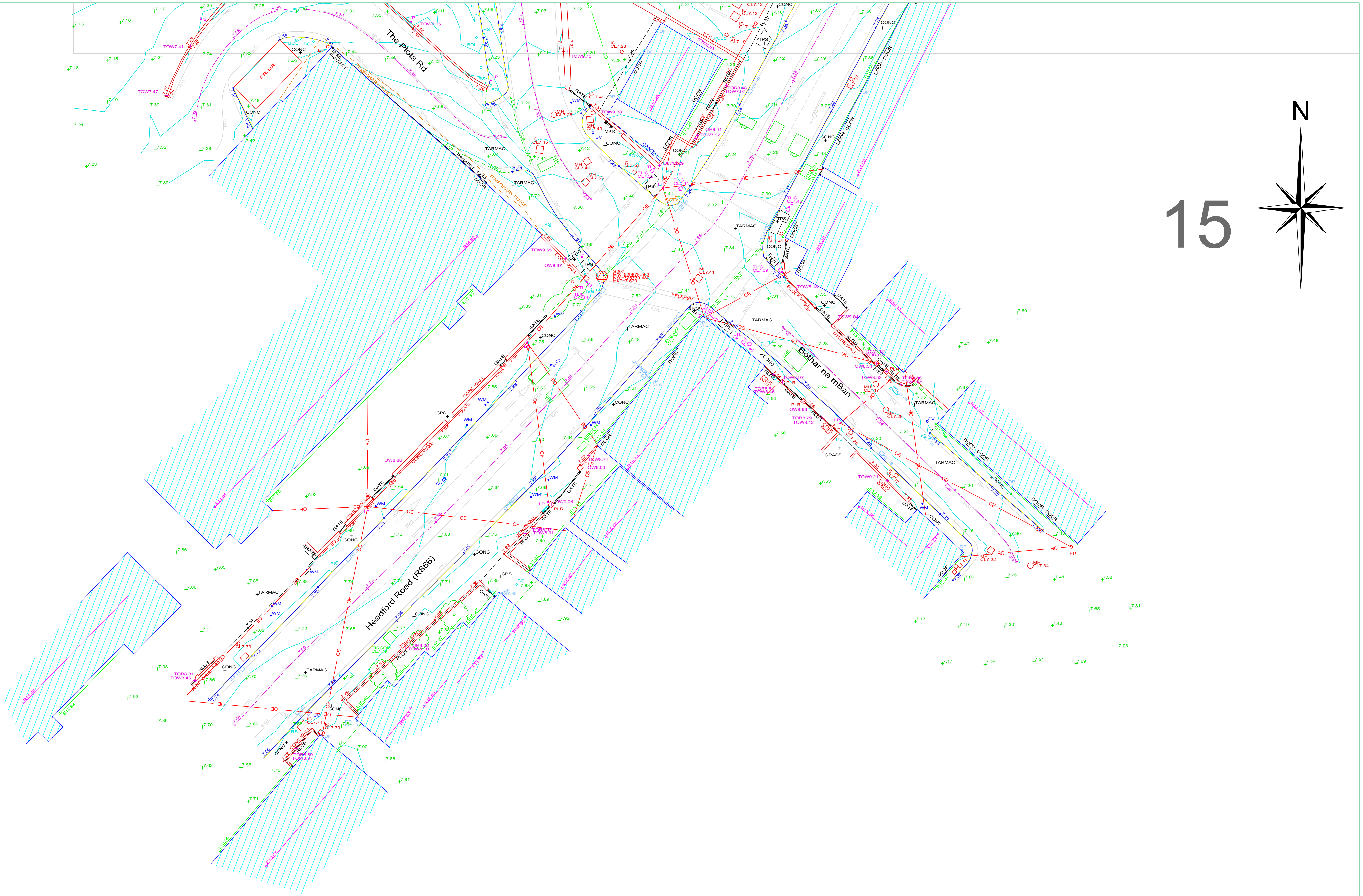
DESCRIPTION : 2D Topographical

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

PROCESSED BY : Jason Pringle

SHEET: 14 of 18

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 ☐
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 •

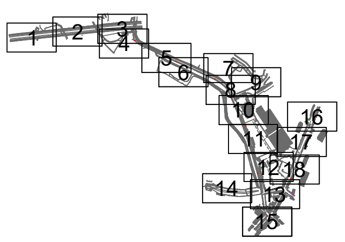
SERVICES :

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:

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00353 1 691 0156

CLIENT:

Client

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

PROJECT:

Dyke Road
Galway City

SCALE : 1/200 A1

DATE : 15/11/2023

DRG No: 5999

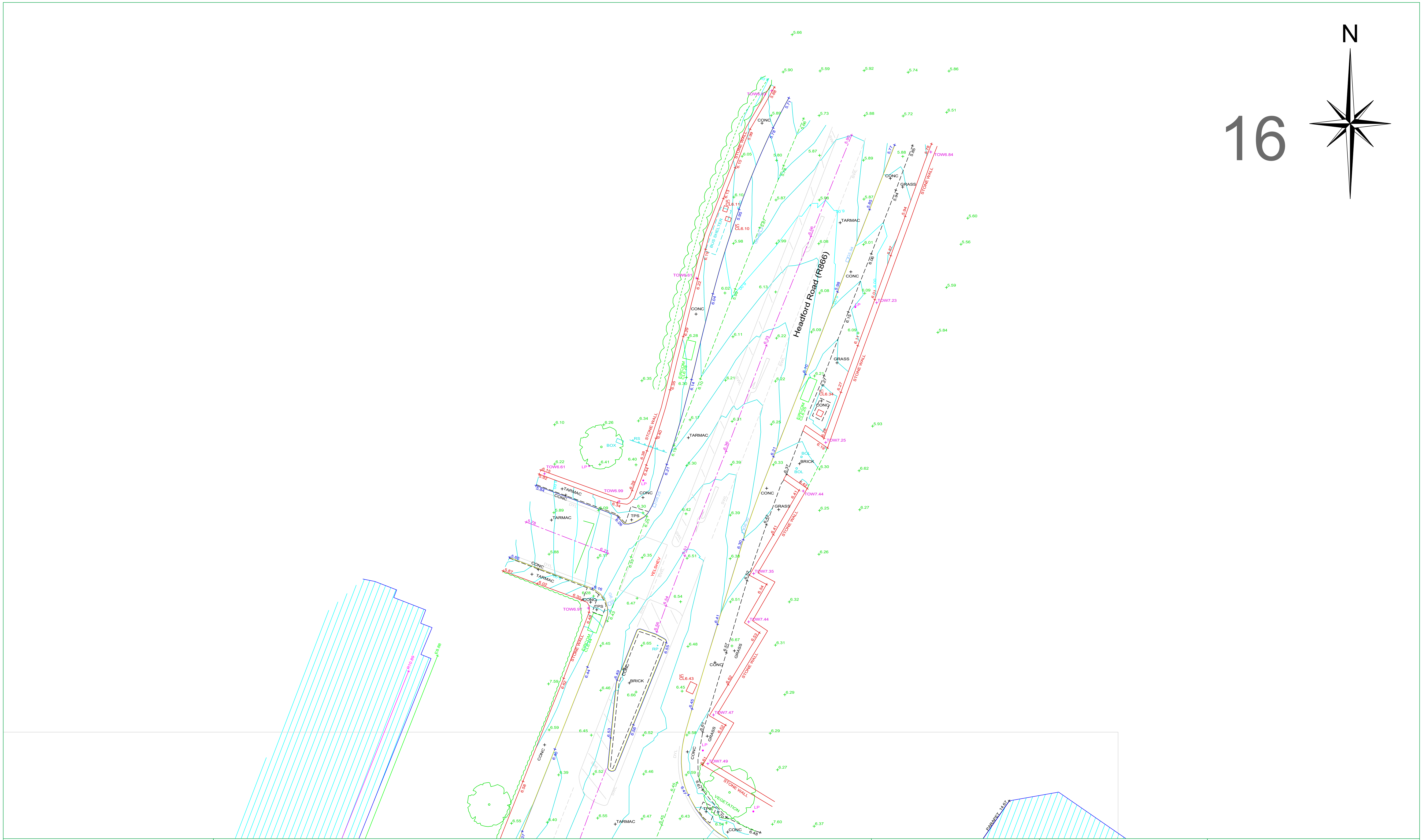
DESCRIPTION : 2D Topographical

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

SHEET: 15 of 18

PROCESSED BY : Jason Pringle

CHECKED BY : Alan Brady



APEX SURVEYS

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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 ☐
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 •

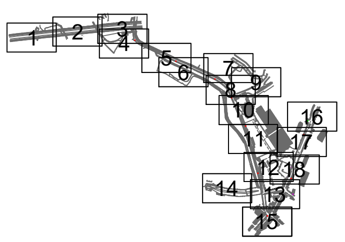
SERVICES :

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:

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CONTACT INFORMATION:

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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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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

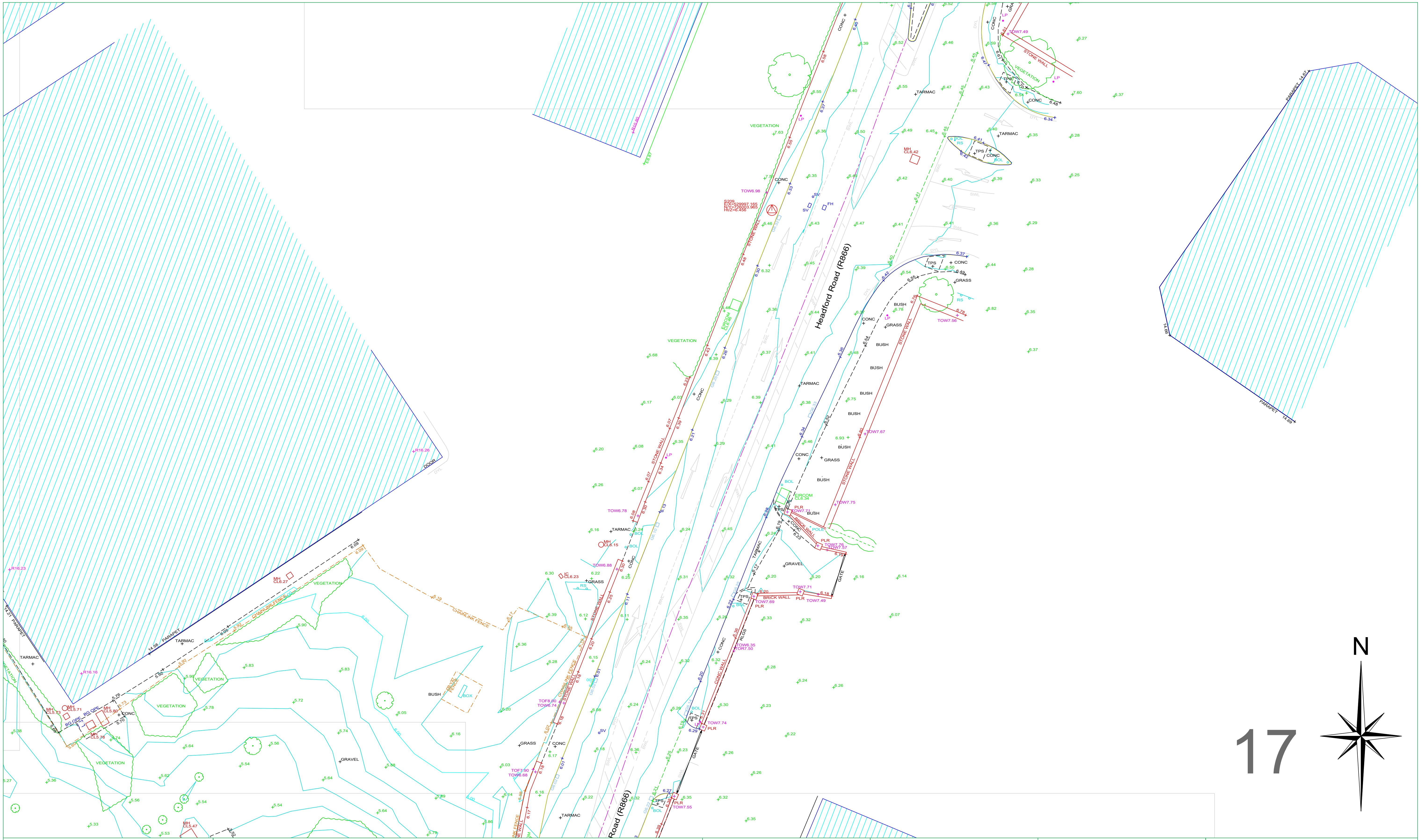
DESCRIPTION : 2D Topographical

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

SHEET: 16 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	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 ☐
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
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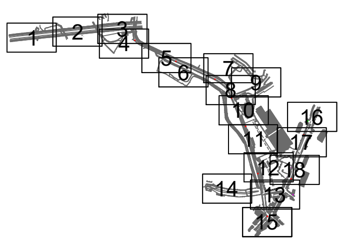
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	⊕

SHEET LAYOUT :



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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

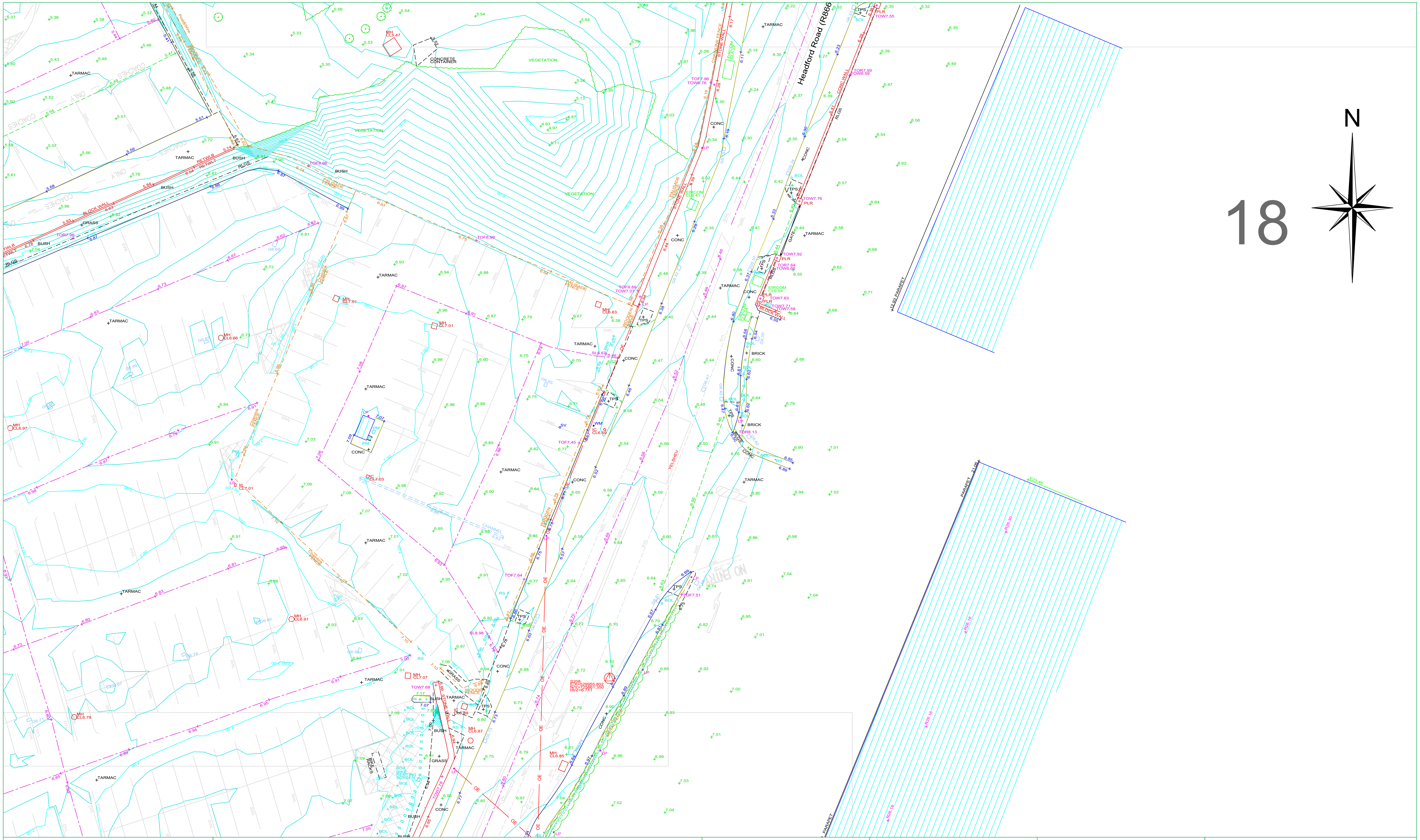
DESCRIPTION : 2D Topographical

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

PROCESSED BY : Jason Pringle

SHEET: 17 of 18

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 □
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 •

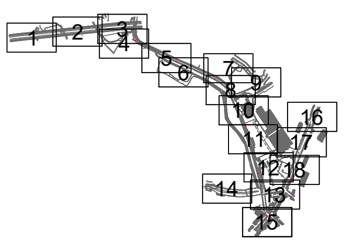
SERVICES :

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

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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:

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.

PROCESSED BY : Jason Pringle

SHEET: 18 of 18

CHECKED BY : Alan Brady

Appendix D Hydraulic Flood Modelling

Aecom

Corrib Causeway Phase 1, Dyke Road

Hydraulic Model Assessment of Proposed Development

Reference:

Final Issue | March 18 2025

Job number 304010-00

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ARUP

Document Verification

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		Signature			
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		Name	Livia Almeida	Cian Buckley	Bairbre O'Breasail
		Signature			
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			Prepared by	**Checked by**	**Approved by**
		Name	Livia Almeida	Cian Buckley	Bairbre O'Breasail
		Signature		Cian Buckley	

Issue Document Verification with Document ☑

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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.

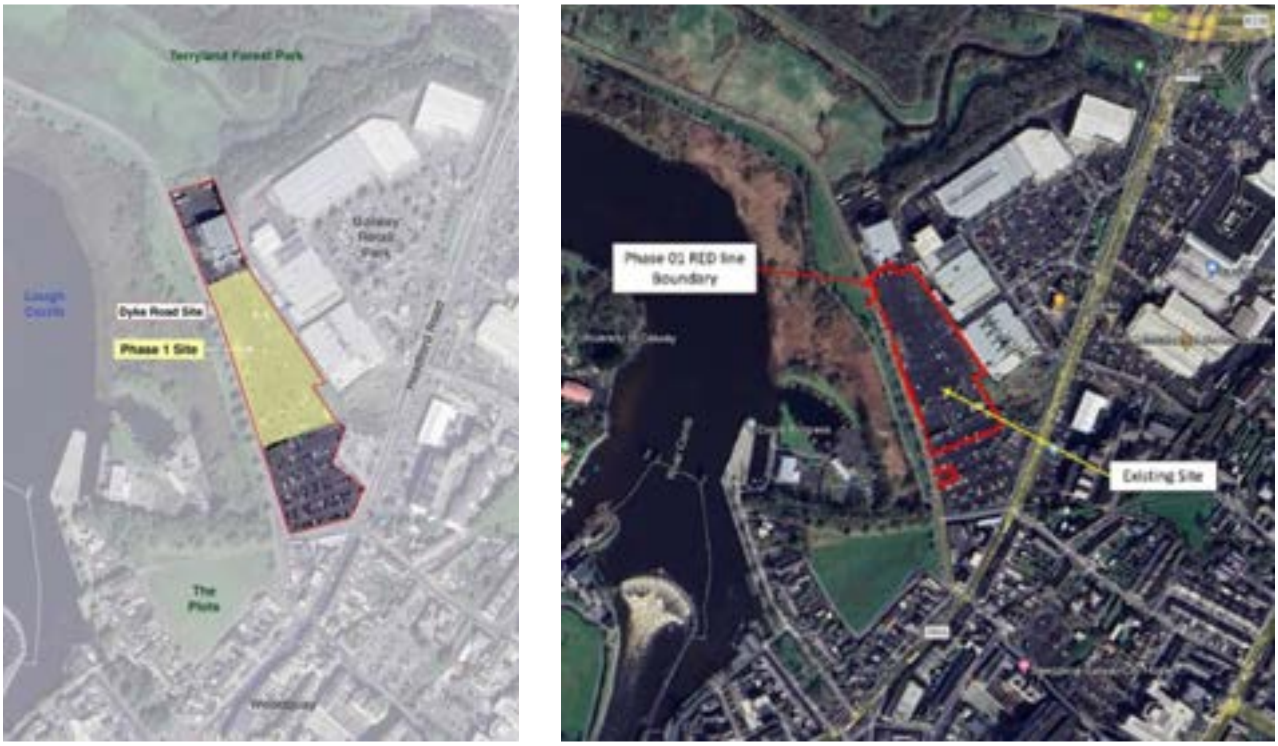


Figure 2 Phase 1, Tóchar na Coiribe Vision (MOLA Architecture 2023)

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.

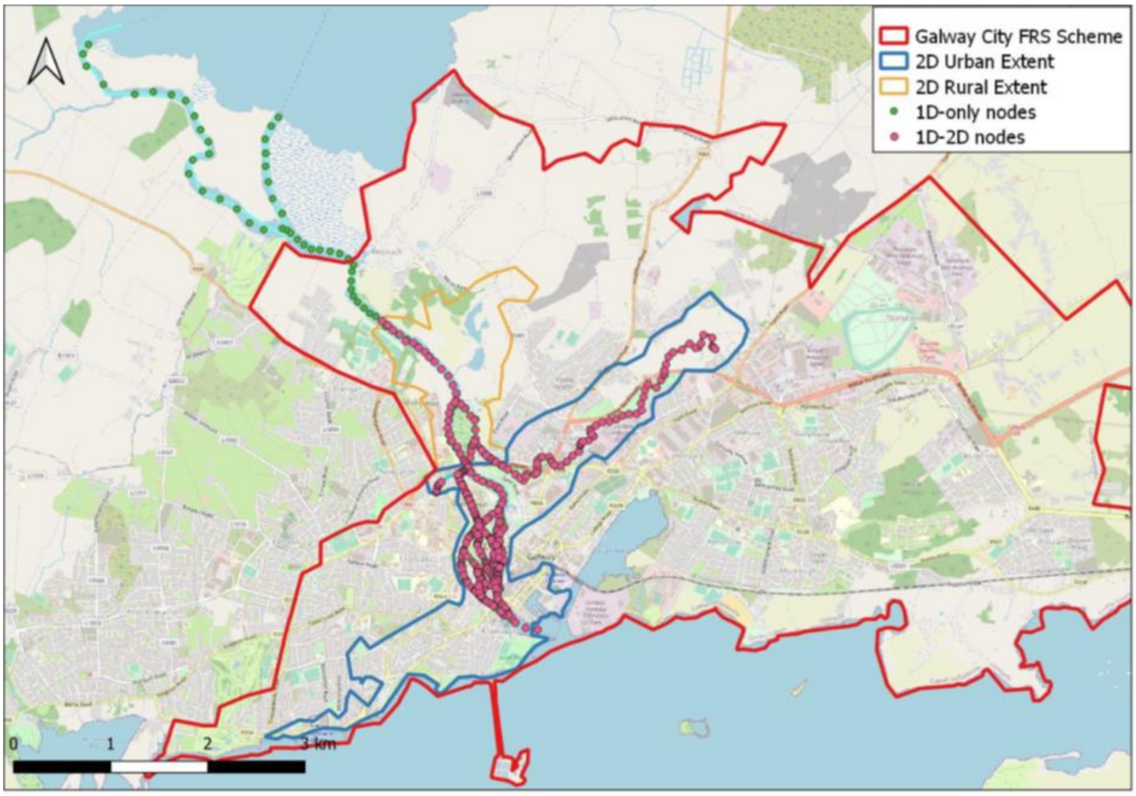


Figure 3 Fluvial/tidal model - 2D model domains (rural and urban) and 1D model cross sections (background mapping ©OpenStreetMap contributors) (Arup)

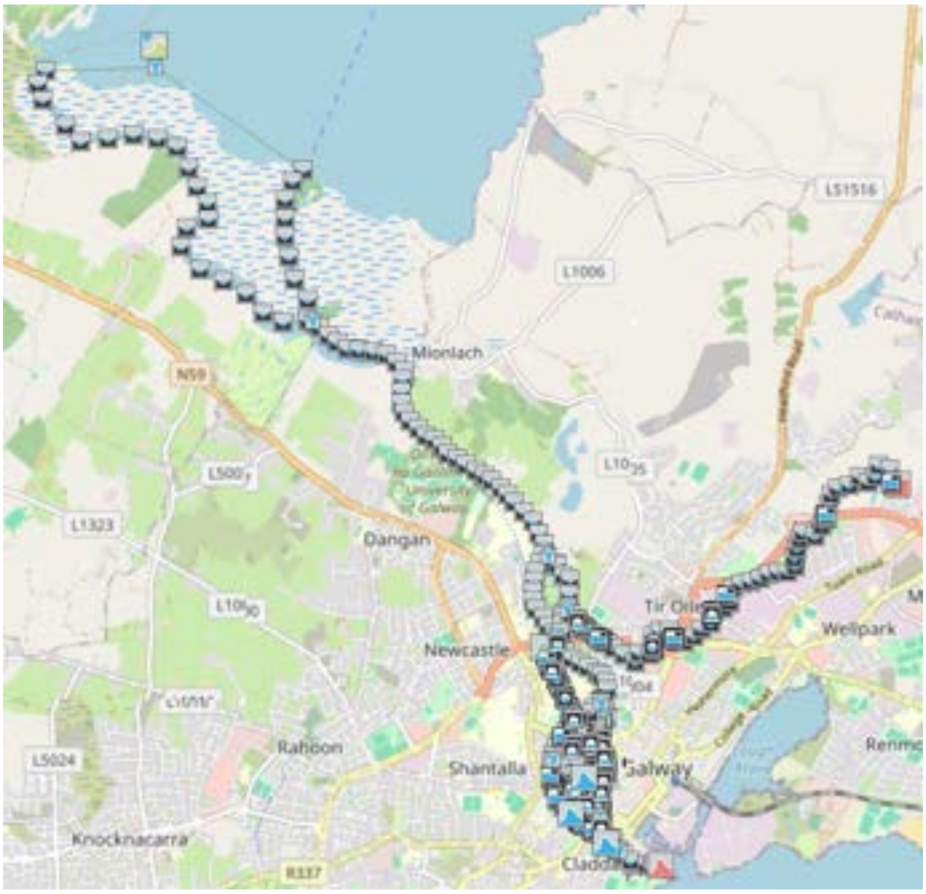


Figure 4 Fluvial/tidal model - Galway 1D baseline model (Arup)

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.

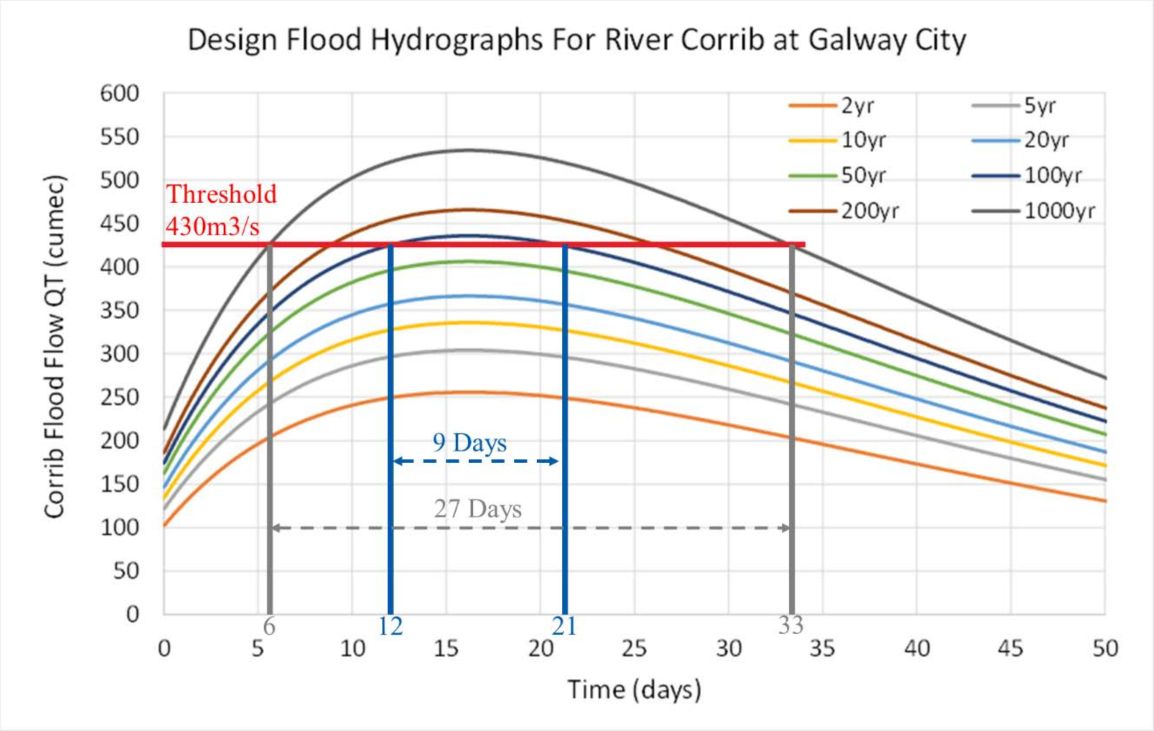


Figure 6 Return Period Design Flow Hydrographs for River Corrib at Galway City (Hydro Environmental)

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.

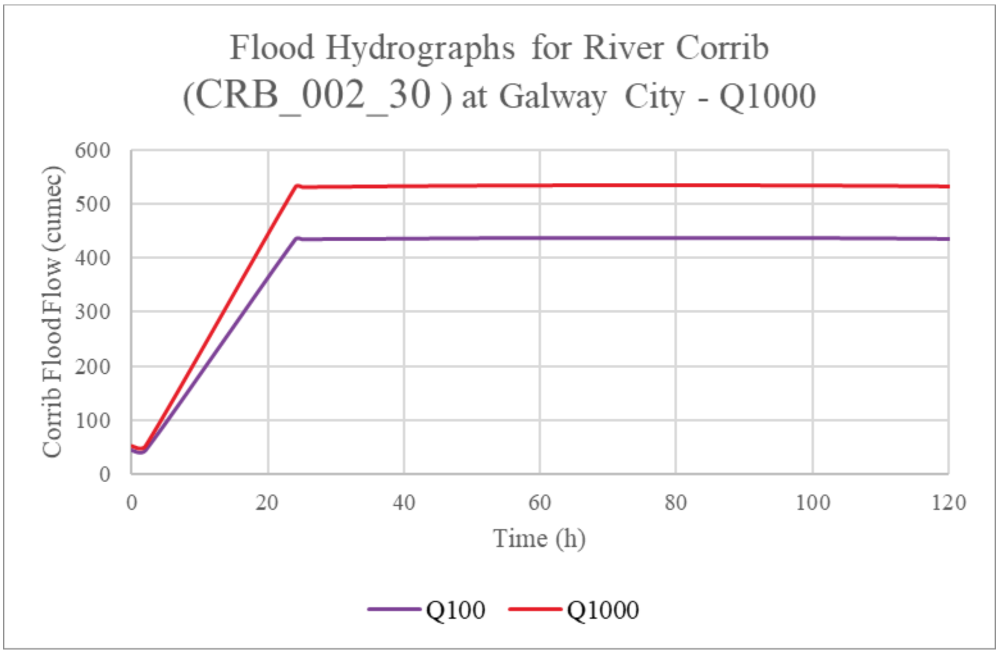


Figure 7 Flood Hydrographs for River Corrib (CRB_002_30) at Galway City - Q100 and Q1000 (Arup)

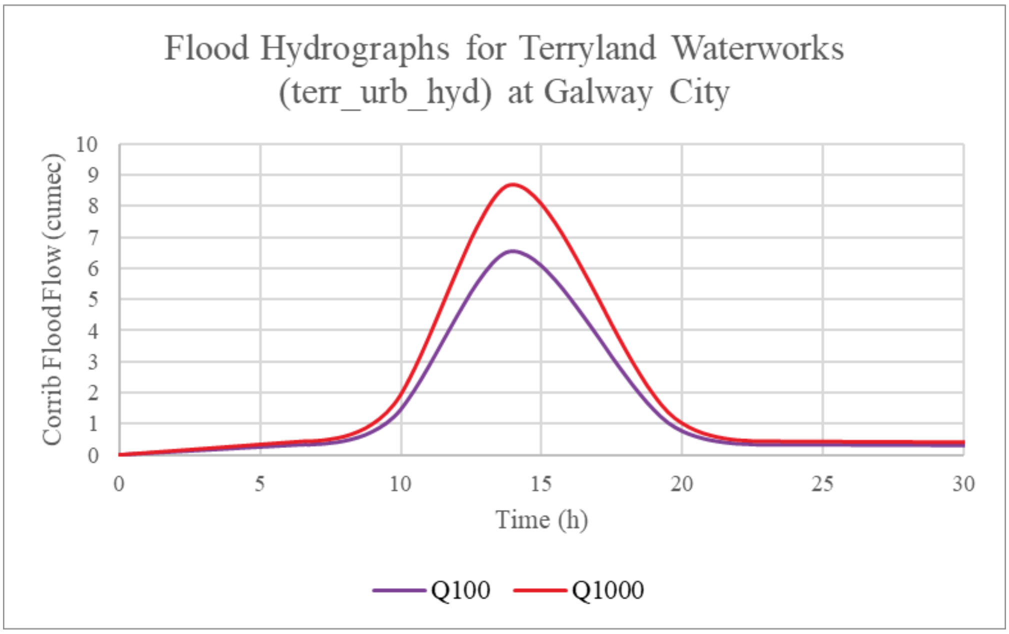


Figure 8 Flood Hydrographs for Terryland Reach (terr_urb_hyd) at Galway City - Q100 and Q1000 (Arup)

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.

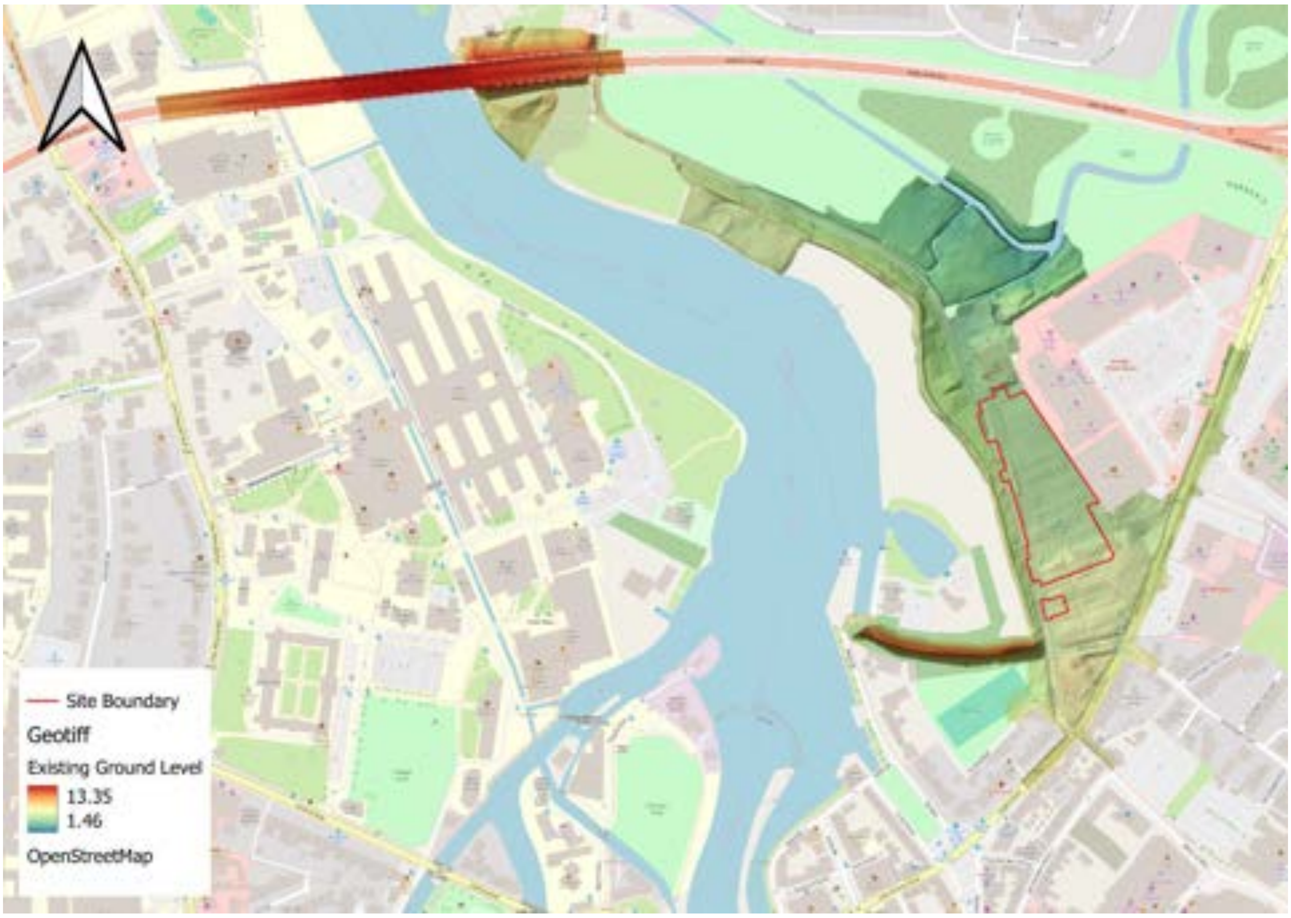


Figure 14 Aecom Surface – Scenario 1

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.

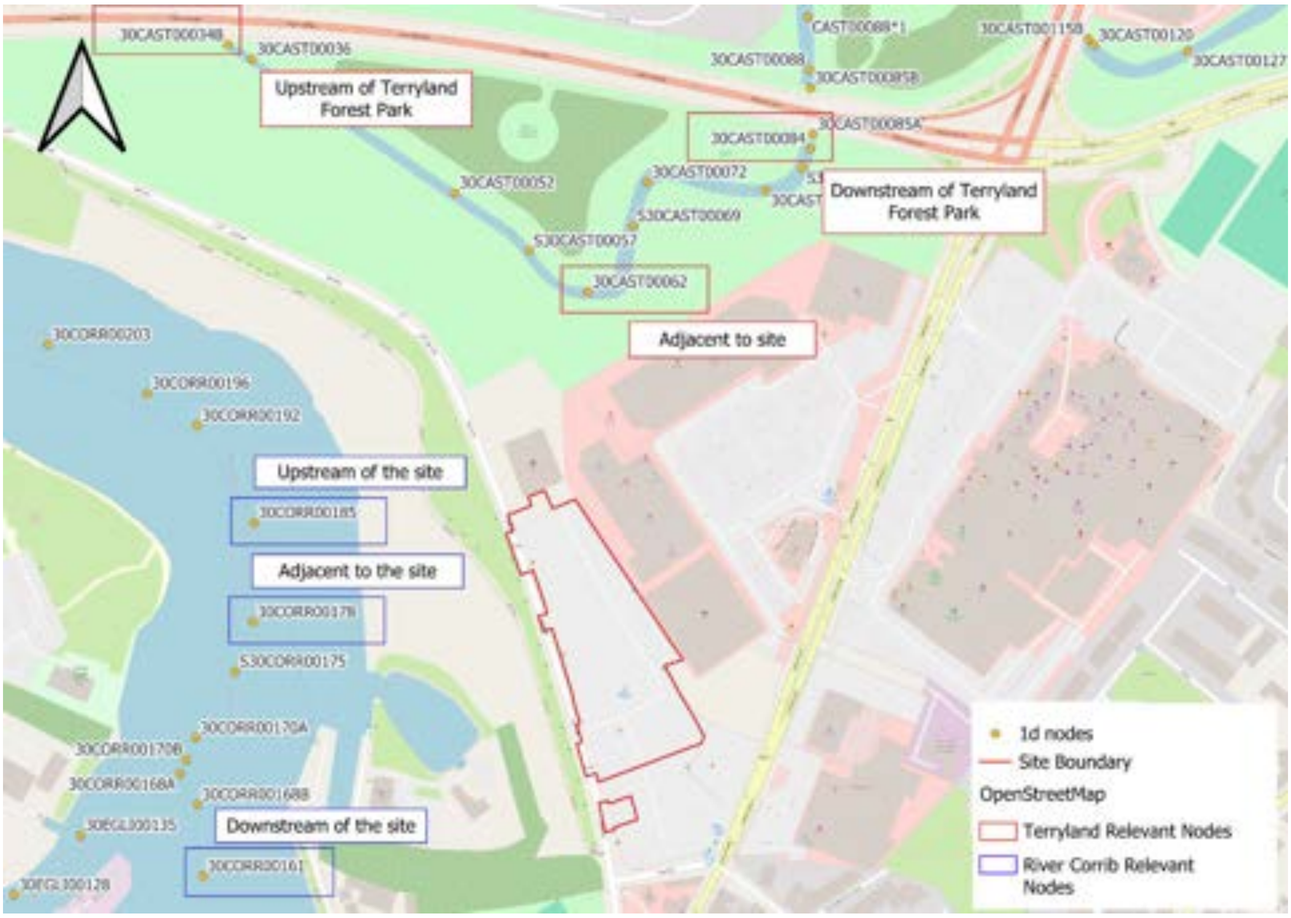


Figure 18 1d nodes in the vicinity of site location

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.

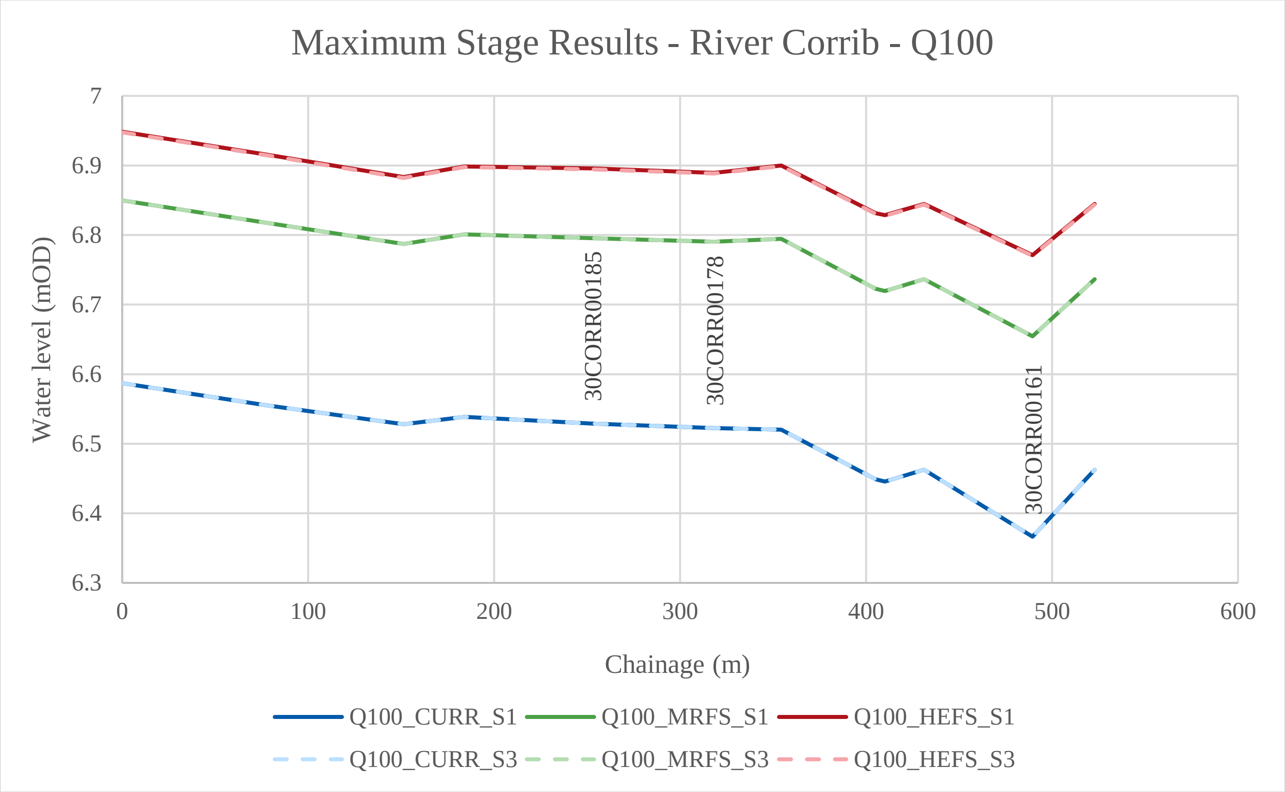


Figure 19 Maximum Stage Results on Corrib River - Q100

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.

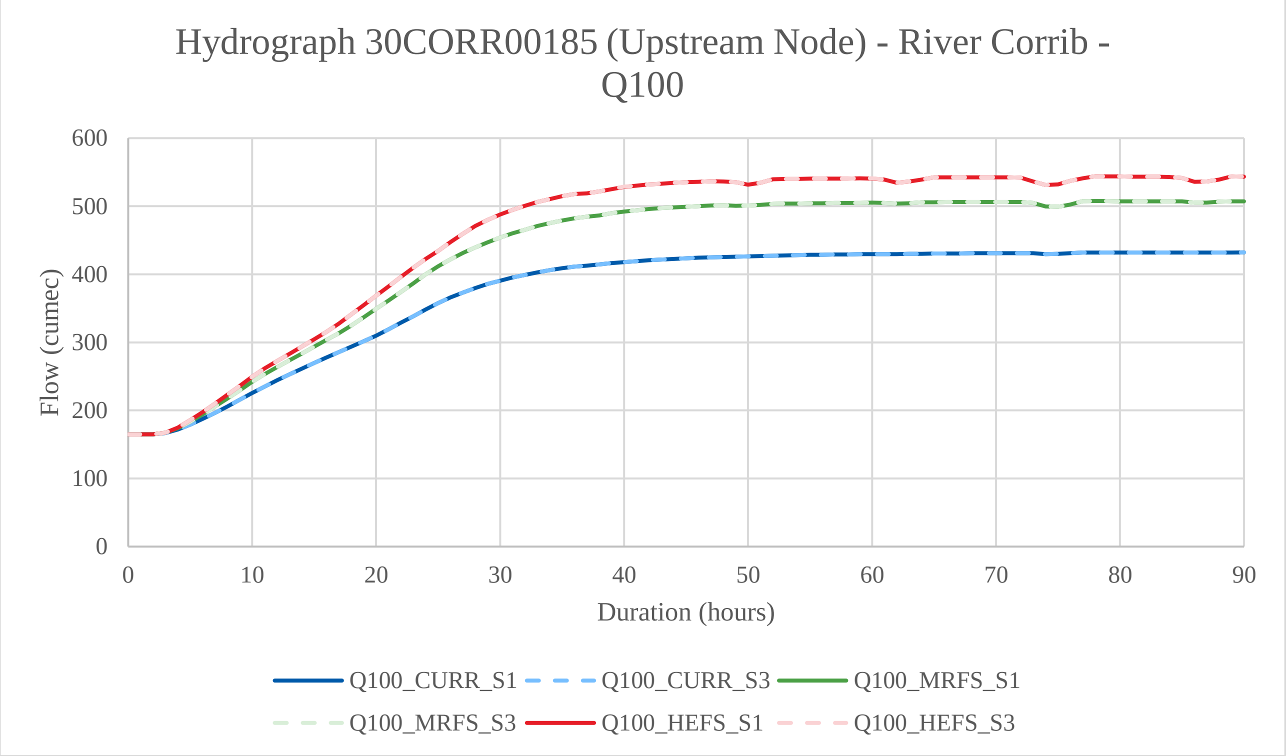


Figure 20 Hydrograph of node upstream of the site on River Corrib – Q100

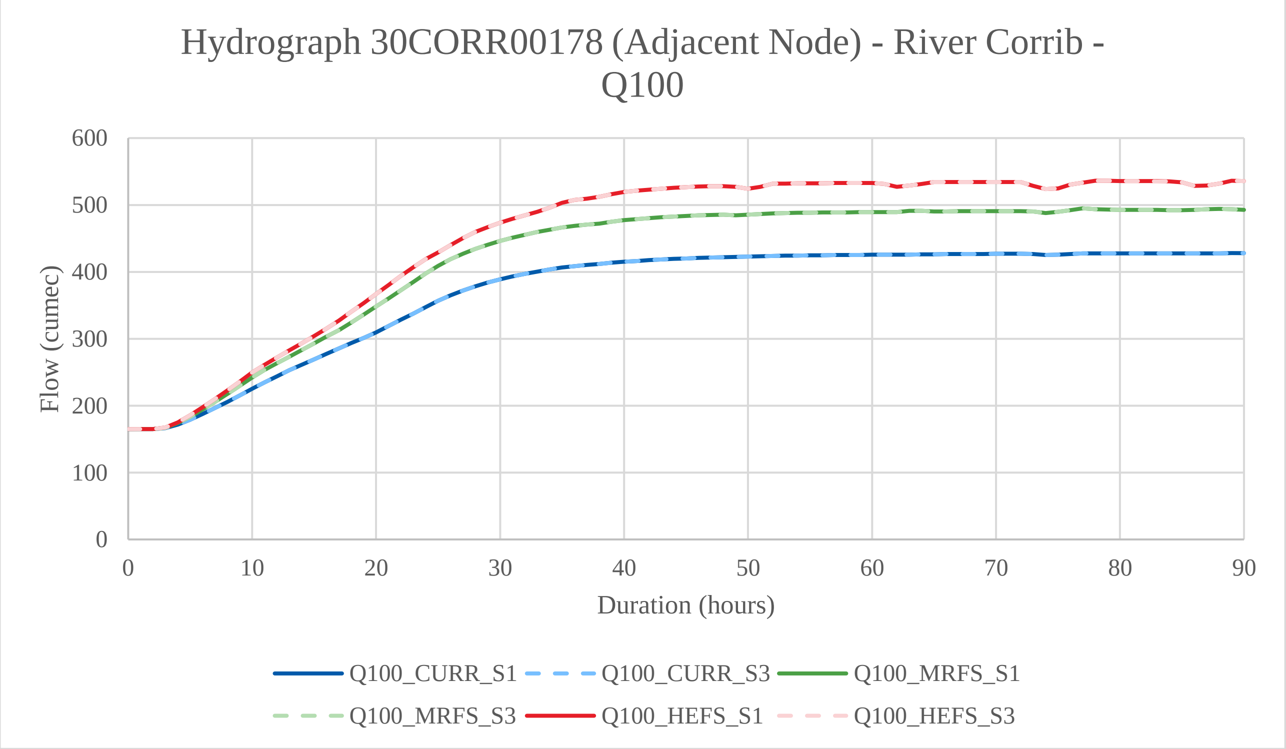


Figure 21 Hydrograph of node adjacent to the site on River Corrib – Q100

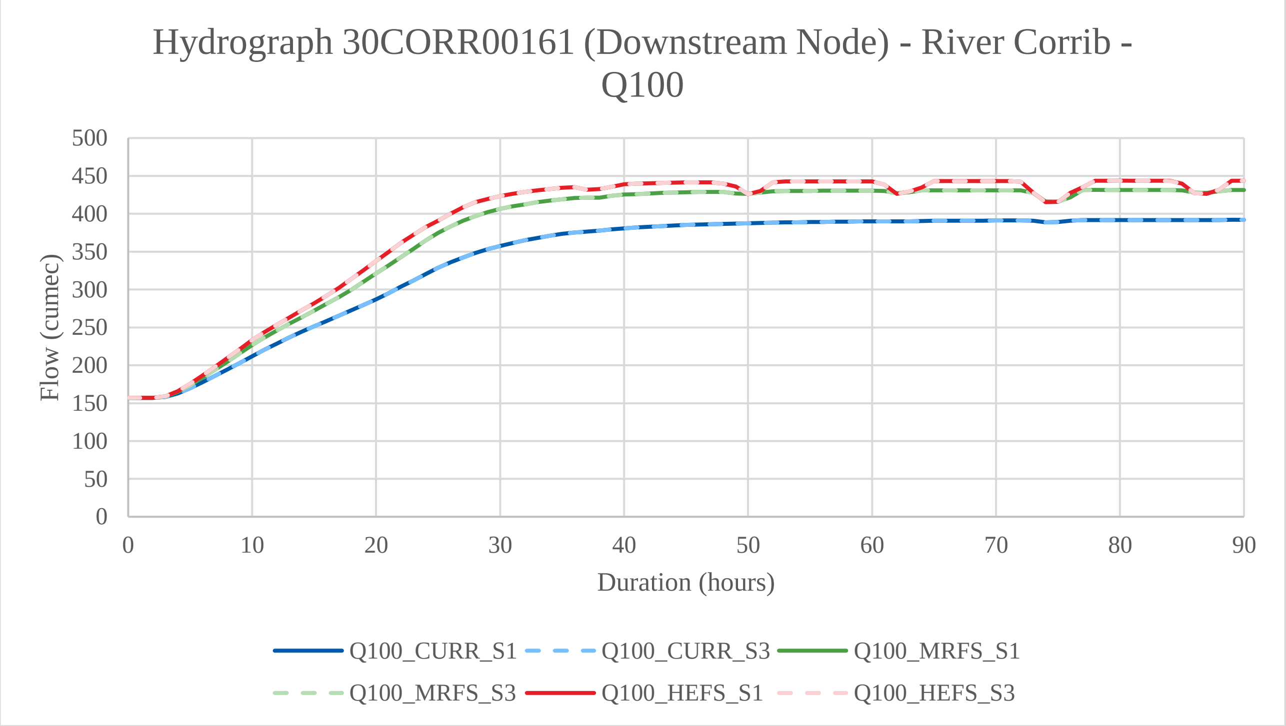


Figure 22 Hydrograph of node downstream of the site on River Corrib – Q100

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.

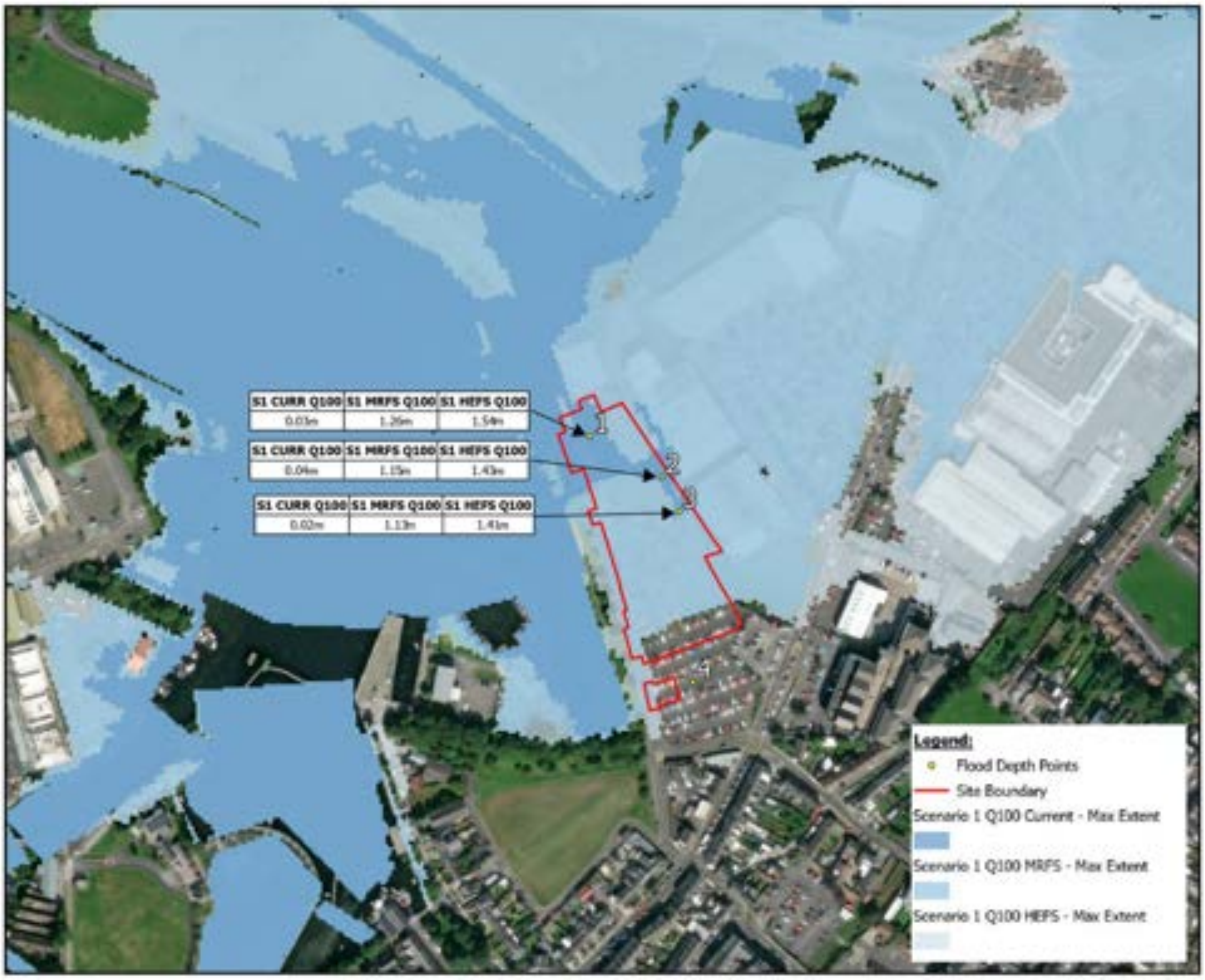


Figure 23 Maximum flood extents for the Q100 current and climate change events for Scenario 1

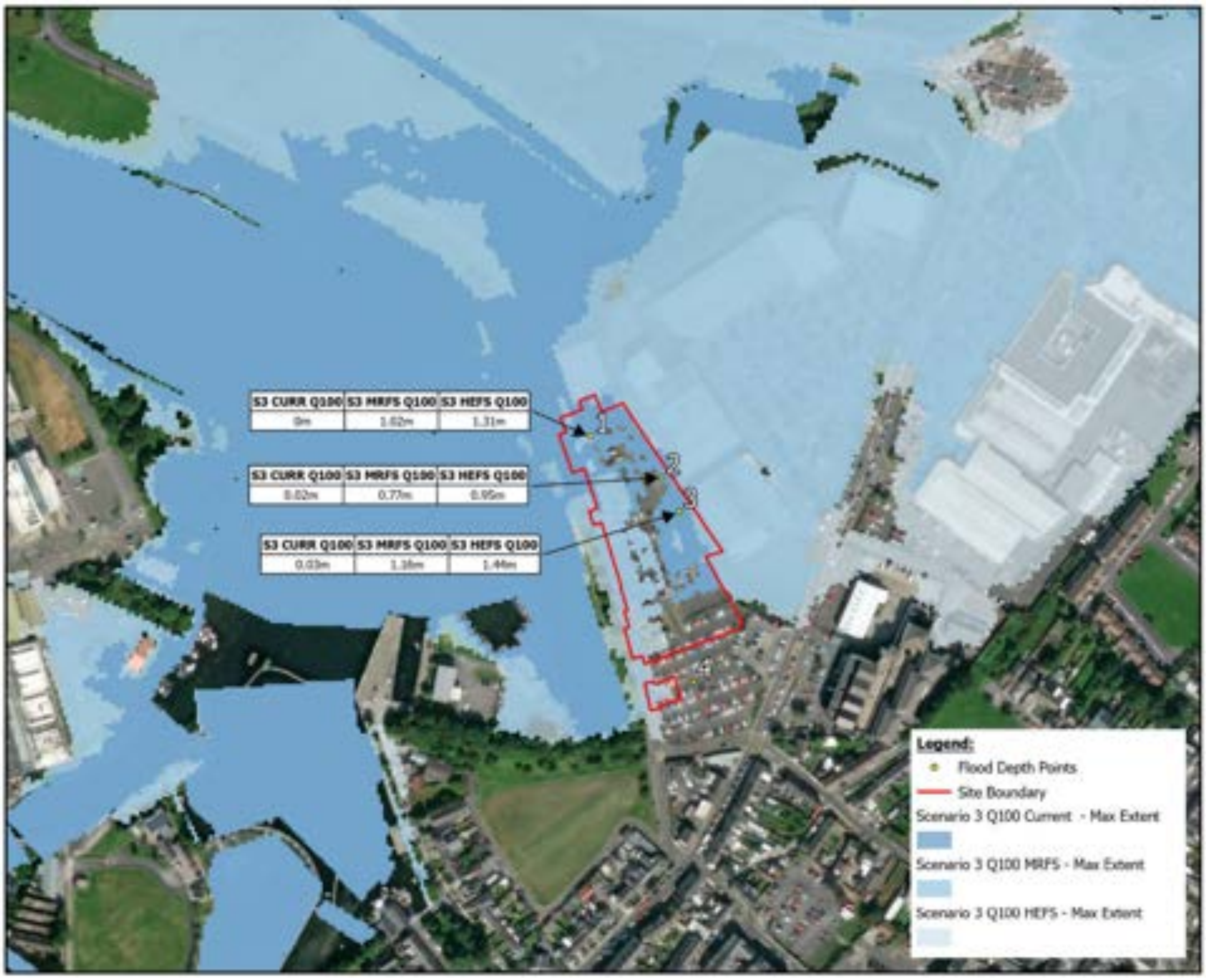


Figure 24 Maximum flood extents for the Q100 current and climate change events for Scenario 3

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.

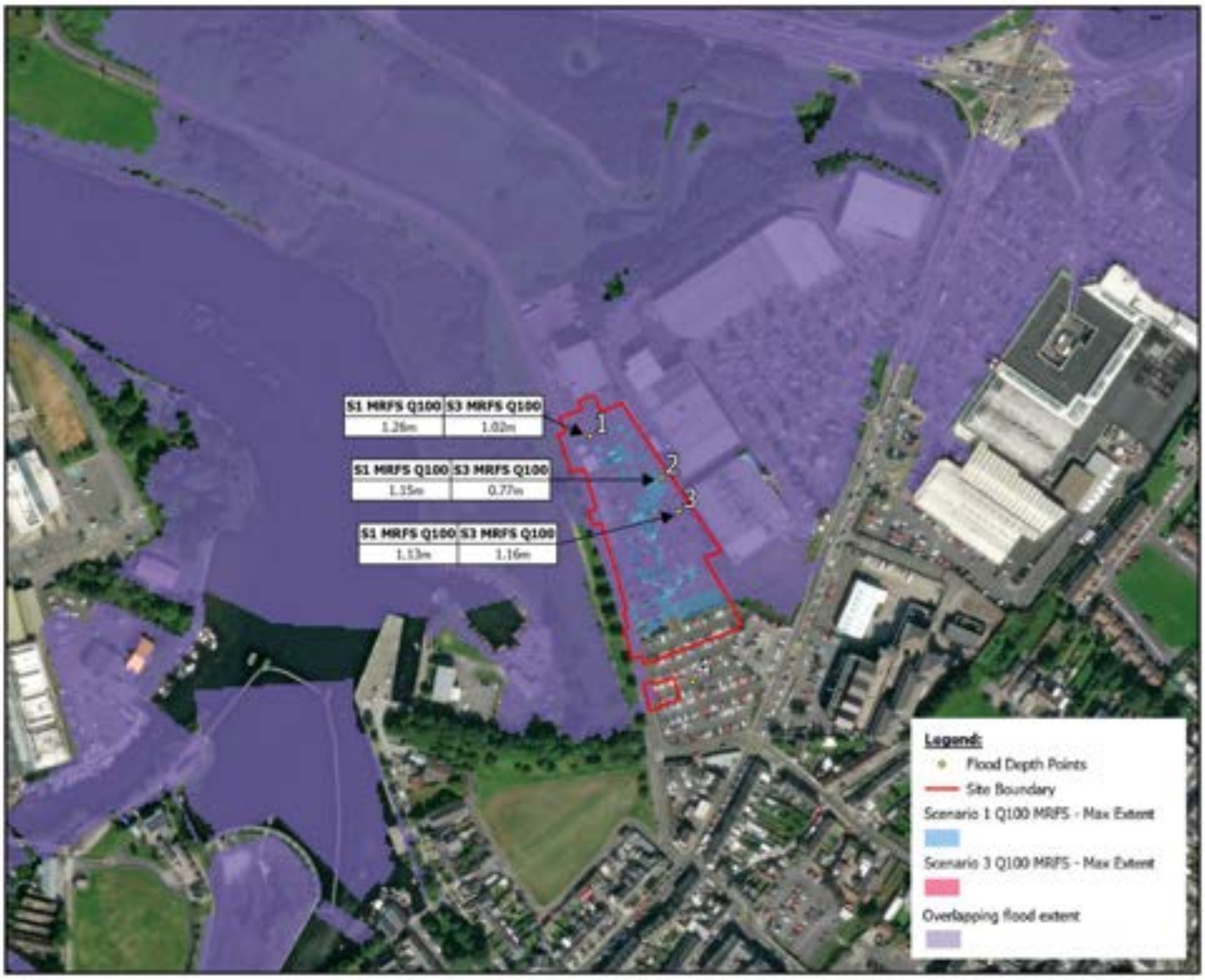


Figure 25 Maximum flood extents for the Q100 MRFS for Scenarios 1 and 3

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.

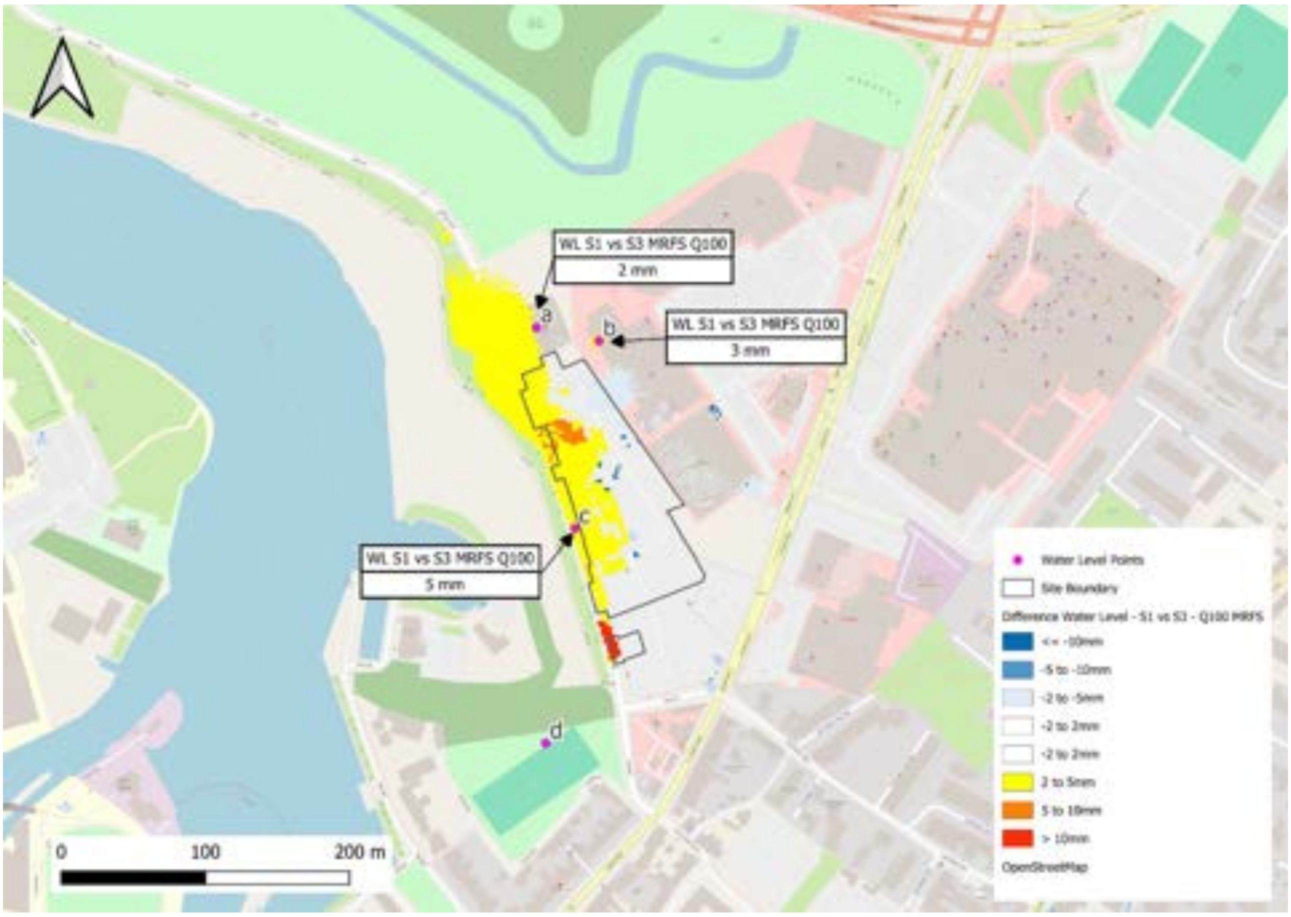


Figure 26 Difference in water levels between Scenario 1 and Scenario 3 – Q100 MRFS

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.

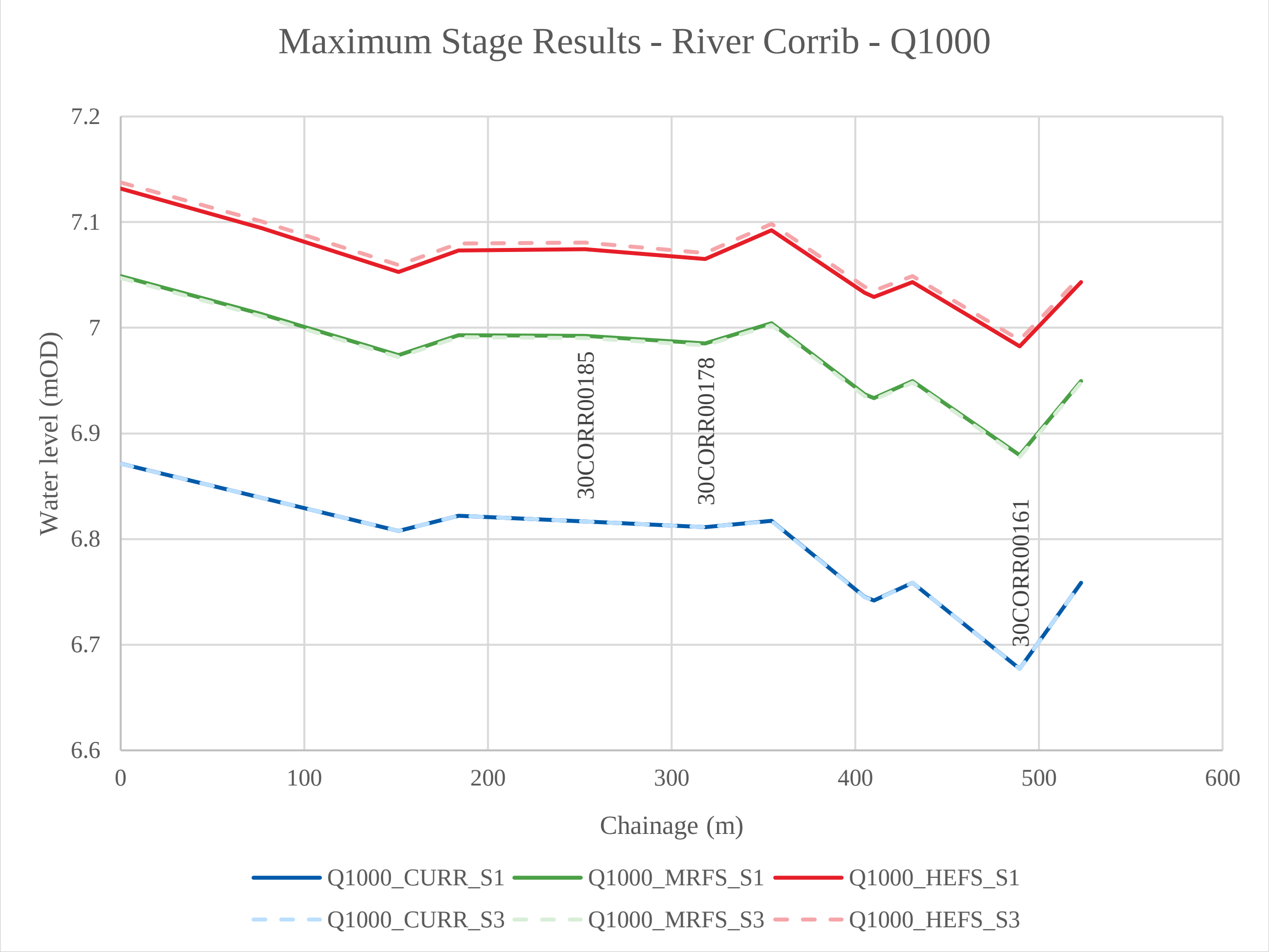


Figure 27 Maximum Stage Results on Corrib River - Q1000

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.

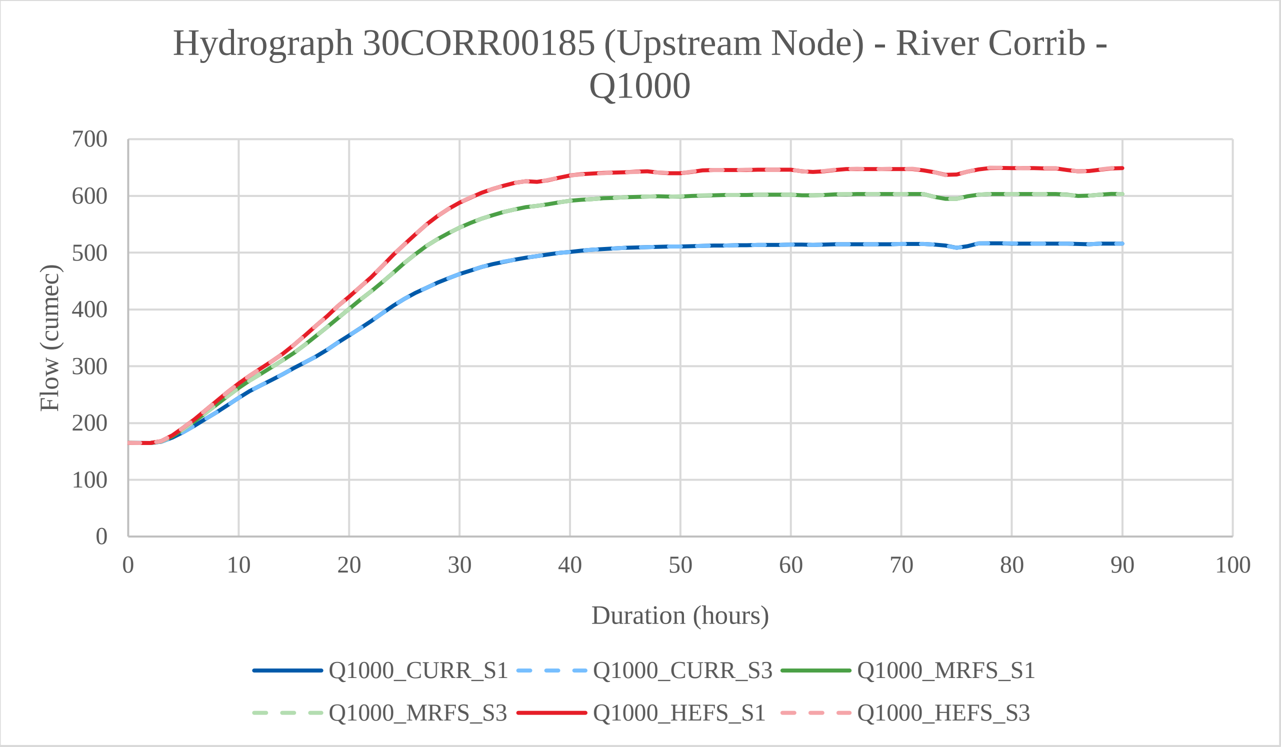


Figure 28 Hydrograph of node upstream of the site on River Corrib – Q1000

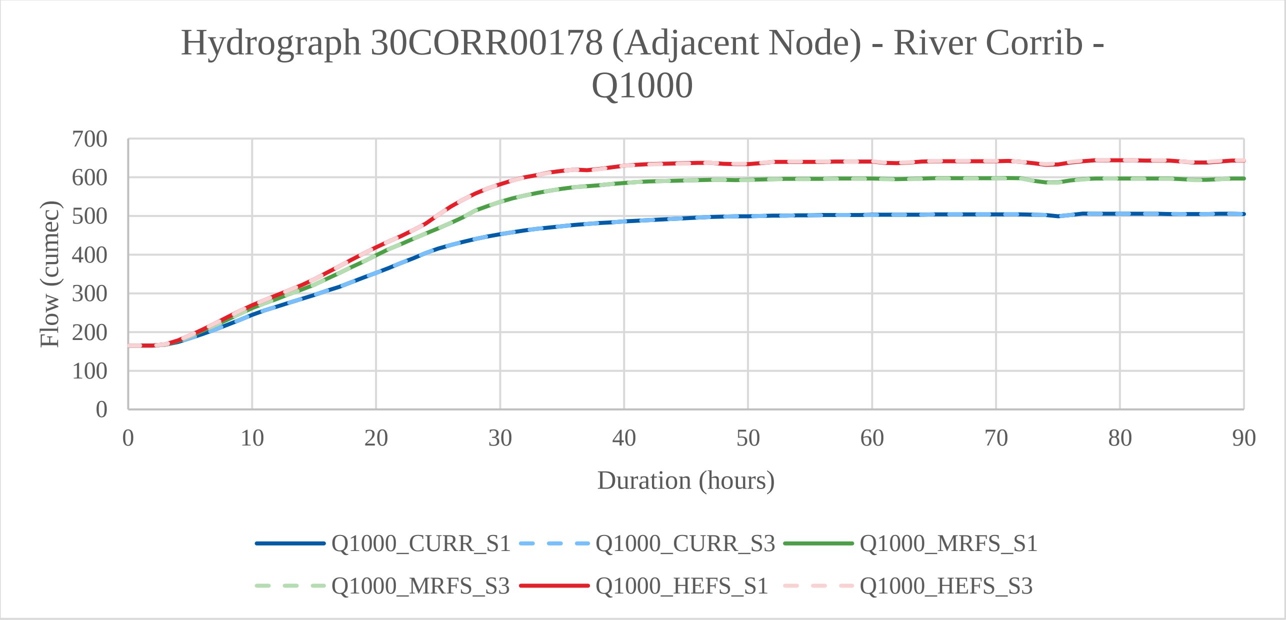


Figure 29 Hydrograph of node adjacent to the site on River Corrib – Q1000

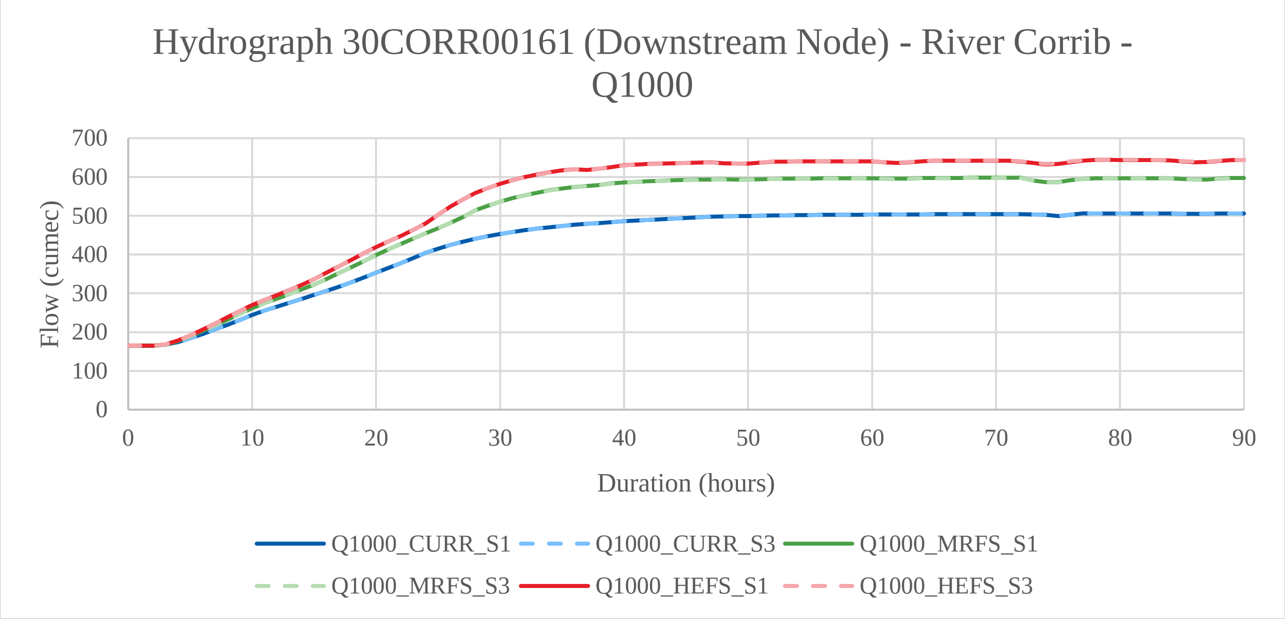


Figure 30 Hydrograph of node downstream of the site on River Corrib – Q1000

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.

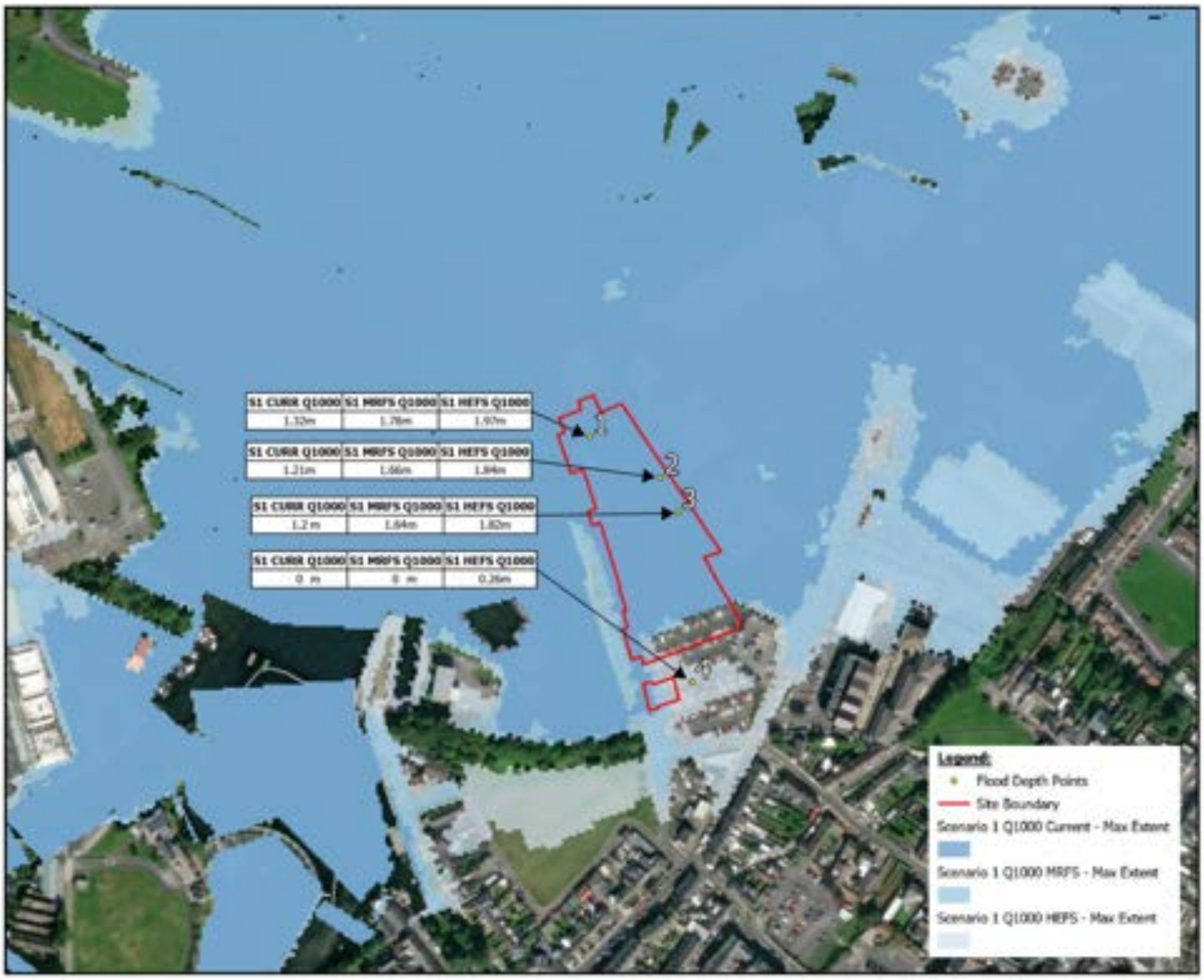


Figure 31 Maximum flood extents for the Q1000 current and climate change events for Scenario 1

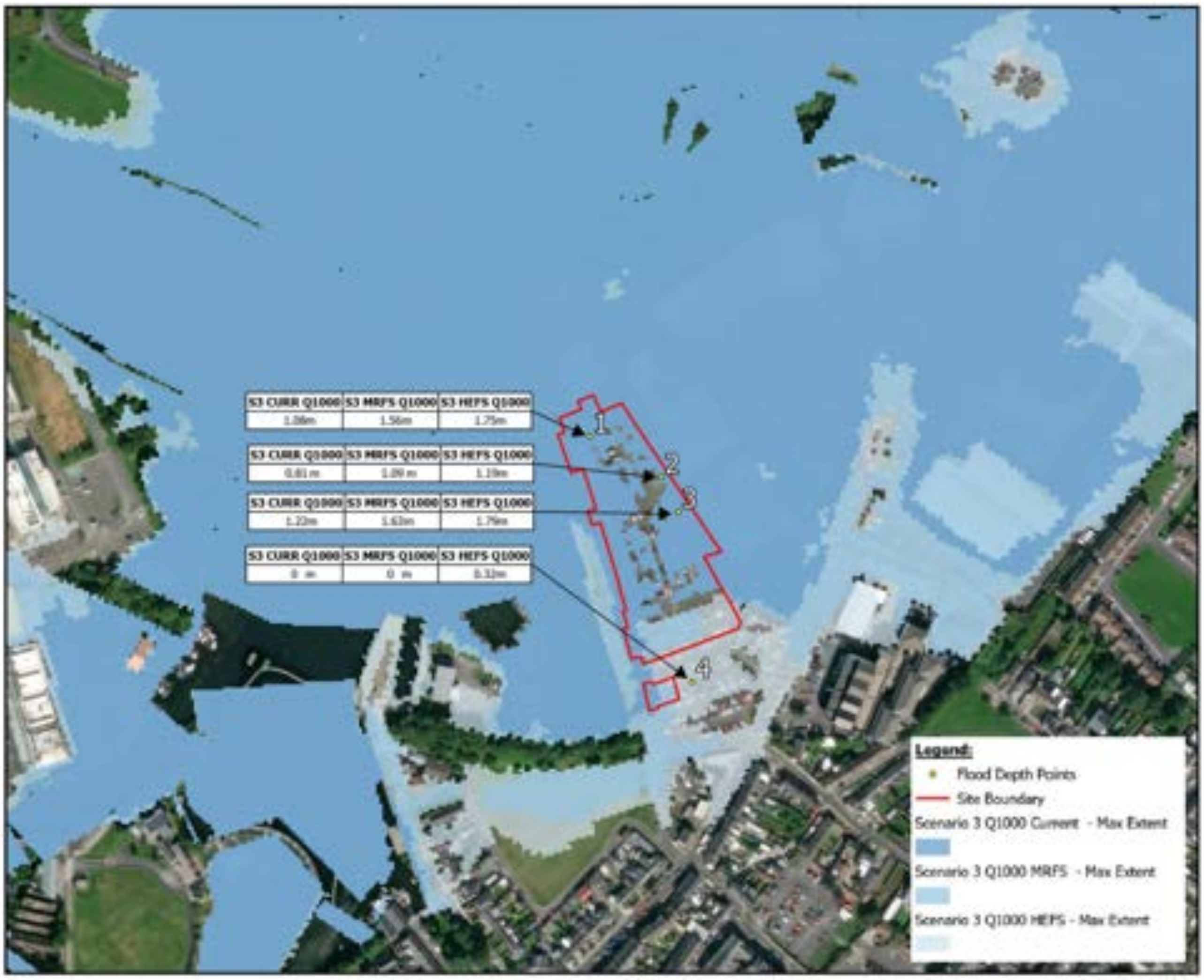


Figure 32 Maximum flood extents for the Q1000 current and climate change events for Scenario 3

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.

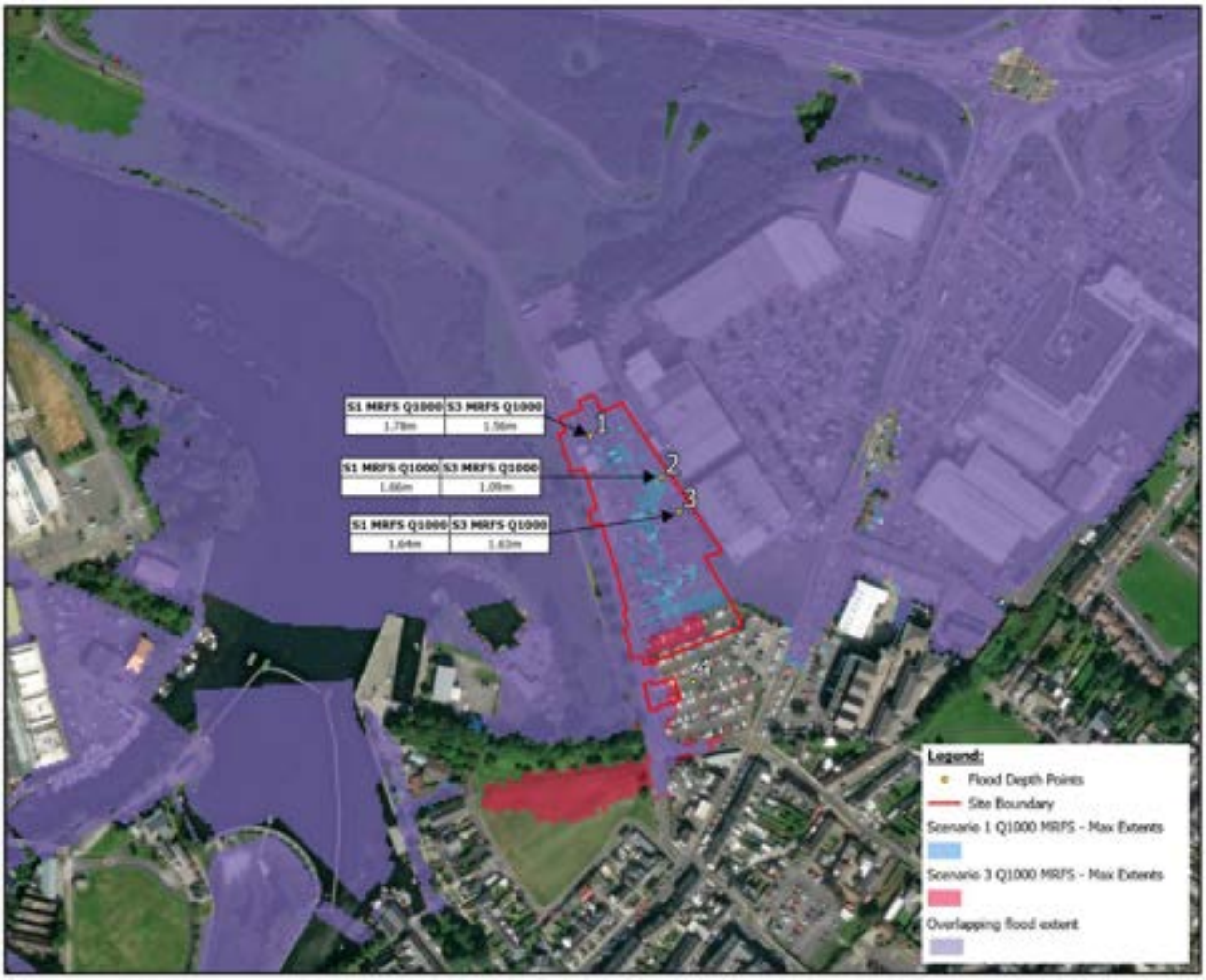


Figure 33 Maximum flood extents for the Q1000 MRFS for Scenarios 1 and 3

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.

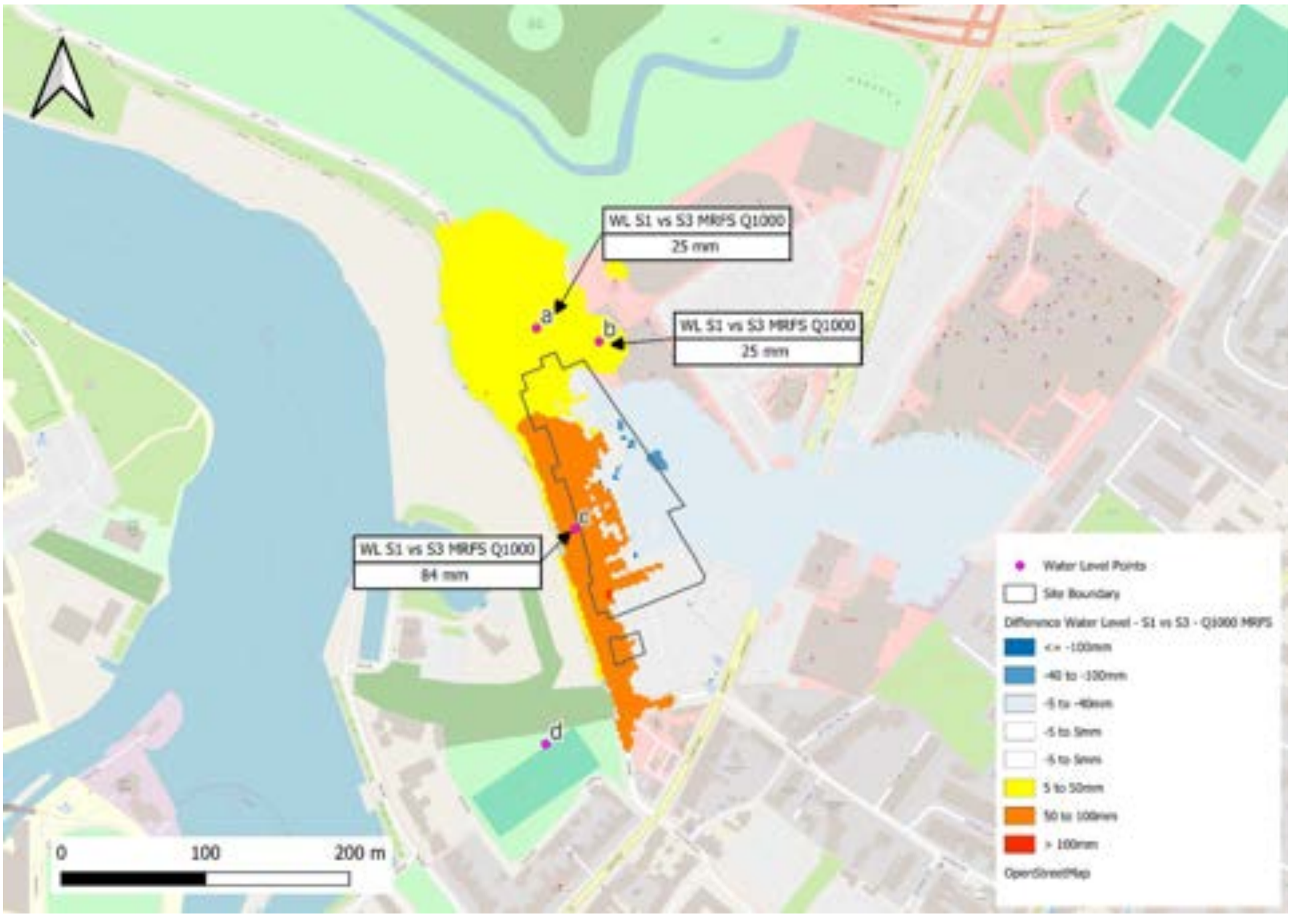


Figure 34 Difference in maximum water levels between Scenario 1 and Scenario 3 – Q1000 MRFS

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.

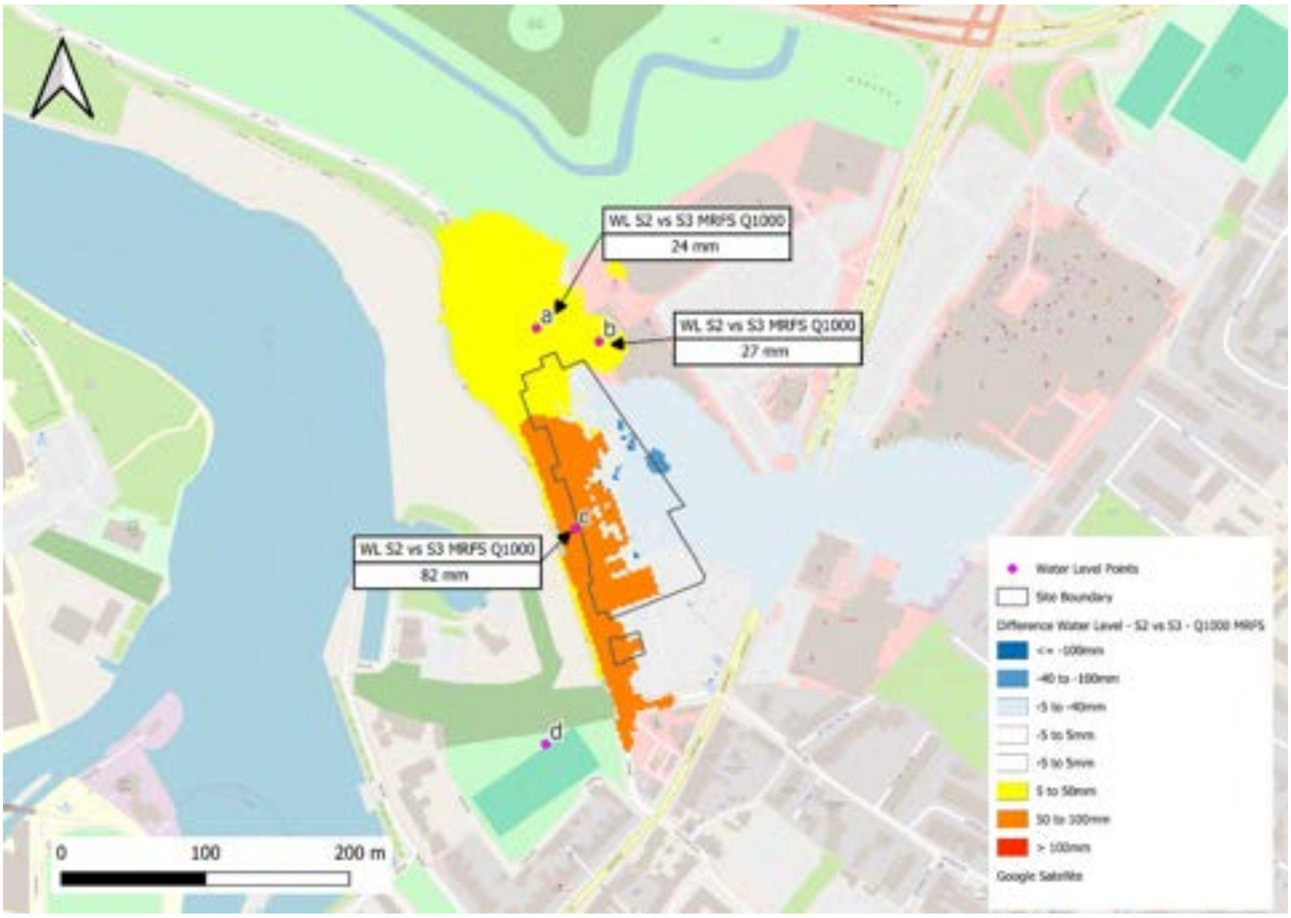


Figure 36 Difference in water levels between Scenario 2 and Scenario 3 – Q1000 MRFS

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.

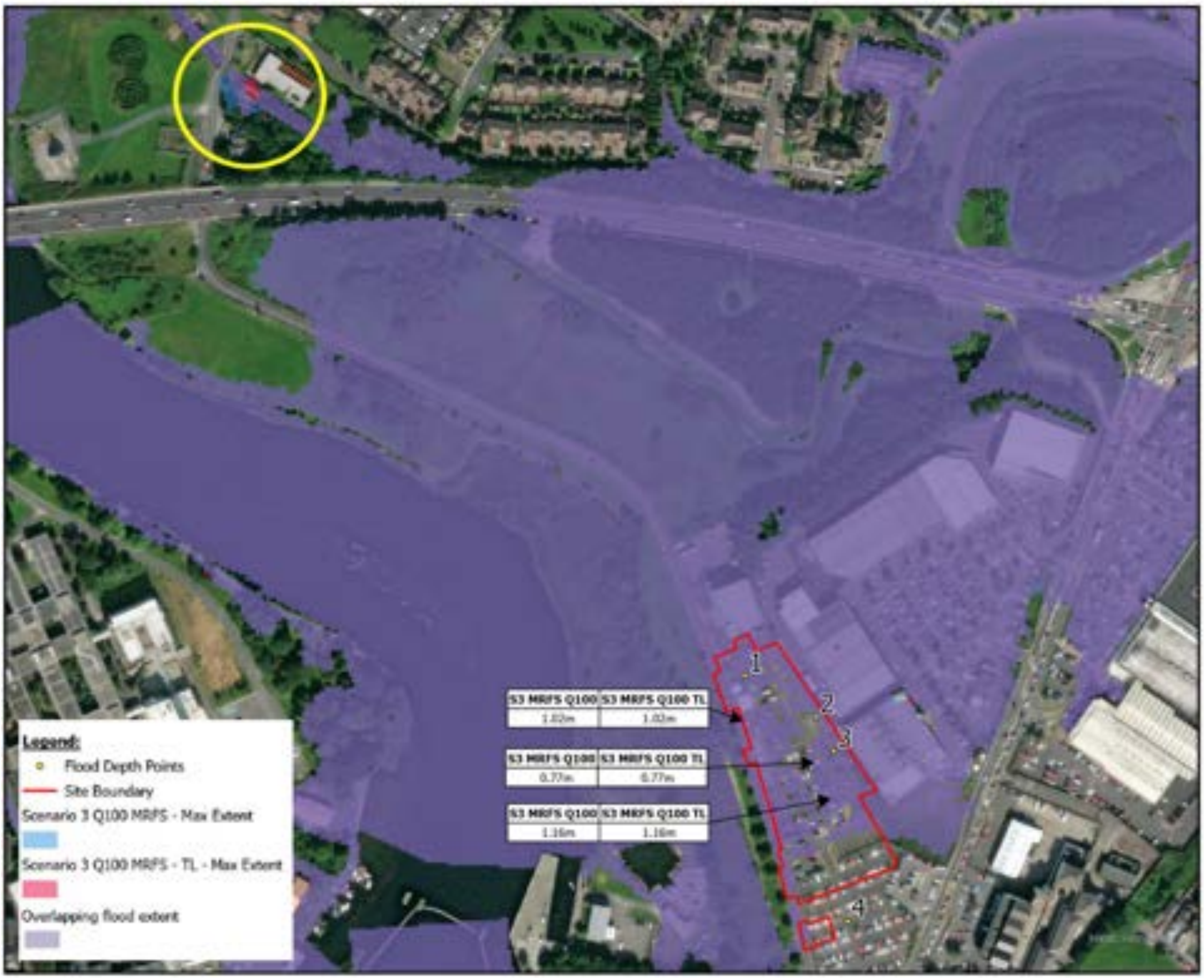


Figure 37 Maximum flood extents for the Q100 MRFS for Scenario 3 – Terryland Analysis

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.

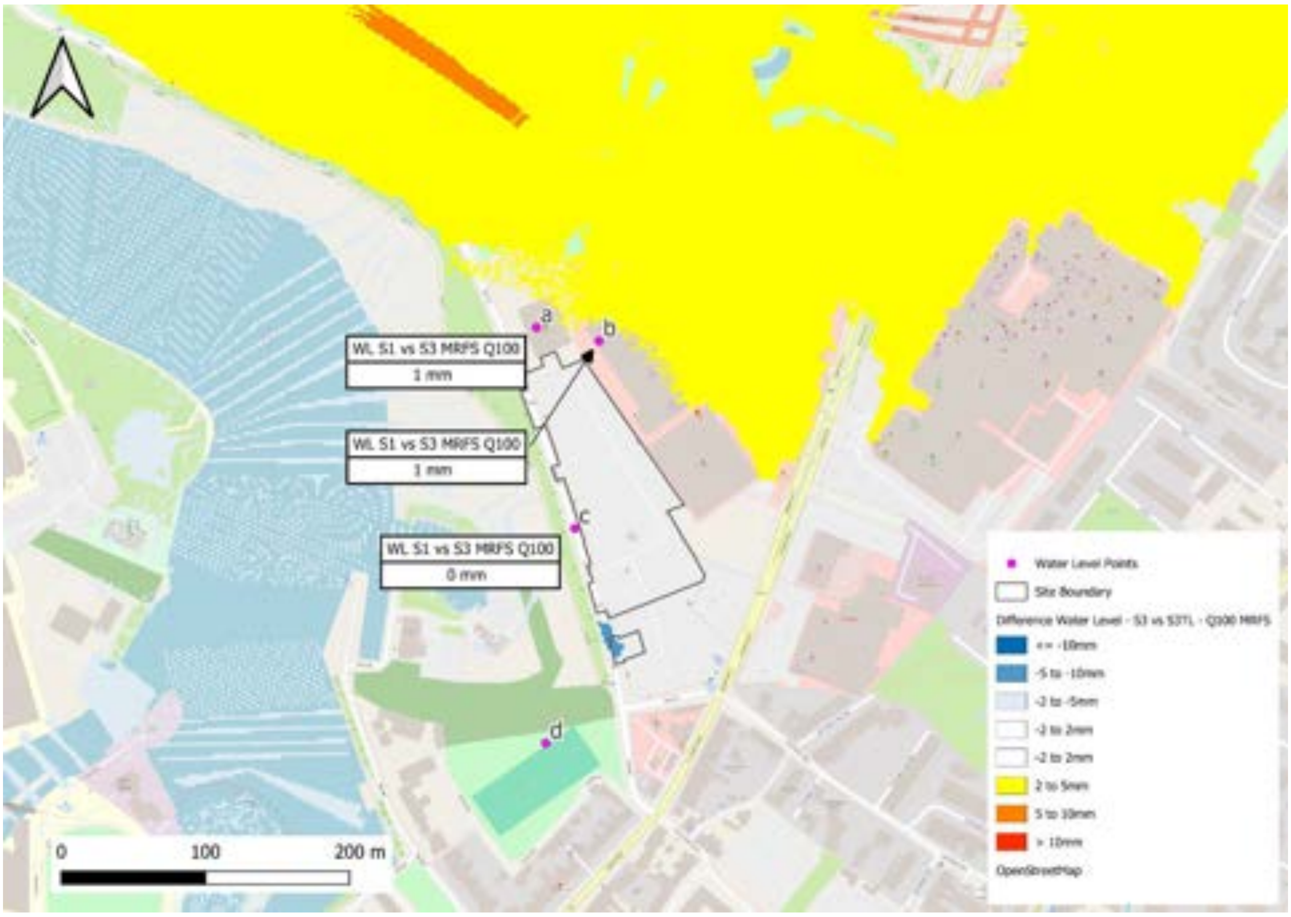


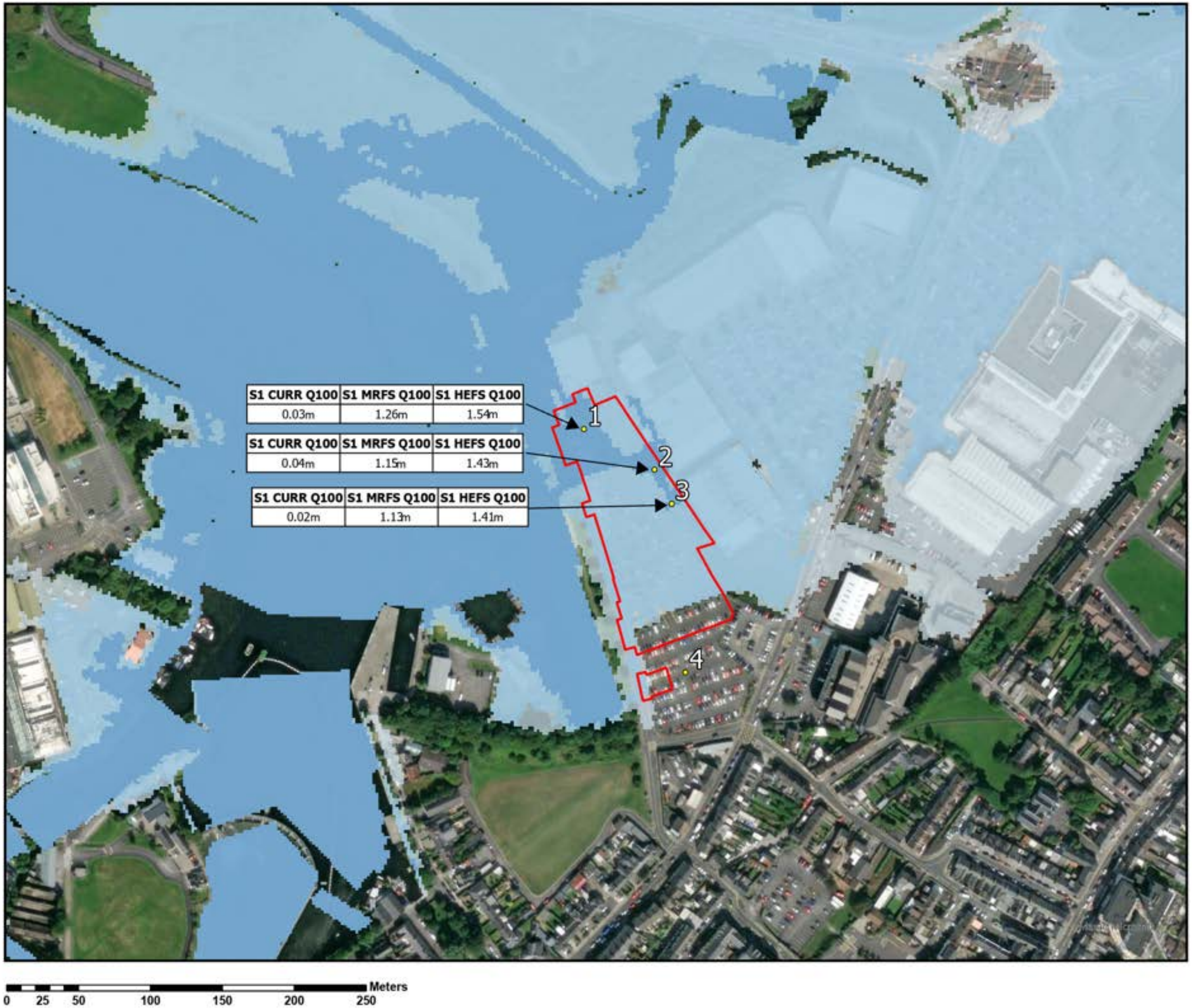
Figure 38 Difference in water levels between Scenario 3 and Scenario 3 Terryland sensitivity – Q100 MRFS

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

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

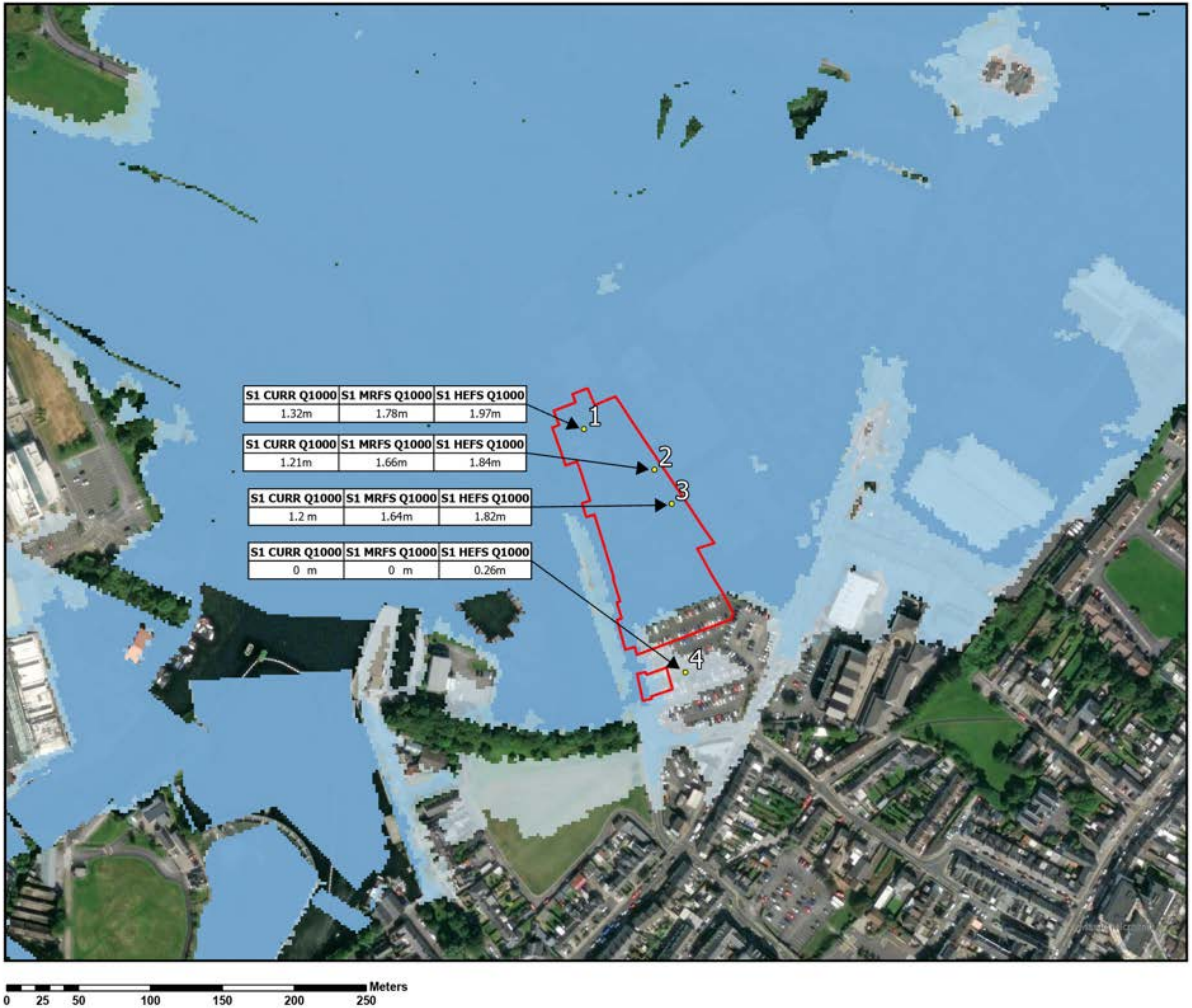
Checked By: CB Date: 14/02/2025

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

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:

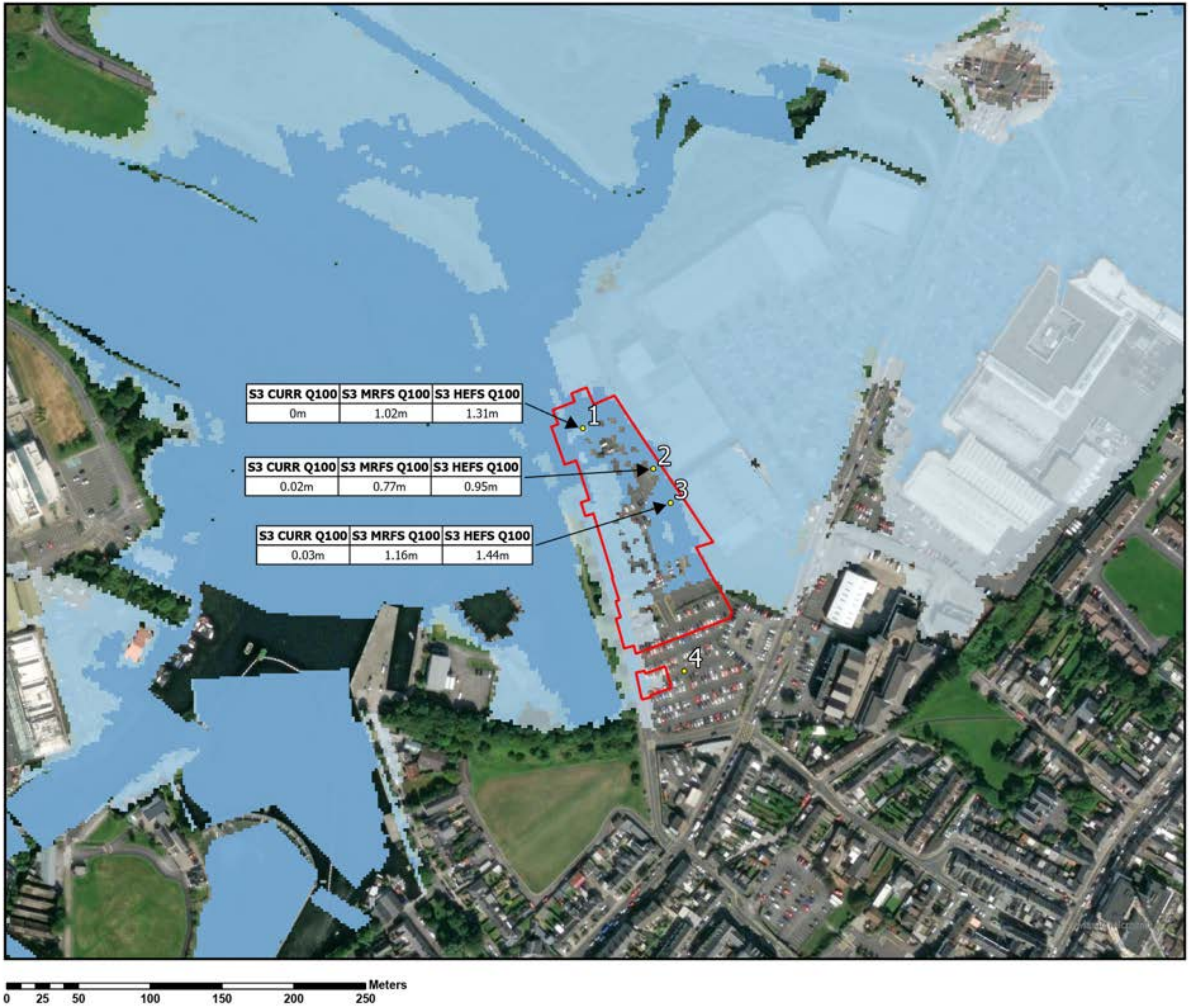
Scenario: Scenario 1 Q1000

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



S3 CURR Q100	S3 MRFS Q100	S3 HEFS Q100
0m	1.02m	1.31m

S3 CURR Q100	S3 MRFS Q100	S3 HEFS Q100
0.02m	0.77m	0.95m

S3 CURR Q100	S3 MRFS Q100	S3 HEFS Q100
0.03m	1.16m	1.44m

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

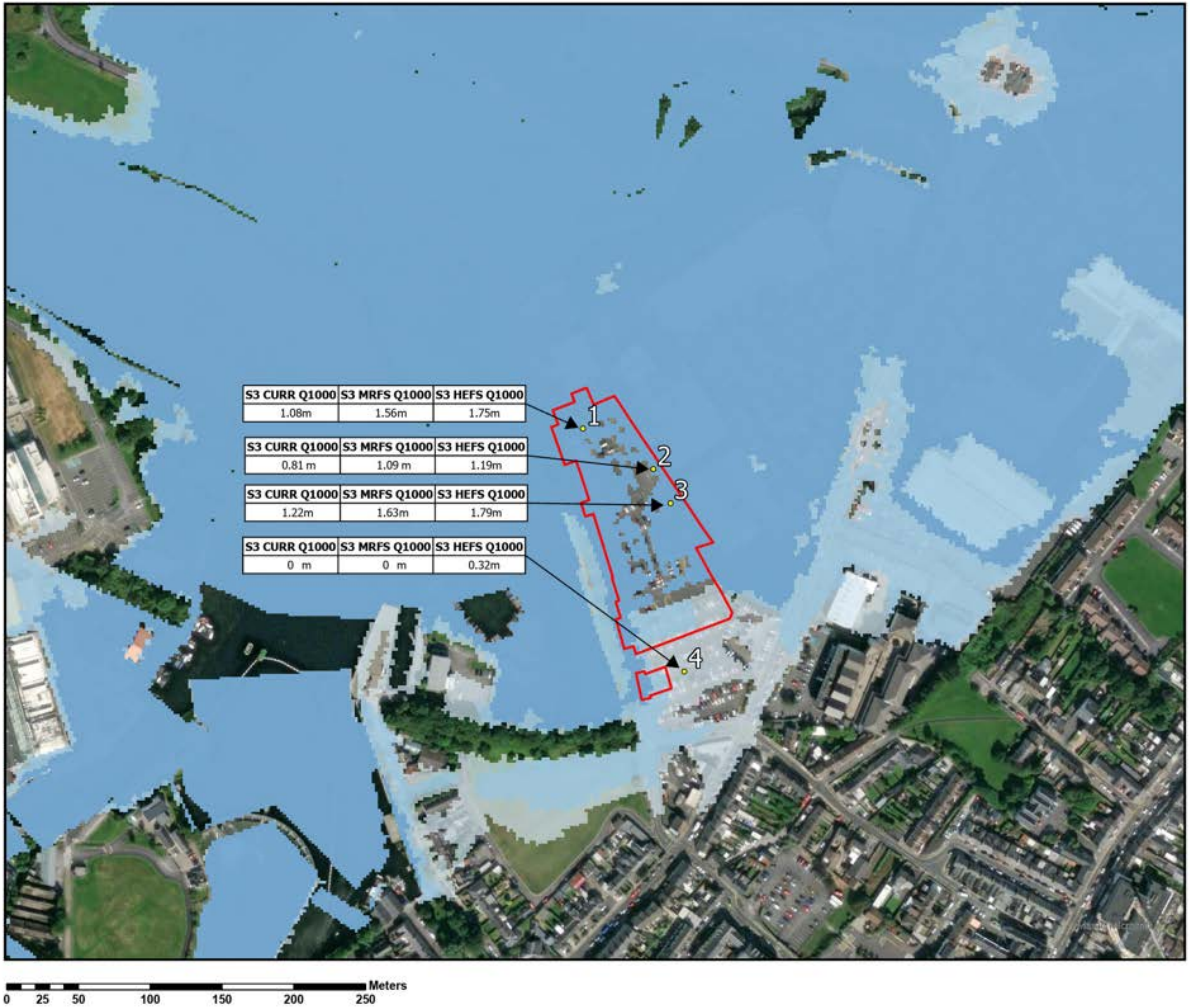
Checked By: CB Date: 14/02/2025

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

Legend:

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

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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

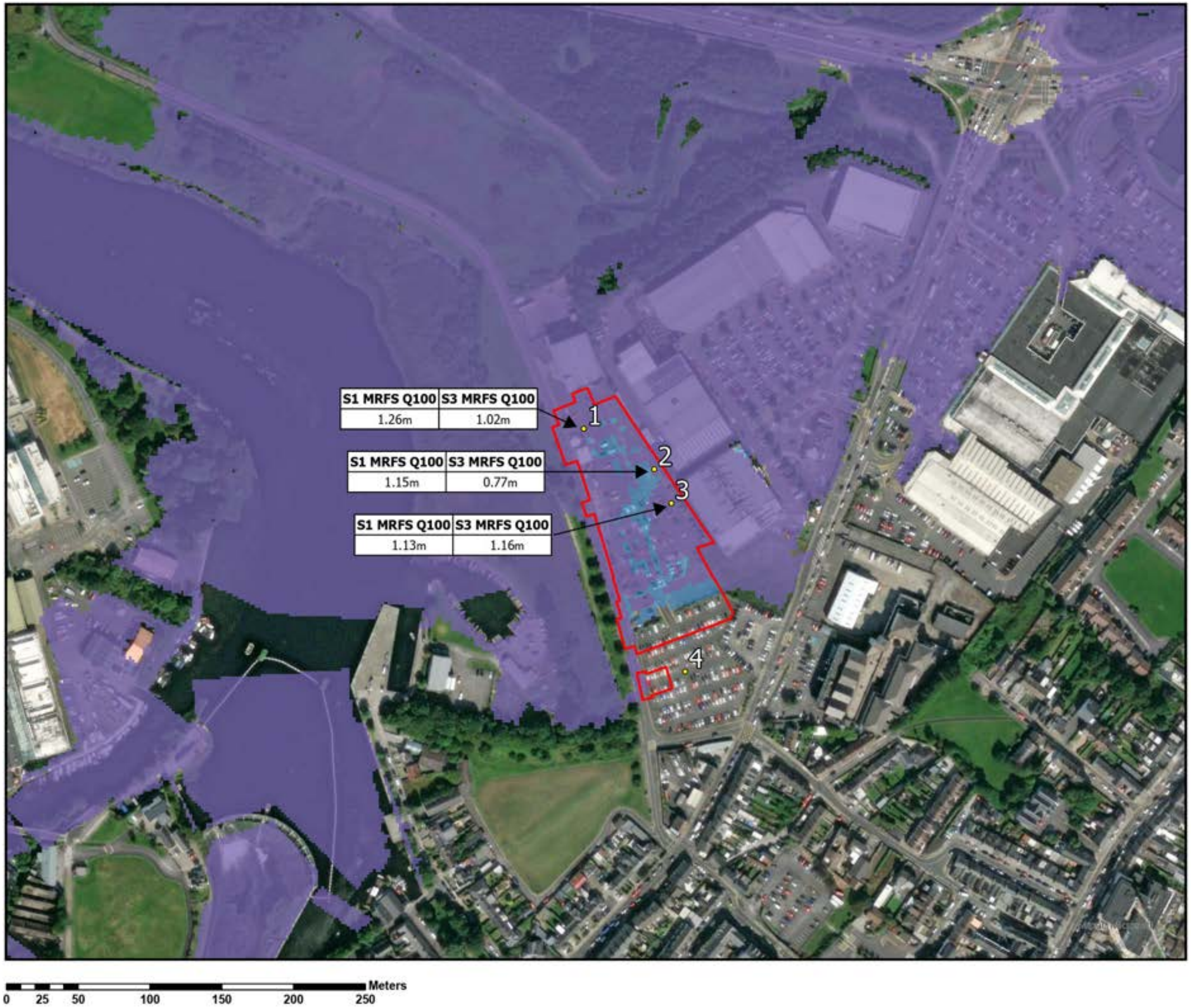
Checked By: CB Date: 14/02/2025

Approved By: RG Date: 14/02/2025

Drawing No: 1

Map Series: Page 1 of 1

Drawing Scale: 1:2,500 @ A3



S1 MRFS Q100	S3 MRFS Q100
1.26m	1.02m

S1 MRFS Q100	S3 MRFS Q100
1.15m	0.77m

S1 MRFS Q100	S3 MRFS Q100
1.13m	1.16m

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

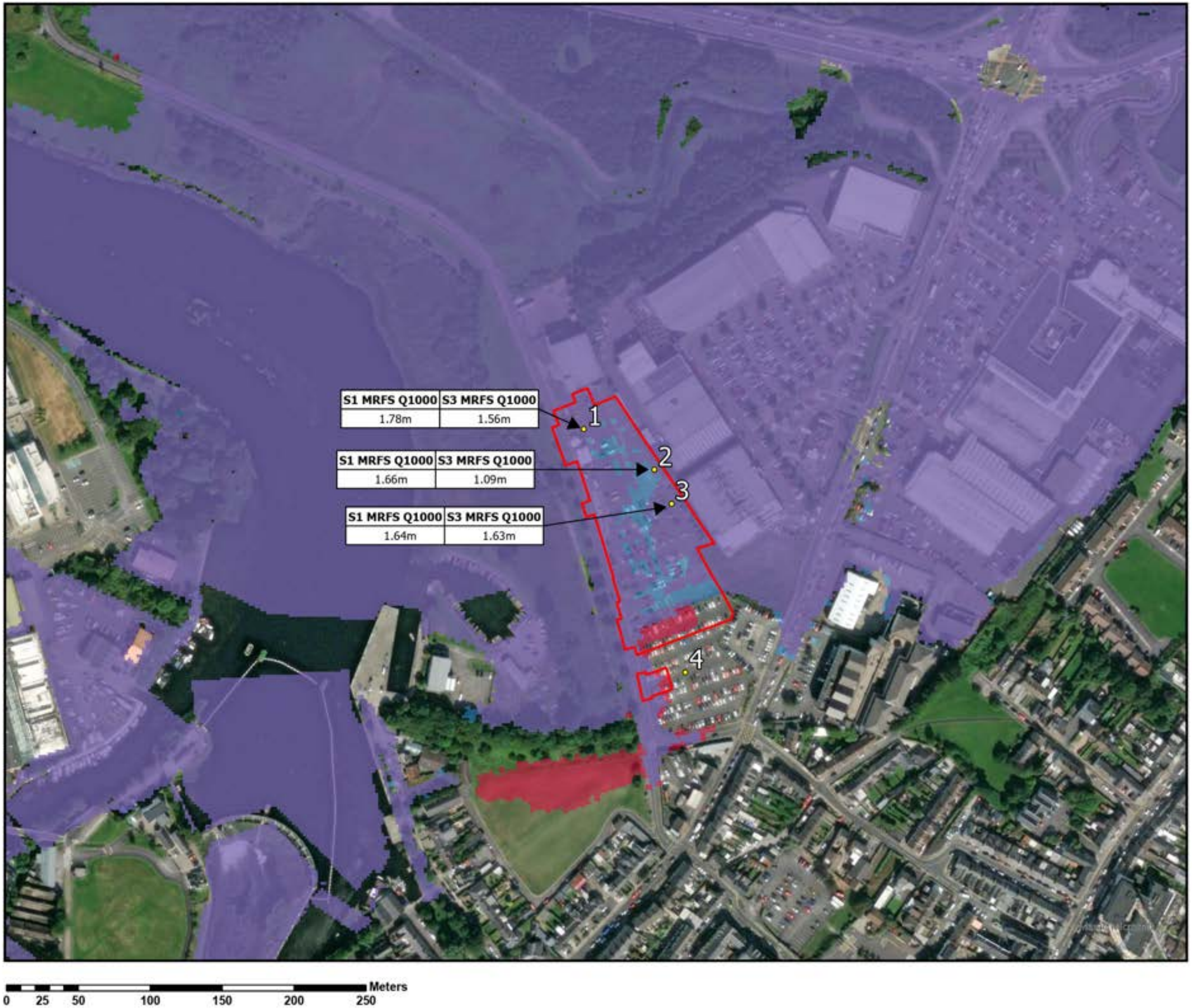
Checked By: CB Date: 14/02/2025

Approved By: RG Date: 14/02/2025

Drawing No: 1

Map Series: Page 1 of 1

Drawing Scale: 1:2,500 @ A3



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	

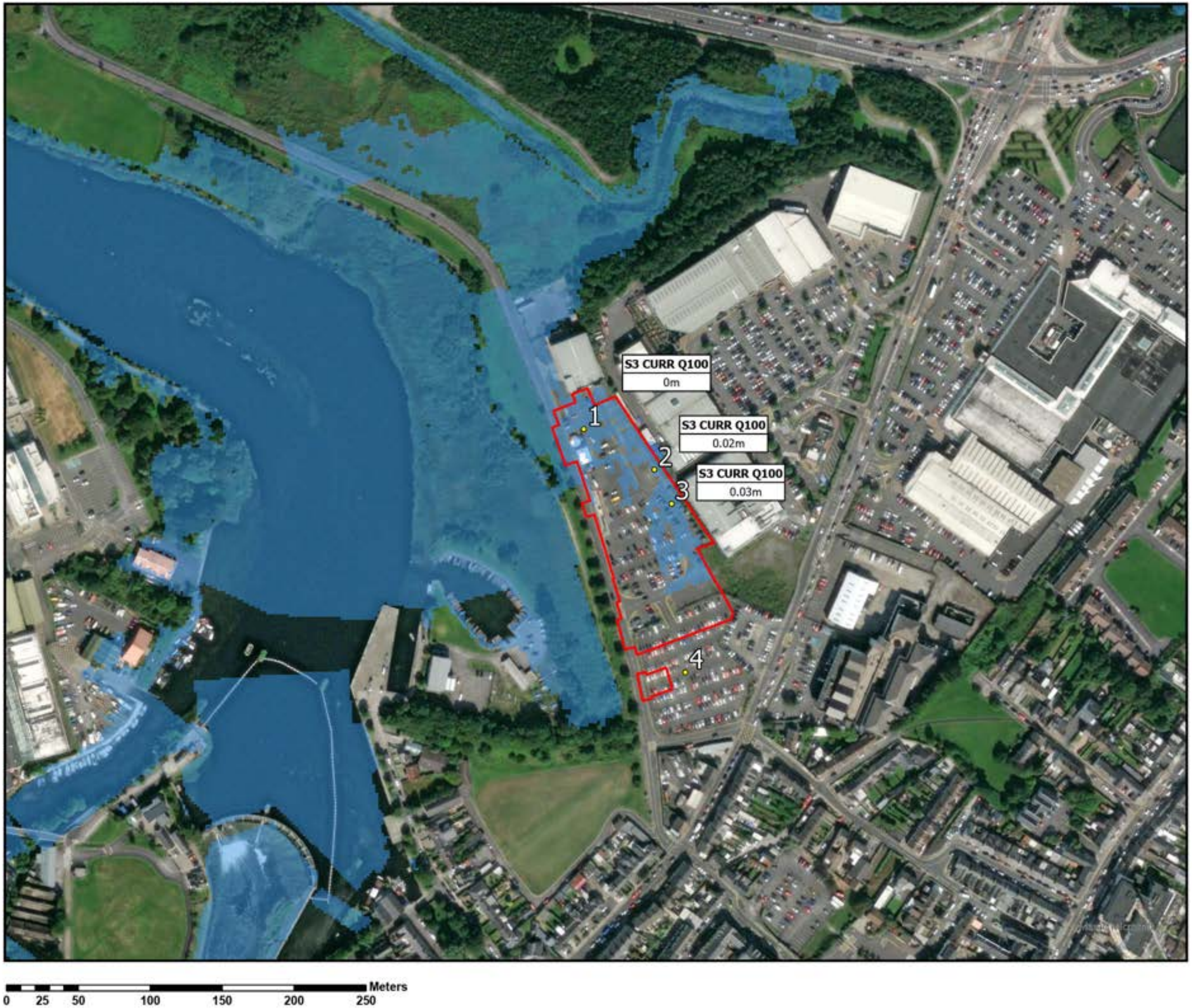
Map Series: Page 1 of 1

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



Legend:

- ● Flood Depth Points
- — Site Boundary

Scenario 3 Q100 Current - Max Extent

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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:

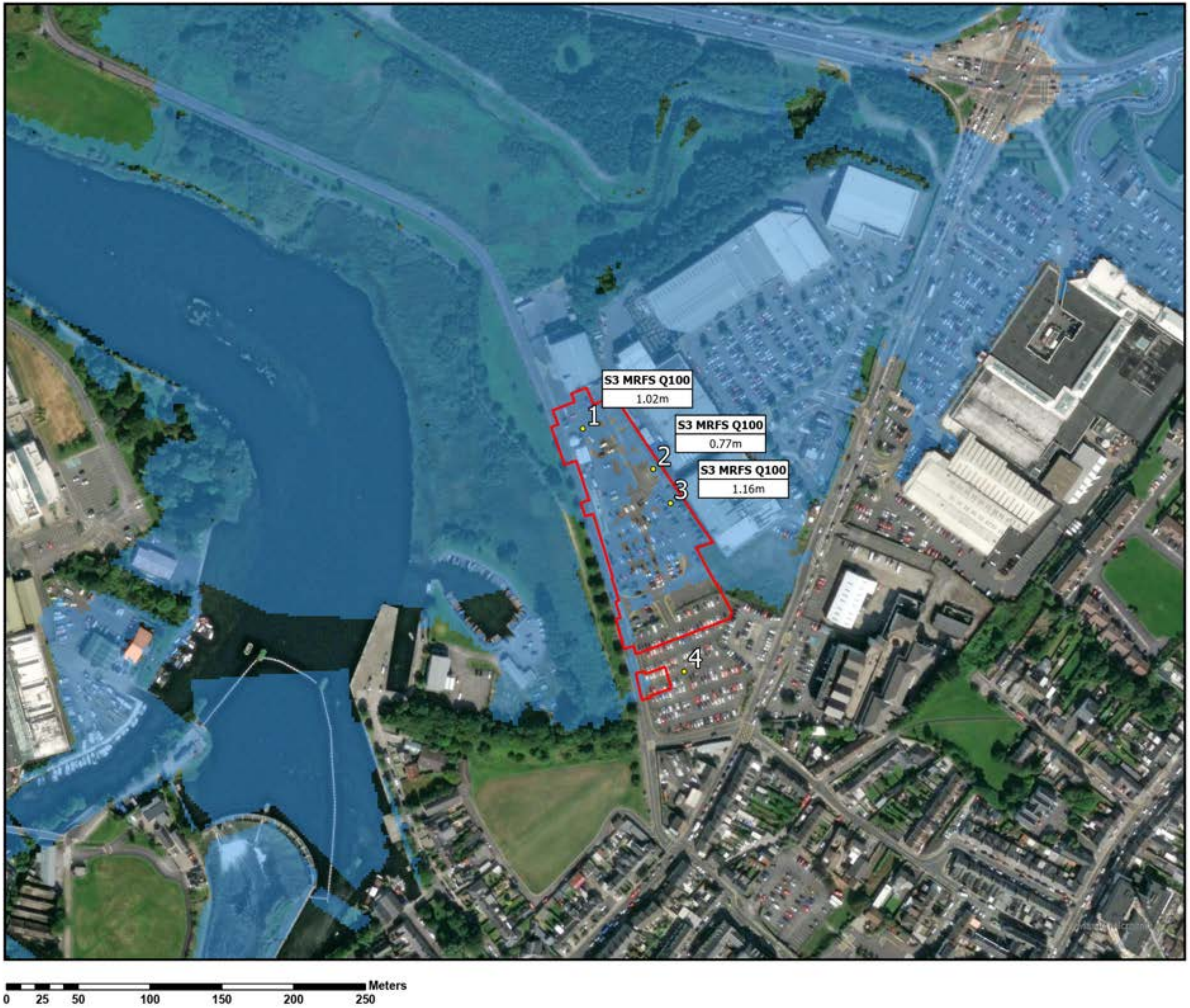
Scenario: Scenario 3 Q100 Current

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



Legend:

- ● Flood Depth Points
- ― Site Boundary

Scenario 3 Q100 MRFS - Max Extent

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Rev. 1		14/02/2025

ARUP

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

Map type: Maximum Flood Extent

Source:

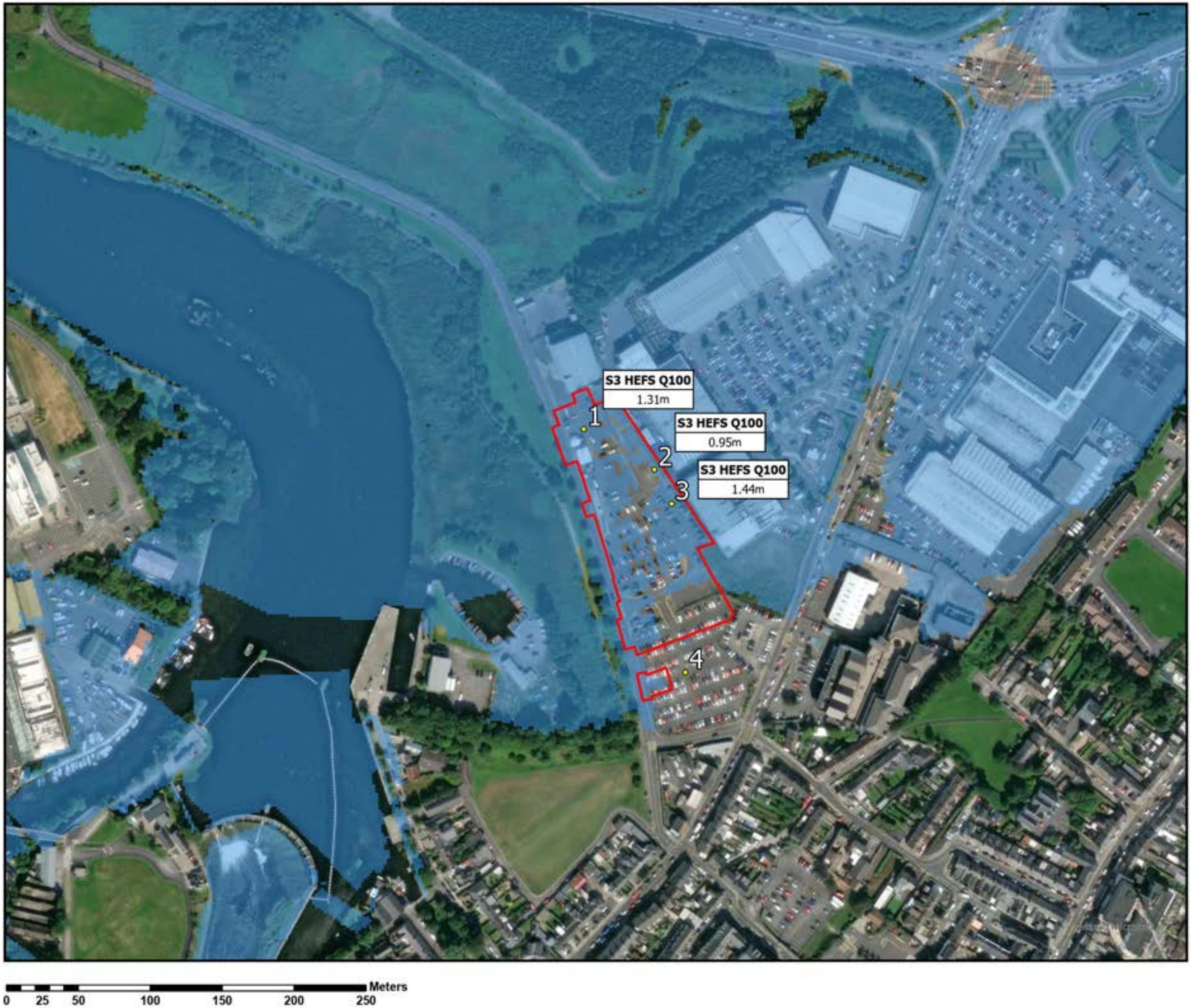
Scenario: Scenario 3 Q100 MRFS

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



Legend:

- ● Flood Depth Points
- — Site Boundary

Scenario 3 Q100 HEFS - Max Extent

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Rev: Rev. 1	Note:	Date: 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

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

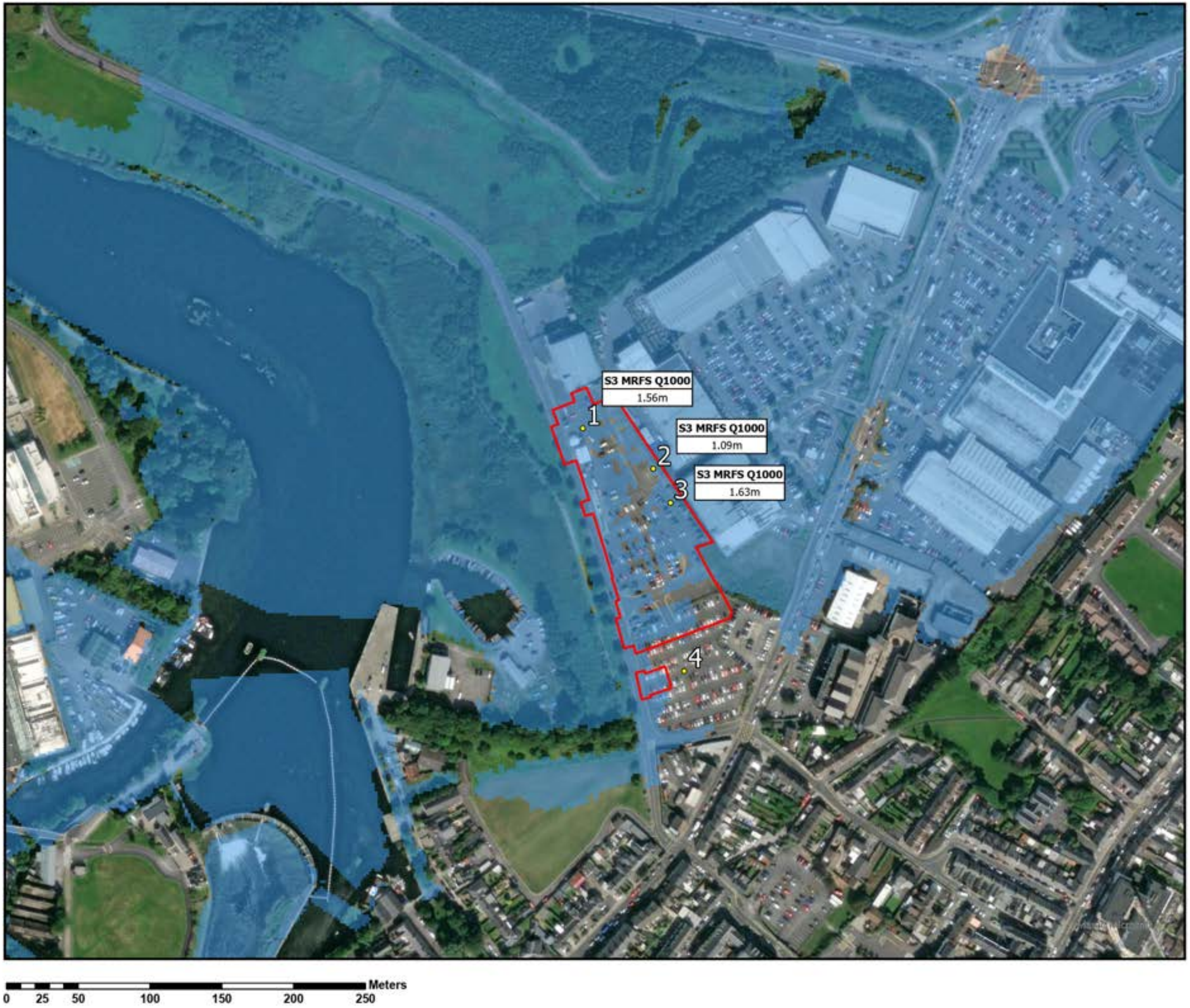
Source:

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



Legend:

- ● Flood Depth Points
- ━ Site Boundary

Scenario 3 Q1000 MRFS - Max Extent

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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

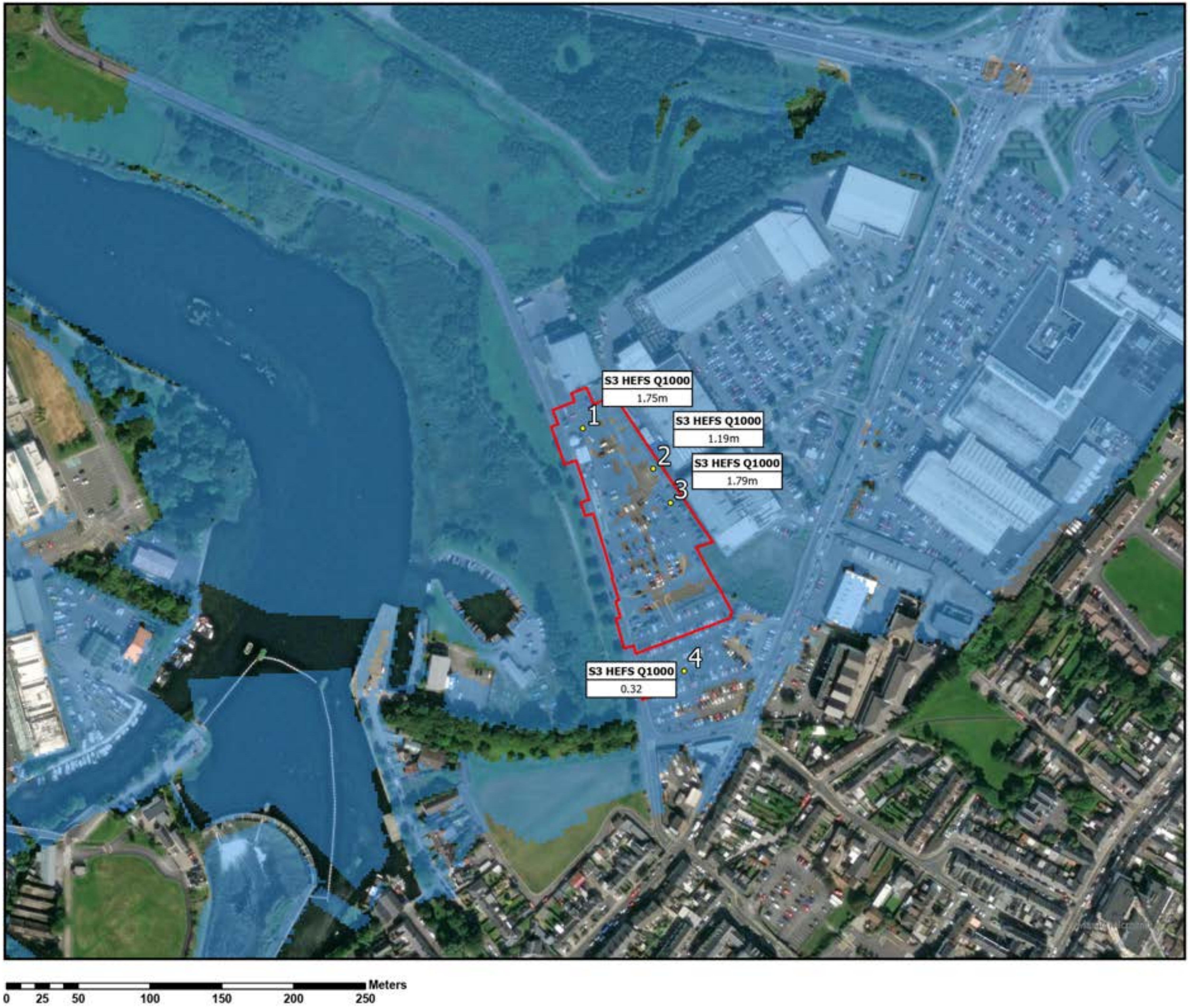
Checked By: CB Date: 14/02/2025

Approved By: RG Date: 14/02/2025

Drawing No: 1

Map Series: Page 1 of 1

Drawing Scale: 1:2,500 @ A3



Legend:

- ○ Flood Depth Points
- — Site Boundary

Scenario 3 Q1000 HEFS - Max Extent

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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

14 March 2025

Report

Flood Emergency Plan and Evacuation Procedure (rev 5)

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-001-05

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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

20250314 FLOOD EVACUATION AND RA PLAN (REV 5) - CORRIB CAUSEWAY DYKE ROAD GALWAY CITY

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. Once completed the upgraded embankment will provide an enhanced Standard of Protection against sever flood events (please refer to enclosed Site-Specific Flood Risk Assessment (SSFRA).

The proposed design solution for the subject development accommodates floodwaters at the Lower Ground Floor level while allowing residents to maintain their daily activities on the Ground Floor level. 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

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 enclosed with this Dyke Road Car Park Phase 1 planning application 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 attached 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). As per the Strategic Flood Risk Assessment and enclosed SSFRA, the River Corrib system is a slow-to-flood system, which provides additional time to evaluate and prepare for flooding.

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;
- 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; and

- The ground underneath the building has been 'dug out' and designed to act like a temporary store for flood waters.

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):

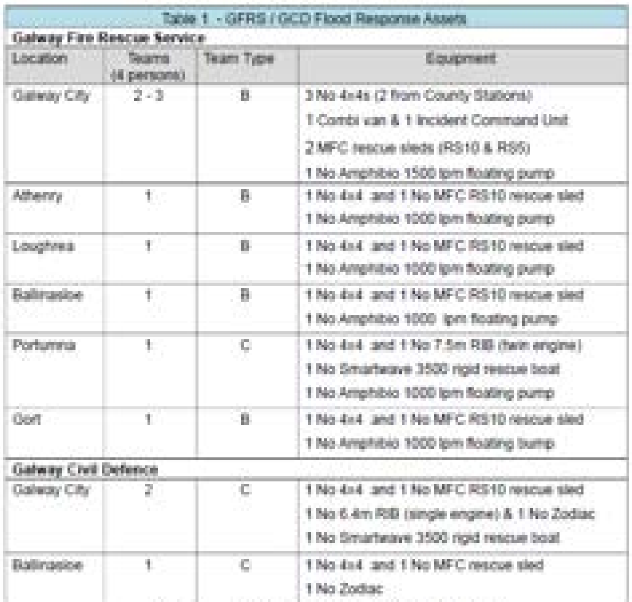


Table 1 - GFRS / GCD Flood Response Assets			
Galway Fire Rescue Service			
Location	Teams (4 persons)	Team Type	Equipment
Galway City	2 - 3	B	3 No 4x4s (2 from County Stations) 1 Combi van & 1 Incident Command Unit 2 MFC rescue sleds (RS10 & RS5) 1 No Amphibio 1500 lpm floating pump
Athenry	1	B	1 No 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.

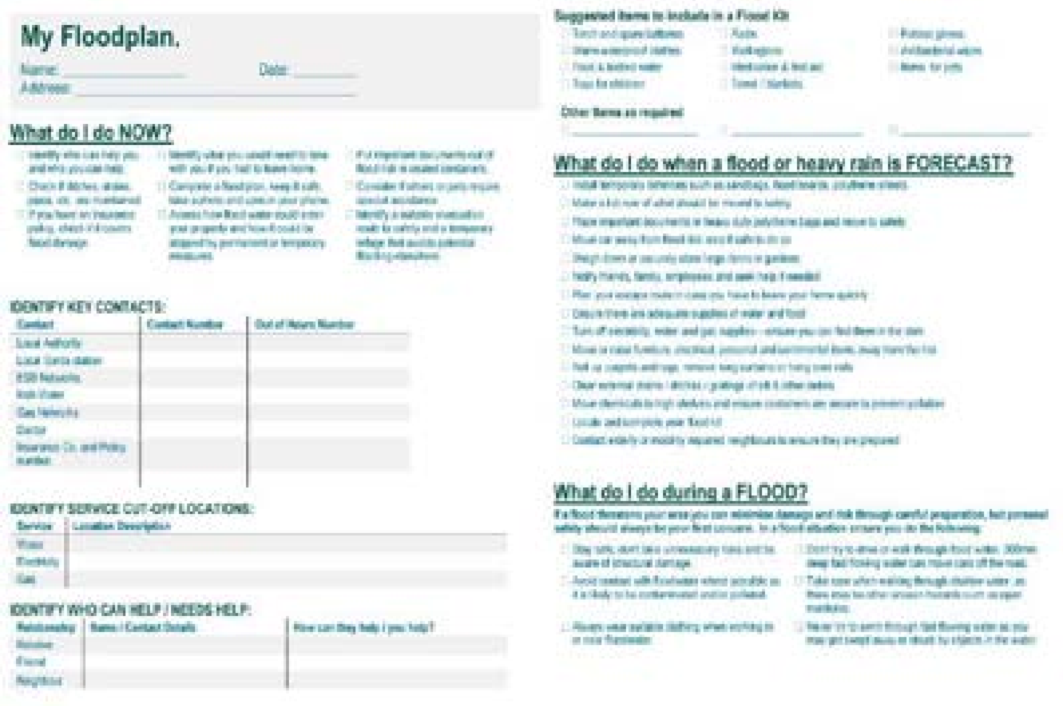
Warning type	Meaning	Actions to be taken
	Met Éireann Yellow Warning: Flooding is possible, be prepared.	• Check Forecasts • Check Flood Maps • Check River Levels (refer to links below:) • Real-time water levels of the River Corrib are available on www.waterlevels.ie. The Galway Barrage gauge (Ref 30099) 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 KEY CONTACTS:

IDENTIFY SERVICE CUT-OFF LOCATIONS:

IDENTIFY WHO CAN HELP / NEEDS HELP:

Suggested Items to include in a Flood Kit

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

What do I do during a FLOOD?

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

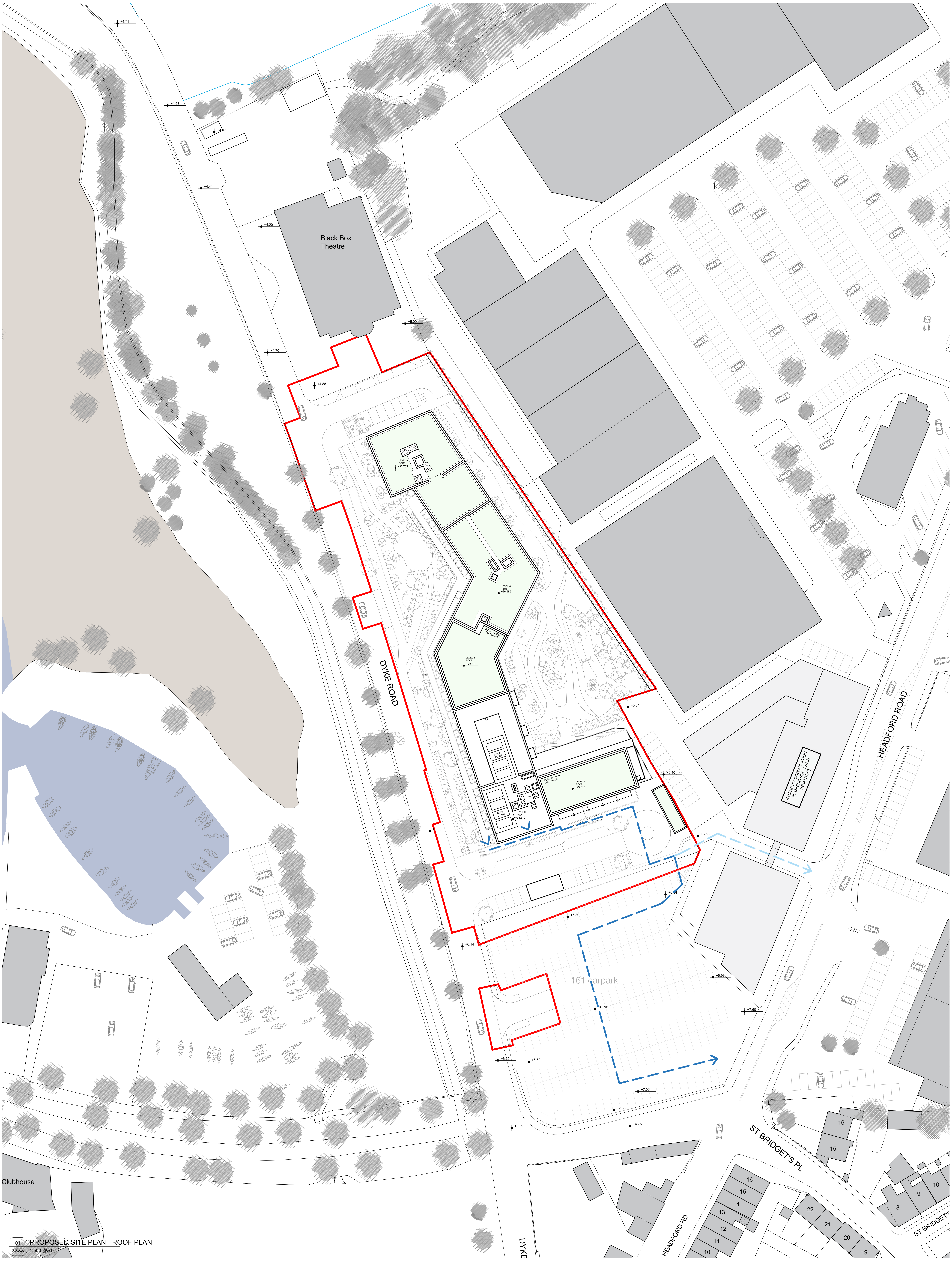
The following warning systems will inform the Evacuation Plan and Emergency Procedure. The Facilities Manager will ensure these are monitored and take the above relevant actions in the event of a weather or flood warning:

- 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

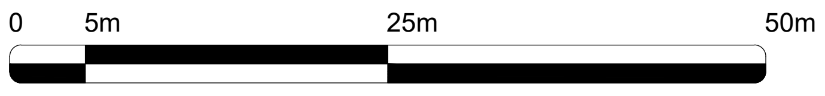
	Organisation	**Position**	**Name**	**Mobile**	**Email**
Galway County Council					
AGS					
HSE					
HSA					
ICG					
ESB					
Bord Gáis					
Irish Water					
Facilities Management					
Retail 1					
Retail 2					
Mechanical					
Electrical					
TMP					
Drains Cleaning					
Cleaners					

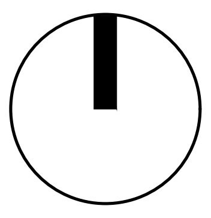
Appendix B – Flood evacuation plan drawings



01
XXXX
PROPOSED SITE PLAN - ROOF PLAN
1:500 @A1

NOTES / LEGEND





🟥 PHASE 1 PLANNING APPLICATION BOUNDARY

Key Plan (not to scale):

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

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

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

Appendix C – Evacuation & vulnerability register*

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

aecom.com

Appendix 10-1

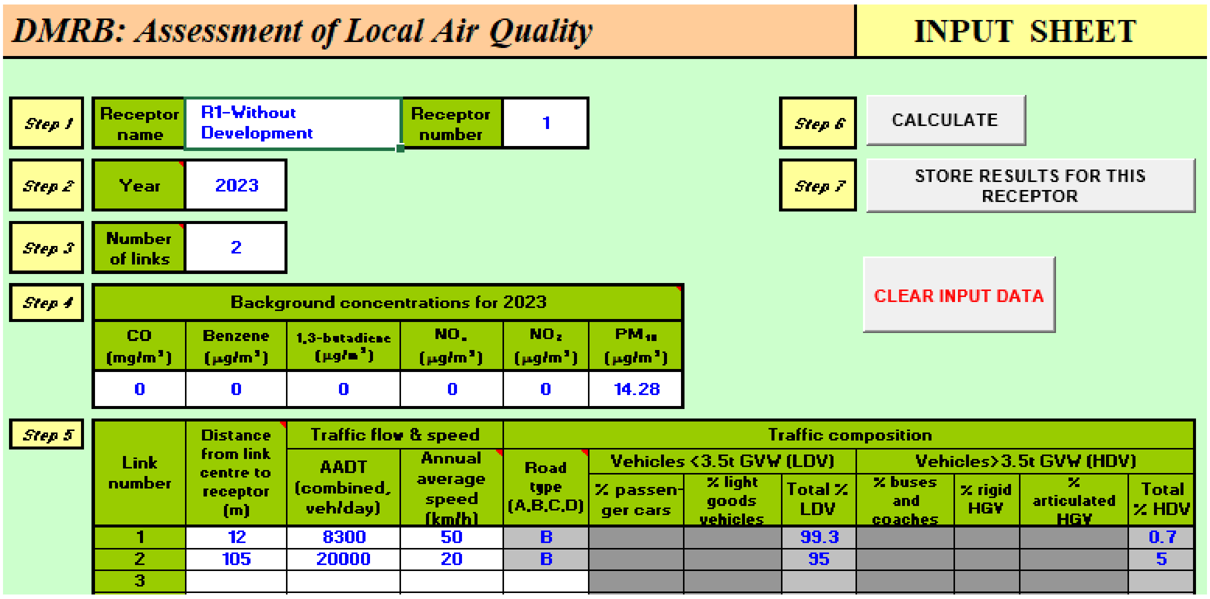
Appendix 10-1

Air Quality Impact Assessment Chapter

<u>DMRB Screening Method Inputs & Outputs:</u>

Baseline Year 2023:

<u>Receiver R1</u>



DMRB: Assessment of Local Air Quality — **INPUT SHEET**

Step 1 Receptor name: R1-Without Development — Receptor number: 1

Step 2 Year: 2023

Step 3 Number of links: 2

Step 4 Background concentrations for 2023

CO (mg/m³)	Benzene (μg/m³)	1,3-butadiene (μg/m³)	NOₓ (μg/m³)	NO₂ (μg/m³)	PM₁₀ (μg/m³)
0	0	0	0	0	14.28

Step 5

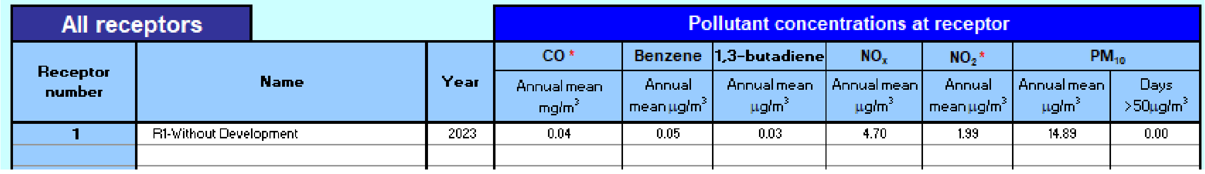
Link number	Distance from link centre to receptor (m)	Traffic flow & speed: AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Vehicles <3.5t GVW (LDV): % passenger cars	% light goods vehicles	Total % LDV	Vehicles>3.5t GVW (HDV): % buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	12	8300	50	B			99.3				0.7
2	105	20000	20	B			95				5
3											

Step 6 CALCULATE

Step 7 STORE RESULTS FOR THIS RECEPTOR

CLEAR INPUT DATA

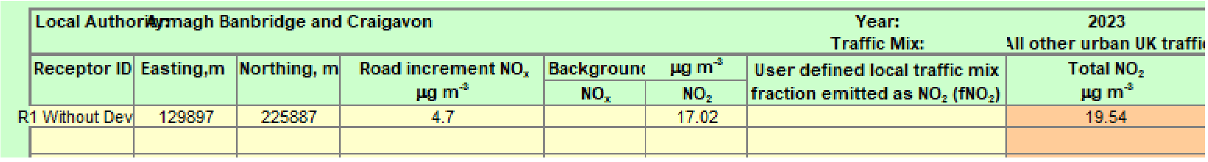
Results



All receptors — Pollutant concentrations at receptor

Receptor number	Name	Year	CO * Annual mean mg/m³	Benzene Annual mean μg/m³	1,3-butadiene Annual mean μg/m³	NOₓ Annual mean μg/m³	NO₂ * Annual mean μg/m³	PM₁₀ Annual mean μg/m³	PM₁₀ Days >50μg/m³
1	R1-Without Development	2023	0.04	0.05	0.03	4.70	1.99	14.89	0.00

<u>2023 NO_x to NO_2 Converter Outputs:</u>



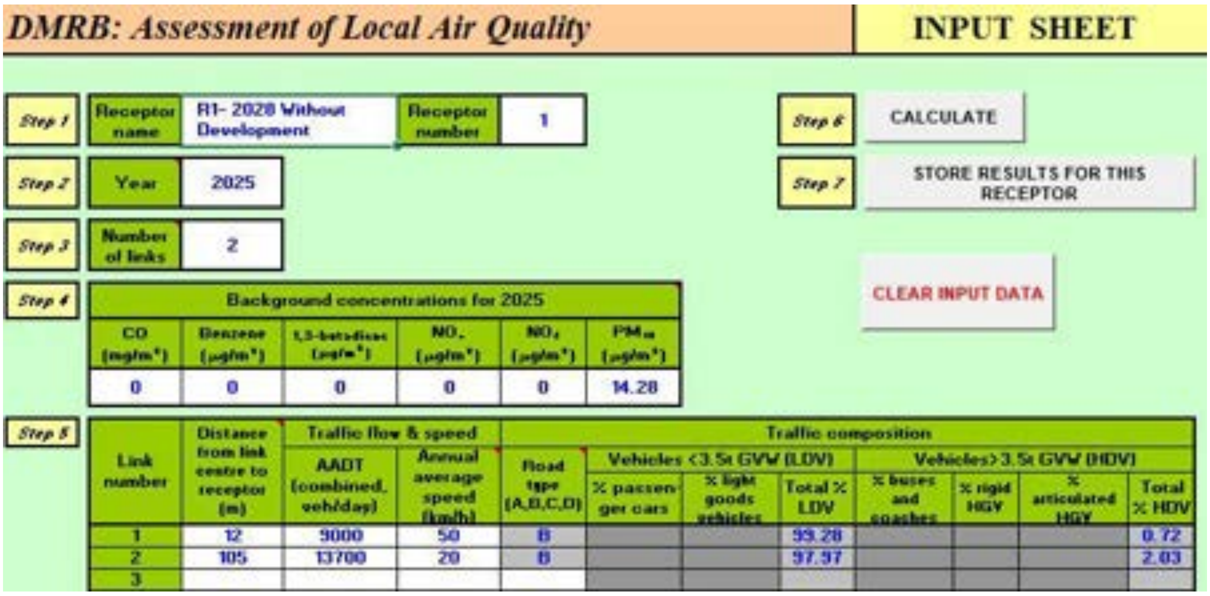
Local AuthorityArmagh Banbridge and Craigavon — Year: 2023 — Traffic Mix: All other urban UK traffi

Receptor ID	Easting,m	Northing, m	Road increment NOₓ μg m⁻³	Background μg m⁻³ NOₓ	Background μg m⁻³ NO₂	User defined local traffic mix fraction emitted as NO₂ (fNO₂)	Total NO₂ μg m⁻³
R1 Without Dev	129897	225887	4.7		17.02		19.54

Receiver R1

Proposed Year of Opening

2028 Do Nothing



DMRB: Assessment of Local Air Quality | **INPUT SHEET**

Step 1 Receptor name: R1- 2028 Without Development | Receptor number: 1

Step 2 Year: 2025

Step 3 Number of links: 2

Step 4 Background concentrations for 2025

CO (mg/m³)	Benzene (μg/m³)	1,3-butadiene (μg/m³)	NO_x (μg/m³)	NO_2 (μg/m³)	PM_{10} (μg/m³)
0	0	0	0	0	14.28

Step 5

Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition								
		AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)				
					% passenger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	12	9000	50	B			99.28				0.72
2	105	13700	20	B			97.97				2.03
3											

2028 Do Something

DMRB: Assessment of Local Air Quality | **INPUT SHEET**

Step 1 Receptor name: R1- 2028 With Development | Receptor number: 2

Step 2 Year: 2025

Step 3 Number of links: 2

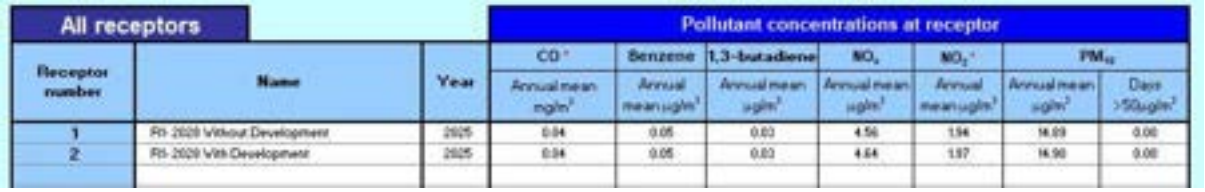
Step 4 Background concentrations for 2025

CO (mg/m³)	Benzene (μg/m³)	1,3-butadiene (μg/m³)	NO_x (μg/m³)	NO_2 (μg/m³)	PM_{10} (μg/m³)
0	0	0	0	0	14.28

Step 5

Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition							
		AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)			
					% passenger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	12	9200	50	B			99.31				0.69
2	105	13900	20	B			98.02				1.98
3											

Results



All receptors

Receptor number	Name	Year	Pollutant concentrations at receptor						
			CO *	Benzene	1,3-butadiene	NO_x	NO_2 *	PM_{10}	
			Annual mean mg/m³	Annual mean ug/m³	Annual mean ug/m³	Annual mean ug/m³	Annual mean ug/m³	Annual mean ug/m³	Days >50ug/m³
1	R1-2028 Without Development	2025	0.04	0.05	0.03	4.56	1.94	14.09	0.00
2	R1-2028 With Development	2025	0.04	0.05	0.03	4.64	1.97	14.90	0.00

2028 NO_x to NO_2 Converter Outputs:

Local Authority: Armagh Banbridge and Craigavon							Year: Traffic Mix:	2028 All other urban UK traffic
Receptor ID	Easting,m	Northing, m	Road increment NO_x $\mu g\ m^{-3}$	Background $\mu g\ m^{-3}$ NO_x	Background $\mu g\ m^{-3}$ NO_2	User defined local traffic mix fraction emitted as NO_2 (fNO_2)		Total NO_2 $\mu g\ m^{-3}$
R1 Without Dev	129897	225887	4.56		17.02			19.42
R1 With Devp	129897	225887	4.64		17.02			19.46

Design Year 2043

Receiver R1

Do Nothing Scenario

Step 1 Receptor name: R1- 2043 Without Development | Receptor number: 1

Step 2 Year: 2025

Step 3 Number of links: 2

Step 4 Background concentrations for 2025

CO (mg/m³)	Benzene (µg/m³)	1,3-butadiene (µg/m³)	NO_x (µg/m³)	NO_2 (µg/m³)	PM_{10} (µg/m³)
0	0	0	0	0	14.28

Step 5

Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition							
		AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)			
					% passenger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	12	10500	50	B			99.19				0.81
2	105	16000	20	B			97.82				2.28
3											

2043 Do Something

Step 1 Receptor name: R1- 2043 With Development | Receptor number: 2

Step 2 Year: 2025

Step 3 Number of links: 2

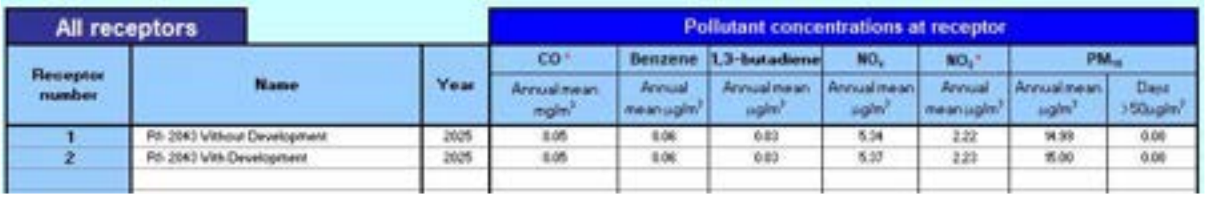
Step 4 Background concentrations for 2025

CO (mg/m³)	Benzene (µg/m³)	1,3-butadiene (µg/m³)	NO_x (µg/m³)	NO_2 (µg/m³)	PM_{10} (µg/m³)
0	0	0	0	0	14.28

Step 5

Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition							
		AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)			
					% passenger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	12	10600	50	B			99.21				0.79
2	105	16100	20	B			97.84				2.26
3											

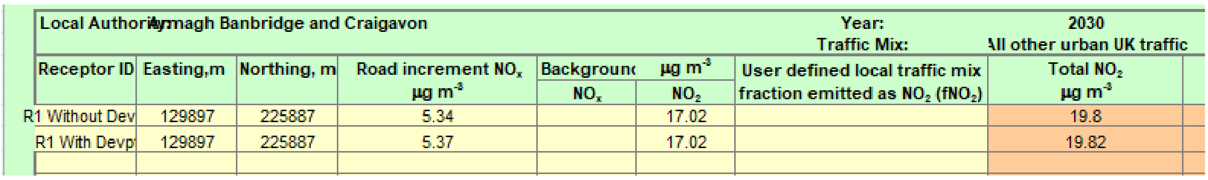
Results



All receptors | **Pollutant concentrations at receptor**

Receptor number	Name	Year	CO Annual mean mg/m³	Benzene Annual mean µg/m³	1,3-butadiene Annual mean µg/m³	NO_x Annual mean µg/m³	NO_2 Annual mean µg/m³	PM_{10} Annual mean µg/m³	PM_{10} Days >50µg/m³
1	R5: 2043 Without Development	2025	0.05	0.06	0.03	5.34	2.22	14.99	0.00
2	R5: 2043 With Development	2025	0.05	0.06	0.03	5.37	2.23	15.00	0.00

2043 NO_x to NO_2 Converter Outputs:



Local Authority: Armagh Banbridge and Craigavon

Year: 2030

Traffic Mix: All other urban UK traffic

Receptor ID	Easting,m	Northing, m	Road increment NO_x µg m^{-3}	Background NO_x	µg m^{-3} NO_2	User defined local traffic mix fraction emitted as NO_2 (fNO_2)	Total NO_2 µg m^{-3}
R1 Without Dev	129897	225887	5.34		17.02		19.8
R1 With Devp	129897	225887	5.37		17.02		19.82

Appendix 12-1

Appendix 12.1 – Visual Impact Assessment

(Image courtesy of 3D Design Bureau)

V1 - Baseline View Summer

V1 - Baseline View Winter

V1 - Proposed View Summer

V1 - Proposed View Winter

Viewpoint 1 - Terriland Forest Park (northwest of the site)
View Description: Protected view from Terriland Forest Park looking southwest a public open space. The view comprises a local park. The foreground shows a pedestrian path with scrub vegetation on the left and a wooden fence on the right of that pathway. The background shows an outline of existing vegetation. View of site is screened by existing trees.
Visual Receptor Sensitivity: High.
Magnitude of change: No appreciable change.
Significance of Visual Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.
Cumulative Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.

V2 - Baseline View Summer

V2 - Baseline View Winter

V2 - Proposed View Summer

V2 - Proposed View Winter

Viewpoint 2 - Headford Rd (Southeast of the site)
View Description: View from Headford Road looking west towards the site's southern boundary, which features a low wall and security fencing. The view shows Headford Road in the foreground. The background comprises an existing building of 3 storey in height on the right, and an outline of existing trees on the left. The car park is screened by the boundary fence. The massing of the proposed development is visible in the middle ground.
Visual Receptor Sensitivity: Low
Magnitude of change: High.
Significance of Visual Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.
Cumulative Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.

V3 - Baseline View Summer

V3 - Baseline View Winter

V3 - Proposed View Summer

V3 - Proposed View Winter

Viewpoint 3 – Water Lane
View Description: View from Water lane looking northwest towards a Public Open Space. The view comprises a local park and residential area. The foreground shows a large grass area. The middle ground shows existing residential buildings of 4 storey. Few semi-mature trees are partially screening those residential buildings. An outline of building can be seen in the horizon. View of the proposed development is obstructed by existing buildings.
Visual Receptor Sensitivity: Medium
Magnitude of change: No appreciable change
Significance of Visual Effect: Not Significant. The proposal is adequately screened due to the existing landform, vegetation or constructed features.
Cumulative Effect: Not Significant. The proposal is adequately screened due to the existing landform, vegetation or constructed features.

V4 - Baseline View Summer

V4 - Baseline View Winter

V4 - Proposed View Summer

V4 - Proposed View Winter

Viewpoint 4 – Dyke Road junction with Plots Local Park
View Description: View from Dyke Road looking northwards towards Dyke Road and the Black Box Theater in the background. The view comprises Dyke road. There is an existing 2 storey high residential building on the right and a local park on the left. Massing of proposed building is visible in this view.
Visual Receptor Sensitivity: Low
Magnitude of change: High
Significance of Visual Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.
Cumulative Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.

V5 - Baseline View Summer

V5 - Baseline View Winter

V5 - Proposed View Summer

V5 - Proposed View Winter

Viewpoint 5 – Dyke Road (South junction)
View Description: View from Dyke Road looking north towards the site's southern boundary, which features a low wall. The view comprises Dyke road in the foreground, the car park in the middle ground and the commercial buildings in the background. A buffer planting is visible along Dyke Road on the left side of this view. Massing of proposed development is visible in this view.
Visual Receptor Sensitivity: Low
Magnitude of change: High
Significance of Visual Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.
Cumulative Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.

V6 - Baseline View Summer

V6 - Baseline View Winter

V6 - Proposed View Summer

V6 - Proposed View Winter

Viewpoint 6 – Plots Local Park
View Description: View from Plots Local Park looking northeast towards a Public Open Space. The view comprises a large grass area in the foreground, and vegetation at the back of this grass area. A local road and few existing building 2 to 4 storey high can be seen on the right of this view. Massing of proposed building is partially screened by existing vegetation.
Visual Receptor Sensitivity: Medium
Magnitude of change: Low
Significance of Visual Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.
Cumulative Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.

V7 - Baseline View Summer

V7 - Baseline View Winter

V7 - Proposed View Summer

V7 - Proposed View Winter

Viewpoint 7 – Corrib Waterside Pier
View Description: Protected view from Corrib Waterside Pier looking east towards the river harbour. The view comprises high quality views of Corrib River. An outline of buildings and vegetation is visible in the background. The site is slightly screened by existing vegetation in proximity to the River. The site is slightly screened by existing vegetation in proximity to the River.
Visual Receptor Sensitivity: High
Magnitude of change: High
Significance of Visual Effect: Significant. The proposal affects a large proportion of the overall visual composition, or views are so affected that they form a new element in the physical landscape.
Cumulative Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.

V8 - Baseline View Summer

V8 - Baseline View Winter

V8 - Proposed View Summer

V8 - Proposed View Winter

Viewpoint 8 – Salmon Weir Bridge
View Description: Protected view from Salmon Weir Bridge looking northeast towards the Salmon Weir. The view comprises high quality views of Corrib River in the foreground and residential buildings in the middle ground, on both sides of the river. Outline of proposed development roof is visible but is mostly screened by existing buildings and vegetation.
Visual Receptor Sensitivity: High
Magnitude of change: No appreciable change
Significance of Visual Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.
Cumulative Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.

V9 - Baseline View Summer

V9 - Baseline View Winter

V9 - Proposed View Summer

V9 - Proposed View Winter

Viewpoint 9 – Inland Fisheries Ireland
View Description: Protected view from the entrance gate at Inland Fisheries Ireland looking eastwards towards the entrance gate. The view comprises 1 storey high buildings at the foreground. The River Corrib is mostly screened by the buildings and an existing rubble wall. The background comprises an outline of existing building and vegetation. Massing of proposed development is partially screened by the existing buildings and vegetation.
Visual Receptor Sensitivity: Medium
Magnitude of change: Low
Significance of Visual Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.
Cumulative Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.

V10 - Baseline View Summer

V10 - Baseline View Winter

V10 - Proposed View Summer

V10 - Proposed View Winter

Viewpoint 10 – University of Galway
View Description: Protected view from the University of Galway at the riverside looking eastwards towards the River Corrib, and the Black Box Theater in the Background. The view comprises high quality views of Corrib River in the foreground and middle ground. The background comprises an outline of trees and 2 to 6 storey high buildings. Massing of proposed development is visible in the background.
Visual Receptor Sensitivity: High
Magnitude of change: High
Significance of Visual Effect: Significant. The proposal affects a large proportion of the overall visual composition, or views are so affected that they form a new element in the physical landscape
Cumulative Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.

V11 - Baseline View Summer

V11 - Baseline View Winter

V11 - Proposed View Summer

V11 - Proposed View Winter

Viewpoint 11 – Dyke Road (Northwest of the site)
View Description: Protected view from Dyke Road looking southwards at Dyke Road and Black Box Theater. The view comprises Dyke Road in the foreground with an outline of vegetation on both sides of the view. The background comprises an outline of 6 storey high buildings. Massing proposed development is partially screened by the Black Box Theatre.
Visual Receptor Sensitivity: High
Magnitude of change: Medium
Significance of Visual Effect: Significant. The proposal affects a large proportion of the overall visual composition, or views are so affected that they form a new element in the physical landscape
Cumulative Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.

V12 - Baseline View Summer

V12 - Baseline View Winter

V12 - Proposed View Summer

V12 - Proposed View Winter

Viewpoint 12 – Dyke Road (at Black Box Theatre)
View Description: View from Dyke Road at Black Box Theater looking southeast towards the car park (site). The view comprises Dyke Road in the foreground. The black box theater is on the right of the view. The car park is in the middle ground. The background comprises an outline of building from 2 to 6 storey in height. Massing of proposed development is visible in this view.
Visual Receptor Sensitivity: Low
Magnitude of change: Very High
Significance of Visual Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.
Cumulative Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.

V13 - Baseline View Summer

V13 - Baseline View Winter

V13 - Proposed View Summer

V13 - Proposed View Winter

Viewpoint 13 – Headford Road junction with St Bridget's Place
View Description: View from Headford Road junction with St Bridget's Place looking northwest towards the site's southern boundary, which features a low wall. There is some existing vegetation behind that wall which partially screens the car park. The view comprises Dyke Road in the foreground. The backround comprises an outline of 3 storey high existing buildings and vegetation. Massing of proposed development is visible in this view.
Visual Receptor Sensitivity: Low
Magnitude of change: Medium
Significance of Visual Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.
Cumulative Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.

V14 - Baseline View Summer

V14 - Baseline View Winter

V14 - Proposed View Summer

V14 - Proposed View Winter

Viewpoint 14 – Cill Ard
View Description: View from Cill Ard looking westwards towards IMC Cinema Galway building in the middle ground. The foreground comprises a local road with a residential building to the write and a high wall to the left. The horizon line is visible in the background between the building and the wall. Massing of proposed development is partially screened by an existing wall and vegetation.
Visual Receptor Sensitivity: Low
Magnitude of change: Low
Significance of Visual Effect: Not Significant. The proposal is adequately screened due to the existing landform, vegetation or constructed features.
Cumulative Effect: Not Significant. The proposal is adequately screened due to the existing landform, vegetation or constructed features.

V15 - Baseline View Summer

V15 - Baseline View Winter

V15 - Proposed View Summer

V15 - Proposed View Winter

Viewpoint 15 – Dyke Road (southwest of the site)
View Description: View from Dyke Road looking northwards towards the car park. The foreground comprises a grasses area and Dyke road. Few semi mature trees are visible at the left of this view. The car park is located in the middle ground of the view. The background comprises an outline of existing building from 2 to 4 storey in height. Massing of proposed development is visible in the middle ground.
Visual Receptor Sensitivity: High
Magnitude of change: High
Significance of Visual Effect: Significant. The proposal affects a large proportion of the overall visual composition, or views are so affected that they form a new element in the physical landscape
Cumulative Effect: Significant. The proposal affects a large proportion of the overall visual composition, or views are so affected that they form a new element in the physical landscape

V16 - Baseline View Summer

V16 - Baseline View Winter

V16 - Proposed View Summer

V16 - Proposed View Winter

Viewpoint 16 – Quincentennial Bridge
View Description: Protected view from Terryland Forest Park, Quincentennial Bridge looking southeast towards the river. The view comprises high quality views of Corrib River in the foreground. The background comprises an outline of buildings and existing vegetation. Massing of proposed development is visible in the background.
Visual Receptor Sensitivity: High
Magnitude of change: Low
Significance of Visual Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.
Cumulative Effect: Moderate. An effect that alters the character of the visual environment in a manner that is consistent with existing and emerging trends.

V17 - Baseline View Summer

V17 - Baseline View Winter

V17 - Proposed View Summer

V17 - Proposed View Winter

Viewpoint 17 – Dyke Road (near N6 Junction)
View Description: Protected view from Dyke Road looking south east at the Terriland Forest Park. The view comprises a local park. The background shows an outline of existing buildings and vegetation. Views of the River Corrib is mostly screened by existing vegetation. Outline of the proposed development is partially visible in the background.
Visual Receptor Sensitivity: High
Magnitude of change: No appreciable change
Significance of Visual Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.
Cumulative Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.

V18 - Baseline View Summer

V18 - Baseline View Winter

V18 - Proposed View Summer

V18 - Proposed View Winter

Viewpoint 18 – Terriland Forest Park (north of the site)
View Description: View from Terriland Forest Park looking southwards.. The view comprises a local park. The foreground comprises a large grass area and a pedestrian path. The background shows an outline of existing buildings and vegetation. Outline of the proposed development is partially visible in the background.
Visual Receptor Sensitivity: Medium
Magnitude of change: Low
Significance of Visual Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.
Cumulative Effect: Slight. The affected view forms only a small element in the overall visual composition, or changes the view in a marginal manner.

Appendix 14-1

Appendix 8-3

Appendix 8-2