McCloy Consulting

Surface Water Management Plan

Carrigeen Renewable Energy Development, Co. Roscommon

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CONTENTS

1 INTRODUCTION 1
1.1 Terms of Reference 1
1.2 Statement of Authority 1
1.3 Water Framework Directive 1
1.4 Hydrological / Drainage Setting 1
2 PERMANENT DRAINAGE 2
2.1 Approach 2
2.2 Water Quantity Standards 2
2.2.1 Sub catchments 2
2.2.2 Drainage Schedule 5
2.2.3 Infiltration Design 6
2.2.4 Attenuation Design 6
2.2.5 Clean Water Drainage 6
2.2.6 Floated Track Drainage 6
2.3 Water Quality & Pollution Control 7
2.3.1 Wastewater Disposal 7
2.3.2 Pollution Control (Oil) 7
2.3.3 Water Quality Indices 7
2.4 Maintenance Requirements 9
3 PERMANENT WATERCOURSE CROSSINGS 10
3.1 Watercourse Crossing Design 10
3.2 Construction Phase Mitigation 10
3.3 Maintenance 11
4 CONSTRUCTION PHASE - TEMPORARY DRAINAGE 12
4.1 Preamble 12
4.2 Pollution Prevention Buffer Zones 12
4.3 Timing of Works 13
4.4 Temporary Drainage 13
4.4.1 Main Principles 13
4.4.2 Project-Wide Requirements 13
4.4.3 Clean / Polluted Water Separation 14
4.4.4 Temporary Track Drainage 14
4.4.5 Check Dams 14
4.4.6 Settlement Basins 15
4.4.7 Vegetative Filtration 15
4.4.8 Borrow Pit Drainage 15
4.5 Turbine Bases and Crane Pads 15
4.6 Cable Trenches 16
4.7 Dewatering 16
4.8 Spoil Management 16
4.9 Temporary Foul Drainage 16
4.10 Forestry Felling 16
4.11 Construction Phase Maintenance 16
4.11.1 Drains / Check Dams 17
4.11.2 Settlement Basins 17
4.11.3 Drainage Pipes 17

APPENDICES

Annex A Permanent Drainage - Layouts
Annex B Permanent Drainage - Details
Annex C Temporary Drainage - Layouts
Annex D Temporary Drainage - Details
Annex E Supporting Calculations
Annex F Watercourse Crossing Schedule

1 INTRODUCTION

1.1 Terms of Reference

Carraigin Power Ltd has appointed McCloy Consulting Ltd to prepare a Surface Water Management Plan (SWMP) to support a planning application for the proposed Carrigeen Renewable Energy Development (hereafter referred to as 'the Project').

The purpose of this SWMP assessment is to provide further details of proposed mitigation measures specifically in relation to management of surface water from the Project area where there is initially a perceived risk of deterioration in the Water Framework Directive (WFD) ecological status of any affected waterbody (refer to section 1.3 for further information), which would similarly be reflected as a significant adverse impact in Environmental Impact Assessment terms.

This appendix is intended to supplement the Environmental Impact Assessment Report (EIAR) specifically **Chapter 11: Hydrology and Hydrogeology, Technical Appendix 11.1: Flood Risk & Drainage Assessment** and **Technical Appendix 11.3: Water Framework Directive Assessment** submitted in support of the planning application for the proposal.

1.2 Statement of Authority

McCloy Consulting is an independent environmental consultancy specialising in the water environment, with specialist knowledge of hydrological assessments, hydraulic modelling, flood risk assessment, and drainage including Sustainable Drainage Systems (SuDS).

McCloy Consulting has ongoing involvement in numerous water environment studies and SuDS projects across the UK and Ireland and has developed expertise in surface water management for wind farms. The company has successfully designed numerous SuDS / surface water management solutions for wind farms in accordance with current best practice guidance. The primary personnel responsible for preparing this SWMP are:

- Duncan Hartwick *BEng (Hons) BSc (Hons) PEng* – Senior Engineer specialising in hydrology, hydraulic modelling, and SuDS / surface water management for wind farm and other developments in the UK and Ireland.
- Kyle Somerville *BEng (Hons) CEng MIEI* – Director and Chartered Engineer specialising in hydrology and surface water management for wind farm developments and has overseen outline and detailed design of surface water management for more than thirty onshore wind farm developments in the UK and Ireland including site supervision, direction, and monitoring.

1.3 Water Framework Directive

The European Water Framework Directive (2000/60/EC) was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003). It applies to rivers, lakes, groundwater, and transitional coastal waters.

A requirement of the WFD is to attain good ecological water status and that deterioration in the status of water is prevented. The Environmental Impact Assessment Directive (85/337/EEC) requires likely significant environmental impacts to be identified, assessed, and mitigated. An impact that would compromise achievement of a WFD objectives or result in the deterioration in the status of waters would be considered a significant impact.

Any new development must ensure that this fundamental requirement of the WFD is not compromised. **Chapter 11: Hydrology and Hydrogeology** of the EIAR outlines mitigation measures specifically in relation to surface water management (detailed further in this SWMP) to prevent deterioration of water quality and quantity. **Technical Appendix 11.3 Water Framework Directive Assessment** specifically assesses the effect of the proposed development on WFD objectives.

1.4 Hydrological / Drainage Setting

The hydrological setting is established at **Chapter 11: Hydrology and Hydrogeology** of the EIAR (hereafter 'EIAR Chapter 11').

2 PERMANENT DRAINAGE

2.1 Approach

The permanent drainage plan will drain the permanent tracks, hardstanding, and compound areas to their finalised footprint after removal of areas of temporary widening during the construction phase.

The approach to drainage planning adopts a sustainable drainage approach and considers water quantity (rate of discharge affecting flood risk), water quality (to protect downstream receptors), amenity (limited consideration at the Project location), and biodiversity (where water can be used to aid habitat management and improvement objectives).

2.2 Water Quantity Standards

Surface water drainage design is per the requirements of Roscommon County Council Development Plan and to the standards of Roscommon County Council Water Services Department, insofar as those standards apply to a development of this nature.

The County Development Plan includes objectives to promote the use of SuDS. SuDS components are considered in relation to the nature and character of the Project location. The SuDS design demonstrates how water quantity and quality are dealt with and makes provisions for amenity and biodiversity where practicable.

Parts of the Project will cause an increase in the peak rate and volume of runoff from the Project area if not mitigated. Permanent surface water drainage design therefore adopts SuDS principles and ensures that runoff from new impermeable and semi-impermeable surfaces (tracks, hardstanding, and ancillary infrastructure) is reduced to the pre-development greenfield rate. The principles adopted in the drainage plan are as follows:

The drainage system caters for protection for up to a 1% AEP rainfall event including allowance for climate change, common to the standard of protection for flooding from surface water drainage afforded by the Greater Dublin Strategic Drainage Study (GDSDS) as best practice.

Proposed changes of surface are limited to proposed permeable or semi-impermeable (unbound gravel) tracks, hardstanding areas at turbine crane pads, and hardstanding areas at the proposed substation. Flat lying track surfaces (gradients < 3%) will not require drainage where water would migrate vertically through the unbound gravel surface and subbase and respond to rainfall in an identical way as existing greenfield runoff.

On all other steeper sections of tracks (conservatively adopted as >3%, where highly efficient permeable pavements are unsuitable at gradients >5%) where runoff is likely to flow laterally rather than infiltrate, runoff from access tracks shall be collected via open swales. Runoff shall be attenuated with the use of check dams in order to reduce the peak rate of runoff and to encourage infiltration of surface water. Outlets from swales will discharge to a control feature (basin) where water will be controlled and discharged. Disposal of water from positively drained areas will adopt a hierarchical approach to suit guidance in the SuDS manual and will either (in decreasing order of preference):

- be by infiltration at a designed feature (infiltration basin, infiltration other, soakaway)
- be attenuated in an attenuation basin to a greenfield equivalent rate (Qbar) with the attenuated discharge being encouraged to disperse overland via a “level spreader”
- where a discharge to a watercourse is unavoidable, be attenuated in an attenuation basin to a greenfield equivalent rate (Qbar) and discharged via an outlet to a watercourse or drain.

Proposed permanent surface water drainage (SuDS) layout and typical detail drawings are included in Annex A and Annex B respectively.

2.2.1 Subcatchments

For the purposes of forming the basis for calculations, semi-impermeable areas have been split into sub-catchments and are shown on Figure 2.1 and Figure 2.2 (overleaf).

Figure 2.1: Drainage Plan Subcatchment Map – Project Site (West)

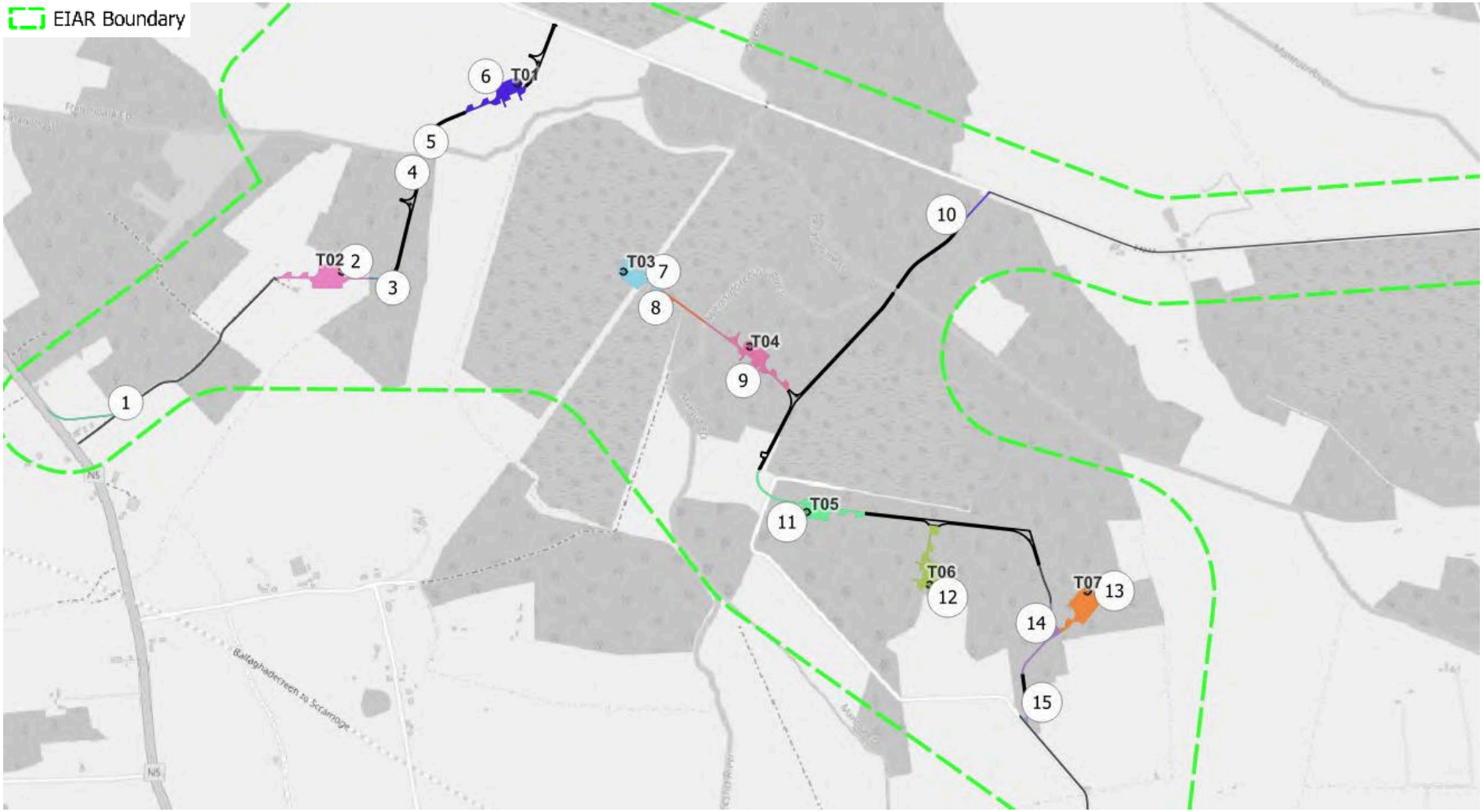
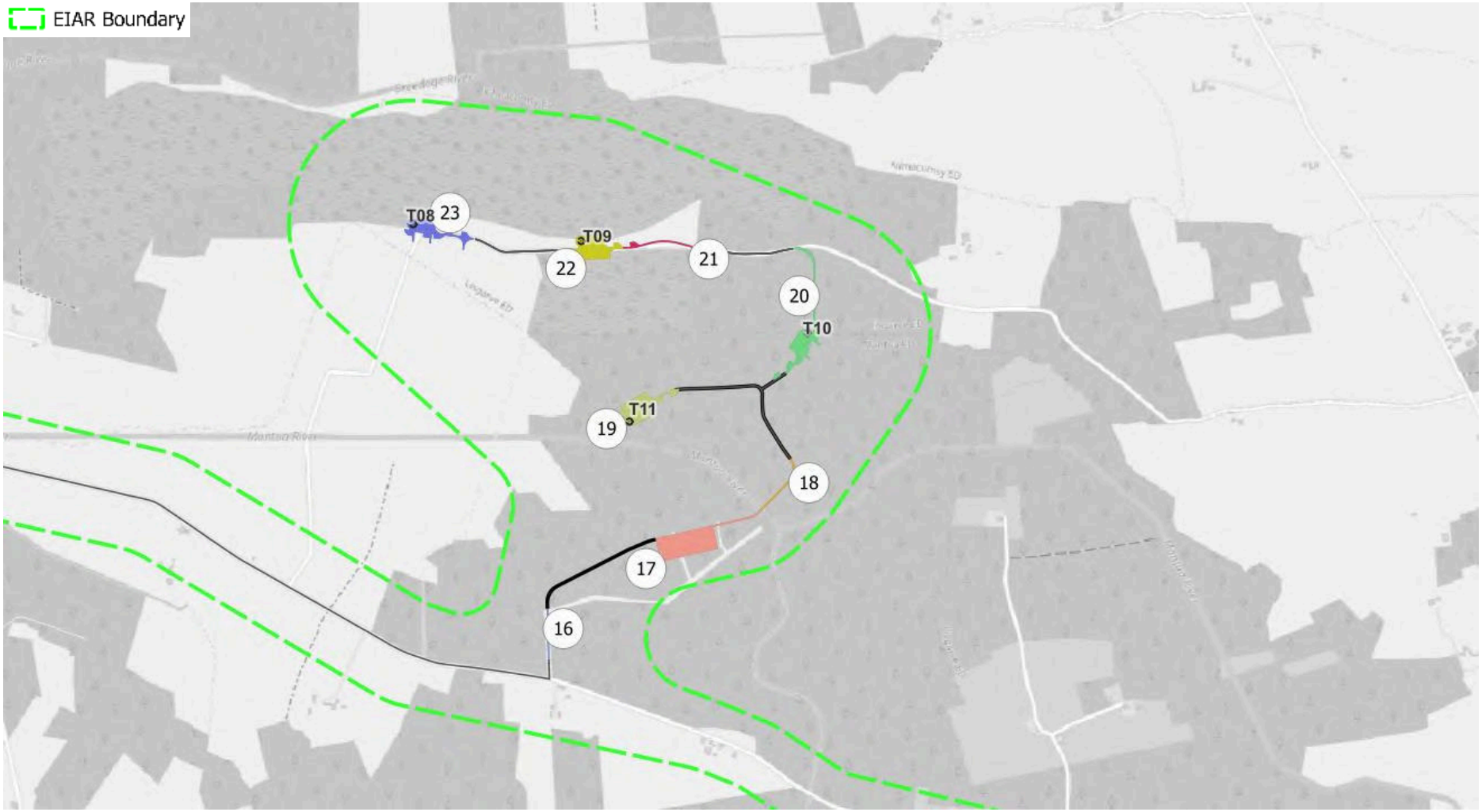


Figure 2.2: Drainage Plan Subcatchment Map – Project Site (East)



2.2.2 Drainage Schedule

A summary of the drainage approach per Subcatchment is scheduled in Table 2.1.

Table 2.1: Drainage Subcatchment Schedule

Catchment ID	Area (sq. m)	Drainage Approach	Discharge Rate (lps)
1	1022	Attenuated discharge overland by level spreader	2
2	7072	Attenuated discharge to watercourse	6.2
3	224	Attenuated discharge to watercourse	2
4	152	Attenuated discharge to watercourse	2
5	234	Attenuated discharge to watercourse	2
6	5165	Attenuated discharge to watercourse	4.5
7	4626	Attenuated discharge overland by level spreader	4.1
8	1000	Attenuated discharge to watercourse	2
9	6141	Attenuated discharge to watercourse	5.4
10	681	Attenuated discharge overland by level spreader	2
11	6068	Attenuated discharge overland by level spreader	5.3
12	5366	Attenuated discharge overland by level spreader	4.7
13	6390	Attenuated discharge to watercourse	5.6
14	1820	Attenuated discharge to watercourse	2
15	333	Attenuated discharge overland by level spreader	2
16	717	Attenuated discharge overland by level spreader	2
17	12003	Attenuated discharge to watercourse	10.5
18	995	Attenuated discharge to watercourse	2
19	6643	Attenuated discharge to watercourse	5.8
20	6289	Attenuated discharge overland by level spreader	5.5
21	1331	Attenuated discharge overland by level spreader	2
22	6374	Attenuated discharge overland by level spreader	5.6
23	5537	Attenuated discharge overland by level spreader	4.9

2.2.3 Infiltration Design

Ground conditions within the Project are not suitable for infiltration. Geology and soils are described in **EIAR Chapter 10: Soils & Geology.** Teagasc soil mapping indicates that the Project area is underlain by peat.

2.2.4 Attenuation Design

The preliminary drainage plan intends for surface water from the Project to discharge either overland or directly to a watercourse via an attenuation basin. A flow control shall be installed at the basin outflow point to ensure that flows are discharged at a greenfield limited rate up to the 1% AEP climate change event. This will ensure that there is no impact on flooding elsewhere.

Basin storage calculations have not included for storage provided within the drainage conveyance system (i.e., by the check dams in swales). The attenuation basin sizes determined are therefore considered conservative.

The pre-development greenfield runoff rate has been determined based on methods described in IoH124. Qbar based on observations per the Wallingford method indicating a WRAP class of 4 is adopted and is consistent with the Teagasc soil description and observed ground conditions.

The volume control approach for purposes of the design conservatively excludes long term storage and infiltration losses and therefore adopts a flow control rate of Qbar or a maximum of 2 lps/ha but a minimum practicable flow control rate of 2 lps to manage potential maintenance / blockage issues.

Proposed permanent surface water drainage (SuDS) layout and typical detail drawings are included in Annex A and Annex B respectively. Supporting calculations are included in Annex E.

2.2.5 Clean Water Drainage

The permanent drainage plan includes clean water drainage pipes where tracks are to cross existing Project boundaries / drains and natural surface water flow routes / depressions to allow for clean water to pass through and under track structures separate to drainage provided for track runoff. This ensures existing natural flow routes are maintained and minimises landslide susceptibility and impact on wildlife habitat.

2.2.6 Floated Track Drainage

Track formation shall be subject to detailed design following future geotechnical investigations. Where a floated construction type is specified, existing drainage paths are not to be unnecessarily re-routed or changed. Existing drainage paths and overland flow-routes should be maintained through the placement of drainage pipes at existing land drainage locations and / or at regular intervals. There will likely be a need to revisit drainage pipes as the floated track deflects causing pipes to deform.

Track runoff will be directed over the edge of the track structure to discharge across existing vegetation to allow filtration / settlement of suspended solids. Locations of indicative floated track crossing pipes are shown on drawings included in Annex A.

2.3 Water Quality & Pollution Control

2.3.1 Wastewater Disposal

Wastewater from the staff welfare facilities in the control building will be collected in a sealed storage tank, fitted with a high-level alarm. This is a device installed in a fuel storage tank that is capable of sounding an alarm during a filling operation when the liquid level nears the top of the tank. Wastewater will be tankered by a licensed waste collector to the nearest wastewater treatment plant. There will be no on-site treatment of wastewater.

2.3.2 Pollution Control (Oil)

Requirements vary dependent on drained surface type and specific measures are in place dependent on the proposed land use.

Operations on the Project location will involve infrequent visits by non-permanent staff. The Project has been assessed as having sufficiently few traffic movements to be low risk (i.e., risk of infrequent light contamination and small spills only). The operational phase risk of minor spillages will be managed through the provision of SuDS, which in sequence (swales to basins) provides a pollution control "management train".

Section 20 of the Greater Dublin Region Code of Practice for Drainage Works states that appropriate interceptors must be installed where SuDS cannot be utilised or in areas where there is a risk of pollution by petrol, oil, silt, and / or other suspended materials. The substation / control compound includes transformers that use oil. However, all oil storage is integrally bunded, or external bunds are covered and not drained. The Project will be drained via a comprehensive SuDS management train. No oil interceptor or separator is required.

Effectiveness of the proposed SuDS components in managing and remediating pollutants, using the CIRIA SuDS Manual 'Simple Index Approach' is outlined in the following sections.

2.3.3 Water Quality Indices

Provision of water quality protection and treatment of runoff is per the 'Simple Index Approach' outlined in the CIRIA SuDS Manual. The permanent access track, cranepads and substation area are taken as land use with low pollution risk, Table 26.2 of the SuDS Manual defines the pollution hazard as low, with pollution indices as follows.

- Total Suspended Solids 0.5
- Metals 0.4
- Hydrocarbons 0.4

Provision of permeable surfaces, swale and infiltration basin in sequence will have a Pollution Mitigation Index per Table 26.3 and 26.15 of the SuDS Manual as shown in the following tables.

In relation to Table 2.1, discharges from attenuation basins that discharge overland via level spreader have an additional stage of treatment (percolation through drainage stone, percolation and filtration over intact vegetated ground) which further increases the water quality provision. In summary there is certainty that the permanent drainage will ensure that runoff from the proposed development is treated to a standard that would not cause an adverse change to water quality elsewhere.

Table 2.2: Water Quality Indices – Infiltration from Subbase

Pollutant	Source Hazard Index	Permeable pavement / surface	Total Mitigation Index	Sufficient?
TSS	0.5	0.7	0.7	Yes
Metals	0.4	0.6	0.6	Yes
Hydrocarbons	0.4	0.7	0.7	Yes

Table 2.3: Water Quality Indices – Trackside drainage to Infiltration Basin

Pollutant	Source Hazard Index	Swale	Infiltration Basin (0.5 mitigation index)	Total Mitigation Index	Sufficient?
TSS	0.5	0.7	0.025	0.725	Yes
Metals	0.4	0.4	0.025	0.425	Yes
Hydrocarbons	0.4	0.6	0.025	0.625	Yes

Table 2.4: Water Quality Indices – Trackside drainage to Attenuation Basin

Pollutant	Source Hazard Index	Swale	Infiltration Basin (0.5 mitigation index)	Total Mitigation Index	Sufficient?
TSS	0.5	0.5	0.25	0.75	Yes
Metals	0.4	0.6	0.25	1.0	Yes
Hydrocarbons	0.4	0.6	0.3	1.0	Yes

2.4 Maintenance Requirements

Permanent drainage assets shall be the responsibility of the Project operator to maintain. The developer shall put in place drainage management procedures as part of the overall facility management. Maintenance plans for drainage features are shown in the following table.

Table 2.5 Permanent Drainage – Operational Maintenance Schedule

Feature	Maintenance Requirements	Time
Swales	Vegetation maintenance – replace / repair scour Rebuild check dams	Inspect annually. Repair as required.
Attenuation Basins	Vegetation control – clear obstructions Inlets & outlets – clear obstructions	Annual and / or After significant storm events
Infiltration Basin	Excessive depth or duration of standing water within basins following a rainfall event (48hrs +) may indicate failure of infiltration due to blinding of the base with fine sediment. Maintenance requirements would entail removal of silt by excavator and reinstatement of the basin in accordance with design drawings. Compacted or smeared soil layers in basins should be loosened by mechanical tilling (min. top 300mm) and re-planted	To suit observed conditions
Level Spreaders	Vegetation control – clear obstructions Clearing / replacement of drainage stone Checking for blockage of perforated outlet pipes and jetting as required.	Inspect annually. Repair as required.
Flow control devices	Checking of devices for siltation/blockages and clearing as required Checking of device outlets for damage and undertaking remediation	Annual and / or After significant storm events
Oil Interceptors	Clearing / desludging	Per manufacturers recommendations and after any spills
Inlets / Gullies / channels	Checking for siltation / blockage and jetting as required	Annual and / or After significant storm events

3 PERMANENT WATERCOURSE CROSSINGS

3.1 Watercourse Crossing Design

To allow the built footprint of the proposed development, six (6) watercourse crossing are required; five (5) on 'major' watercourses and one (1) on a 'minor' watercourse. No other temporary watercourse crossings are required.

Works to watercourse crossings will be subject to authorisation by the Office of Public Works (OPW) under Section 50 of the Arterial Drainage Act 1945.

A sufficiently detailed design to allow assessment of environmental effects has been prepared as part of this assessment. Final design of watercourse crossings will be undertaken at detailed design stage, post planning consent.

The following guidance has been adhered to in the preliminary design and will be similarly applied in the detailed design of watercourse crossings:

- OPW Section 50 guidance / standards: Culverts are designed to convey the 1% AEP flood including allowance for climate change with free inlet conditions. Hydrological analysis is based on appropriate Irish hydrology methods to determine design flows.
- CIRIA culvert design and operation guide (C689).
- Fisheries considerations shall incorporate guidance stated in 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' as published by Inland Fisheries Ireland (2016).

Minimum dimensions have been established based on site-specific hydraulic modelling and are presented in Annex F. Factors considered in the design of all watercourse crossings:

- Crossing directions will generally to be perpendicular with access track direction to minimise the length of watercourse affected.
- Consideration of the passage of out-of-bank flood flows.
- Additional mitigation will be designed to prevent pollution of the watercourse during the construction of the watercourse crossings to reduce residual risk (i.e., temporary installation of silt fences in the watercourse downstream or similarly effective measures).

Design ensures that culverts are installed at a level lower than existing bed levels in order to create a 'stilling' effect and reduce potential for increased local flow velocities in the culvert in addition to promoting the formation of a natural substrate within the culvert.

3.2 Construction Phase Mitigation

Residual risk to watercourses specific to the construction stage will be fully addressed in the Contractor's construction method statement and will include the following:

- Works to install all crossings shall be programmed to coincide with a period of anticipated low drain flow and firm ground conditions in order to minimise potential for silt laden runoff draining toward the stream.
- For closed crossings (culverts) the channel will be dammed upstream of the proposed culvert location using sandbags or similar in order to provide a dry working environment at the culvert location. Dammed flows will be pumped out of channel and returning directly to the drain shortly downstream of the culvert location. Erosion protection shall be placed at the point of pump return. All pumping will be controlled on a contractor permit-to-pump scheme, such that pumping operations can be carefully planned, installed and monitored.
- Geotextile silt fences shall be installed adjacent to the drain bank upstream and downstream of the culvert location to filter contaminated runoff that may be caused by plant movement associated with the culvert installation. A sequence (minimum 2 no.) in-channel geotextile check dams will be installed within the drain channel downstream of the culvert location and downstream of the pump-return.
- The culvert comprising pre-cast concrete or pre-formed plastic pipes shall be installed and backfilled with suitable aggregate. Headwalls and scour protection to the drain bed shall be formed at the culvert inlet and outlet using dry formed components (lean-mix concrete-filled sandbags or similar). Washed gravel or pebbles (including if feasible that material recovered from the natural substrate

excavated to permit the culvert installation) shall be introduced to cover and protect the extent of the drain channel affected by excavations. No wet concrete or cementitious material shall be required to be used within the channel.

- Over pumping and upstream dams shall be removed and water permitted to pass through the culvert. Downstream in-channel filtration check dams shall be retained and renewed as necessary in order to trap sediment until any residual washout of sediment from the exposed excavation has stabilised to a normal (pre-construction) level.
- Geotextile or equivalent splash-guards shall be erected to the track embankment over the culvert or clear span crossing prior to trafficking.

3.3 Maintenance

Permanent drainage assets shall be the responsibility of the Project operator to maintain. The developer shall put in place drainage management procedures as part of the overall facility management. Maintenance plans for drainage features are shown in the following table.

Table 3.1 Permanent Culverts – Operational Maintenance Schedule

Feature	Maintenance Requirements	Time
Culvert Inlets / outlets	Vegetation maintenance – remove Clear siltation and debris causing blockage	Inspect twice annually and after significant storms. Repair as required.
Culvert barrel	Inspect (visual / by camera) for cracking / fracturing and deflection. Repair as required.	Inspect prior to any heavy traffic movements for maintenance during the operation phase.

4 CONSTRUCTION PHASE - TEMPORARY DRAINAGE

4.1 Preamble

The following key considerations have been identified in the planning-stage design of hydrology and drainage for the Project to preserve water quality, downstream hydrology and preserve stream morphology sufficiently that there is certainty that the measures can be implemented effectively and to ensure that the assessment of residual effects can be predicted with certainty. The measures at planning stage will provide a framework within which any future design will match or better. Key concerns addressed by the planning-stage design are as follows:

- Definition of Buffer Zones;
- Separation of 'clean' and 'dirty' water; and
- Management and treatment of reduced quality runoff from the works ("dirty water").

A temporary works SuDS design has been prepared for purposes of the planning application. The design as presented in the planning application is conservative in its approach and is sufficiently detailed to allow a robust appraisal of the scheme in EIAR terms, including consideration of the scheme earthworks footprint. Temporary drainage layouts prepared to inform the planning application are shown at Temporary Drainage Management Drawings at Annex C.

Specific requirements to be imposed on any Contractor involved in the construction of the scheme will be further outlined in a detailed Construction Environmental Management Plan (CEMP) which will include Construction Method Statements, which can be subject to be approval by the relevant local authority prior to construction.

All personnel will be made aware of their environmental responsibilities of the Project induction prior to being allowed to work on Project location, and through the production of a Method Statement outlining Environmental Requirements for Sub-Contractors, which will include environmental emergency response procedures to deal with spillages, should they occur.

This section of the report outlines the steps which will be undertaken during the construction phase of the project to ensure compliance with relevant best practice guidance stated in **EIAR Chapter 11**. Project area visits by the SuDS Engineer will be agreed in advance and will be undertaken at various stages of the construction process to ensure that the proposed SuDS scheme is being constructed in line with the design.

Essential mitigation measures relevant to controlling erosion and runoff from construction of the SuDS are described in best practice guidance stated in **EIAR Chapter 11.**

The measures proposed for the Construction Phase shall be similarly implemented for the Decommissioning Phase.

4.2 Pollution Prevention Buffer Zones

Buffer zones to water features have been established within the Project Boundary / EIAR boundary and outlined in **EIAR Chapter 11.** Proposed infrastructure is designed to lie out with stated hydrological buffer zones as described in the EIAR.

The same buffers and additional buffers to known potable water supplies will apply during the construction phase to limit the types of construction activities permissible in proximity to water, and to ensure additional precautions are applied in relation to pollution prevention (spills etc.). Buffer areas will act as riparian zones allowing filtration and settlement, minimising sediment transport, attenuating flows and maximising infiltration.

Construction phase buffers are shown on the Temporary Drainage Management Drawings at Annex C. The following procedures apply to the general construction activities in the vicinity of watercourses (i.e., within buffer zones):

- Due cognisance will be given to the prevailing ground conditions and season when programming the execution of the works, to seek to undertake the works in a period with low potential to cause introduction of silt laden runoff to on-site water features;

- Works will be planned so that trackside drains do not discharge directly into watercourses, but rather through a buffer area of adequate width or via a constructed settlement feature such as pond or sequence of silt fences;
- Cement and concrete will be kept out with buffer zone to avoid contamination of watercourses;
- Runoff from excavations will not be pumped directly to watercourses. Where dewatering of excavations is required, water shall be pumped to the head of a treatment train (swale, basin, or detention pond) to receive full treatment prior to re-entry to the natural drainage system; and
- SuDS treatment techniques will be utilised to remove silts from runoff prior to the discharge of flows over open vegetated areas.

If a specific short-term risk to water quality is identified, specific localised measures will be implemented including:

- Placing temporary filtration silt fences within drainage channels where siltation is observed; and
- Installing temporary constructed settlement features such as sumps or settlement ponds / lagoons where required.

4.3 Timing of Works

Works on the Project area likely to cause a high risk to surface water will be programmed to avoid unfavourable prevailing ground conditions and high volumes or extended periods of seasonal rainfall. Project clearance will take place in advance of construction works.

4.4 Temporary Drainage

4.4.1 Main Principles

During the construction phase the following principles have been employed when planning temporary drainage requirement:

- "Clean" drainage / runoff from land upslope of the works footprint will be managed through or around the works in order to avoid mixing clean and "dirty" water;
- Reduced quality runoff ("dirty water") from the works will be managed and treated before it is discharged to any watercourse;
- Dirty water collected in temporary drainage will be dispersed frequently overland to allow filtration in vegetation, which is likely to be more effective in removing sediment than larger settlement basins; and
- Significant accumulations of dirty water at low points where water will be treated at temporary settlement ponds prior to any discharge to a watercourse.

The measures are more fully described in the following sections.

4.4.2 Project-Wide Requirements

Temporary pollution prevention measures and temporary or permanent drainage and surface water management features (SuDS) will be constructed prior to earthworks (including preliminary or enabling works including felling) proceeding to construct any linear works (tracks / hardstanding areas / cable routes), turbine bases, and other infrastructure. Drainage will be provided to temporary works and reinstated to suit the final footprint of the completed development.

Temporary drainage measures in advance of earthworks will include:

- Temporary silt fences erected in areas where risk of pollution to watercourses has been identified e.g., watercourse crossing locations and areas where development (such as felling) unavoidably lie within watercourse buffer zones;
- Upslope cut-off drainage channels approximately parallel to the proposed track alignment installed in advance of any excavated cuttings for the track or turbine hardstanding areas. This will prevent washout by surface flows of exposed clays in excavations and fine sediments in track makeup, and increase efficiency of silt removal in future trackside drainage swales;
- Minor drains, other flow paths and cut-off drain outlet locations will be identified and charted, to ensure that piped crossings can be installed in advance of or adjacent to the track construction;

- Settlement ponds will be constructed in advance of commencing excavations for foundations and at any other locations identified as required at detailed design stage; and
- Trackside drainage swales will be installed in parallel with track construction. Note that this may require that drainage swales are reformed on an ongoing basis as temporary track alignments are modified to their eventual finished design level.

In addition, spoil management is to be planned in advance of earthworks and on an ongoing basis, to allow planning of drainage required in advance of spoil being deposited.

Suitable prevention measures will always be in place to prevent the conveyance of silts to receiving watercourses.

4.4.3 Clean / Polluted Water Separation

Drainage management ensures that significant flows of clean water is not permitted to mix with contaminated water from sources such as excavation dewatering or track runoff, where "clean water" should be interpreted as natural surface runoff unaffected by construction / earthworks runoff.

Design ensures that upslope cut off ditches are to be installed to intercept and divert clean upslope surface water runoff flowing overland prior to meeting areas of excavation. Design and construction sequencing ensures that clean water cut off ditches are installed ahead of main earthworks wherever practical. This is intended to reduce the flow of clean water onto any exposed areas of rock and soil, thereby reducing the amount of potential silt laden runoff requiring treatment.

Installed drainage allows provision for clean water intercepted in cut-off ditches to pass through and under track structures separate to drainage provided for track runoff.

Temporary silt / pollution prevention and scour protection measures (such as check dams) is provided in artificial clean water drainage installed to mitigate potential for scouring and transport of sediment from newly excavated channels.

Diversion drainage is to be dispersed over vegetated ground. Diversions are designed to avoid collection and interception of large catchments creating significant point flows, with associated risks due to scour and hydraulic capacity. Temporary drainage is intended to be reinstated on completion of the temporary works.

4.4.4 Temporary Track Drainage

All track runoff (dirty water) will be directed to flow to ditches / swales installed to the track-edge, to be installed as tracks are constructed.

Dirty water will be discharged via frequent spillways created on the downhill sides of the access tracks.

Temporary drainage will be reinstated to the permanent drainage (refer to Section 2) to suit the permanent infrastructure footprint. Drainage track shoulders will be re-vegetated as soon as feasible after completion of the track and drainage across the Project coverage.

4.4.5 Check Dams

Initial treatment is provided "at source" by check dams installed within trackside drainage at regular frequencies, to reduce flow velocities and improve conditions for the settlement of solids in transit.

Check dams shall be of stone formation however compacted clay check dams may be used should suitable stone be unavailable locally.

Where stone is used, the aggregate used to form check dams will be a small 'clean' graded stone. On steeper slopes the check dams will be anchored using larger stone placed on the downhill side of the check dam to prevent washing away of the smaller graded stone.

The check dams will serve dual functions, by both removing and settling out silts and reducing flow velocities, therefore mitigating against the effects of erosion within the swale and improving the design life of end of line settlement and attenuation features.

4.4.6 Settlement Basins

Washout pits to be located local to large excavations (i.e. turbine bases) are to accommodate the anticipated volume of contaminated water to be removed from the excavation, either through unavoidable surface water runoff or accumulation of shallow groundwater. Washout pits for concrete (washdown of concrete delivery plant) will be treated separately and shall be lined, with washwater removed for treatment offsite.

4.4.7 Vegetative Filtration

Wherever possible, runoff from swales, ponds, or other pumped discharges will be dispersed over undisturbed intact vegetation, nominally over agreed riparian watercourse buffer zones, to allow vegetative filtration of runoff prior to water entering receiving watercourses.

4.4.8 Borrow Pit Drainage

Borrow pits represent a significant potential source of reduced quality runoff due to dust from blasting and rock breaking, potential for encountering shallow groundwater in excavations, accumulation of rainwater in excavations and trafficking by heavy plant causing sludge.

Temporary drainage will be installed prior to opening of borrow pits. The approach to drainage ensures that clean runoff flowing toward or over the borrow pit is diverted either in cutoff drainage and bunds formed from cutoff ditch excavation to the top of the cut slope, prior to commencement of clearing of overburden.

Settlement features are planned at the low point or adjacent to borrow pits, and internal drainage (or pumping) of accumulated water on the borrow pit floor shall discharge to settlement features. Settlement features treat runoff to an acceptable standard before discharging overland or discharging into proposed trackside drainage. The critical water quality event is likely to be a high intensity “first flush” rainfall event and as such a 1-hour design rainfall intensity is adopted, including allowance for climate change. Given the likely duration of main construction work and operation of temporary drainage, a 2-year return period storm is adopted.

Borrow pit drainage arrangements are shown on drawings included in Annex A.

4.5 Turbine Bases and Crane Pads

Excavated turbine foundations are likely to result in large volumes of displaced excavated material as spoil, as well as concrete operations. Specific measures are, therefore, required to manage potential for silt laden runoff from spoil, silt laden runoff from pumped dewatering, and cementitious contamination in pumped dewatering from turbine bases.

Concrete will not be allowed to enter watercourses under any circumstances, and drainage from excavations in which concrete is being poured will not be discharged directly into existing watercourses without appropriate treatment. Delivery trucks, tools and equipment will be cleaned at designated washout areas located conveniently and within a controlled area of the construction compound. Runoff from wash-out areas will be appropriately stored within bunded containers and removed by an appropriate waste disposal company. In addition, the following drainage measures will apply:

- Installation of cut-off drains around the working areas to intercept clean surface runoff and divert it around and away from the works;
- Minimising the stockpiling of materials and locating essential stockpiles outside any watercourse buffer zone;
- Polluted (silt laden) water collected in the base of any excavation would be gathered in a sump and pumped at a low flow rate into either the mini-settlement pond or track swale for treatment. Dewatering of excavations direct to watercourses will not be permitted; and
- The foundation working areas will be re-vegetated as soon as possible after construction.

4.6 Cable Trenches

The following shall apply to the construction of all cable trenches at the Project area:

- To minimise impacts from disturbance, cables will be laid in small trenches along the side of access tracks, as far as possible;
- Due cognisance will be given to the prevailing ground conditions and season when programming the execution of the works, to seek to undertake the works in a period with low potential to cause introduction of silt laden runoff from excavations;
- Excavation of cable trenches will be carried out over short distances, with frequent backfilling of trenches, to minimise opportunity for the ingress of water into open trenches;
- Temporary silt traps will be provided in longer trench runs and on steeper slopes; and
- Where constructed trackside swales are disturbed by cable installation, swale slopes will be correctly reinstated post infilling of the cable trench.

4.7 Dewatering

To control dewatering activities and to ensure that all dewatering allows for pollution prevention measures, a permit-to-work system will be implemented by the Contractor, particularly to ensure pumped dewatering from excavations is controlled. A permit will be required to be issued to a competent person prior to allowing any specific dewatering to commence.

4.8 Spoil Management

Design of permanent and temporary spoil management ensures the following:

- There will be no depositing of material within the watercourse buffer zones.
- Spoil shall be placed in such a manner to ensure no ponding of surface water on top of spoil heaps. Temporary spoil will be graded to ensure that all direct precipitation will run directly off the surface.
- Temporary spoil deposition areas ensure that natural flow paths (drainage channels) are not altered or blocked by deposited spoil.

4.9 Temporary Foul Drainage

The project will include an enclosed wastewater management system at the temporary compound capable of handling the demand during the construction phase with 52 to 65 at peak. A holding tank is proposed for wastewater management. Wastewater will be removed weekly, by a licensed wastewater disposal company and disposed at an appropriate licenced facility, likely to be situated in the Drogheda area.

4.10 Forestry Felling

Felling to facilitate construction works will take place prior to groundworks commencing. Water protection measures will reduce the risk of suspended solids and nutrient release in surface watercourses.

- Felling and extraction of timber, as far as possible, should be conducted during periods of dry weather. During a period of heavy rainfall, harvesting works should cease until the Project area has dried out to reduce the risk of siltation, rutting and soil compaction; and
- Any drains crossed during the extraction phase to be kept clear of any residues/debris to ensure no drainage issues arise for the remaining trees.

4.11 Construction Phase Maintenance

It is envisaged that an Engineer specialising in surface water management and SuDS would be required to undertake Project inspections during the construction phase of the wind farm, to validate that any detailed SuDS design and associated requirements to ensure construction methods are adhered to and in order to identify areas where additional or enhanced mitigation is required.

In addition to the regular Project inspections carried out by the Engineer, the following inspections will be undertaken during the construction phase of the project. The list is not exhaustive and will be added to as per the requirements of the Project.

4.11.1 Drains / Check Dams

- All check dams and settlement basins to be checked weekly in dry weather and daily during periods of heavy rainfall via a walkover survey during the construction phase. Excess trapped silt to be removed and disposed of / re-used as may be agreed with relevant authorities;
- Where check dams have become fully blocked with silt, they will be replaced. Procedure for replacement of the check dam as follows:
    - silt deposits to be removed from the upstream side of check dams;
    - removed silt to be buried or re-used by spreading in an area of the Project where surface runoff will not convey silt deposits back to a watercourse;
    - where there are regular incidents of check dam blockage further check dams to be installed (every 15-20 m intervals) within the swales;
- Should there be noticeable effects of erosion along the swales or at discharge points, suitable erosion protection measures such as placement of large stones or erosion protection textiles will be installed at the area affected; and
- Any temporarily stored or stockpiled material will be placed in a manner to ensure stability and set back sufficiently far such that in the case of unforeseen collapse, spoil would not cause infilling of swales.

4.11.2 Settlement Basins

- Basin inlets to be cleared of debris;
- Silt in aggregate forebays to be removed by excavator and disposed of. Any aggregate removed to be replaced with clean stone; and
- Any flow control device (orifice, weir or similar) to be checked and cleared of any debris.

4.11.3 Drainage Pipes

- Piped drainage (clean water / dirty water) to be monitored at inlets. Silt to be removed by hand or by excavator and disposed of; and
- Pipe deflection to be monitored. Ineffective gradients to be identified and pipes excavated and replaced to ensure drainage function.

Annex A

Permanent Drainage - Layouts

NOTES:

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2. All locations of suds features identified are approximate and to be refined on an observational basis dependant on local topography and track alignment / micrositing.
3. Additional temporary drainage / mitigation will be provided during the construction phase on an observational basis.
4. All drainage management features shown should be read in conjunction with relevant typical detail drawings.

POLLUTION PREVENTION
5. Temporary or permanent drainage / silt management features including settlement features and drainage crossings should be installed prior to or in parallel with construction of new access roads / hardstanding to prevent the conveyance of silts to receiving watercourses.
6. Interim measures to be employed in all instances where work carried out is likely to cause adverse environmental impacts through increased silt loadings being generated during the construction phase.
7. Oil fuel should be stored within containment and cement should be mixed within compound / containment, tools washed in the same area and water recycled (in the cement mix).
8. Direct discharge of untreated track drainage to watercourses shall not be permitted.
9. DO NOT pump water direct to watercourses.
10. DO NOT strip vegetation from existing ditches unless absolutely necessary.
11. If water pollution is identified the following steps should be adhered to:
STOP - Work in the immediate area should be stopped and the source of the pollution identified
CONTAIN - The source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.
NOTIFY - The relevant authorities and Client/Developer should be notified immediately to ensure that measures can be implemented downstream to protect fish habitat and other sensitive areas.

TRACK / INFRASTRUCTURE DRAINAGE
12. Temporary upslope cutoff / diversion drainage to be installed in advance of main earthworks in areas indicated in order to minimise surface water ingress to excavations
13. Settlement/attenuation ponds are retained following completion of construction activities.
14. Batters of swales to have dimensions as per separately issued typical detail drawing. Swale to be re-vegetated with local species.
15. Slopes of swales to be vegetated or protected from erosion until vegetation has been established. Stripped vegetative layer from excavations to be stored locally and used to line slopes and base of swale. Vegetative layer to be placed into swale after construction of the swale.
16. Clean stone check dams to be installed in all drainage channels in order to promote settlement of suspended solids and control flow rates. Check dams generally to be locally won well graded stone. Aggregate size for stone check dams to be typically 5-40mm clean stone. On steep sections small stone to be anchored through the placement of 100mm stone on the downhill face of the check dam
17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
19. All HDPE pipes shall be twinwall type, BBA HAPAS approved.
20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
22. The level of silt in runoff during construction is to be monitored visually and excessive silt levels in any area to be temporarily managed through use of silt fences / constructed settlement features.
23. Build-up of silt levels at check dams to be removed and disposed of. Silt levels at check dams to be visually inspected as part of an ongoing maintenance programme during the construction phase. Where check dams become clogged with silt or vegetation, stone check dam to be removed and replaced subsequent to the removal of silt.

Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
1	Attenuated discharge overland by level spreader	1022	2	14	6 x 3 x 0.8

574100 574200 574300 574400 574500 574600 574700

789800 789700 789600 789500 789400

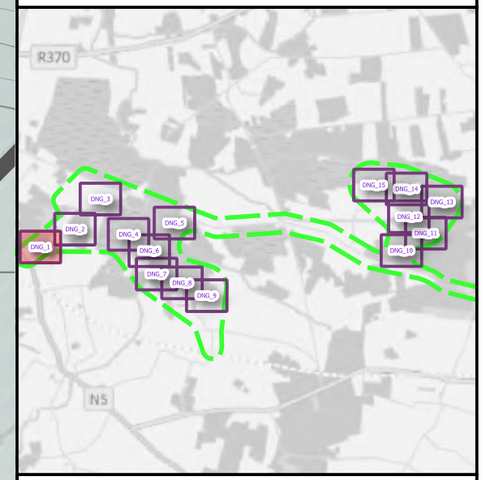
N

TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 1

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Existing Roads to be Upgraded
- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Permanent Drainage Features
- Dirty Track Drainage Pipe
- Clean Drainage Pipes
- Swale / Track Drainage with Check Dams & Breakouts
- Attenuation Basin
- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 1

PROJECT / FIGURE NO. M02232-01_DNG_1

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

574700 574800 574900 575000 575100 575200 575300

790100 790000 789900 789800 789700

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POLLUTION PREVENTION
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17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
19. All HDPE pipes shall be twinwall type, BBA HAPAS approved.
20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
22. The level of silt in runoff during construction is to be monitored visually and excessive silt levels in any area to be temporarily managed through use of silt fences / constructed settlement features.
23. Build-up of silt levels at check dams to be removed and disposed of. Silt levels at check dams to be visually inspected as part of an ongoing maintenance programme during the construction phase. Where check dams become clogged with silt or vegetation, stone check dam to be removed and replaced subsequent to the removal of silt.

Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
2	Attenuated discharge to watercourse	7072	6.2	126	21 x 5 x 1.2
3	Attenuated discharge to watercourse	224	2	2	2 x 1.5 x 0.6

N

REGULAR CROSS DRAINAGE CULVERTS TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

T02

Basin 2

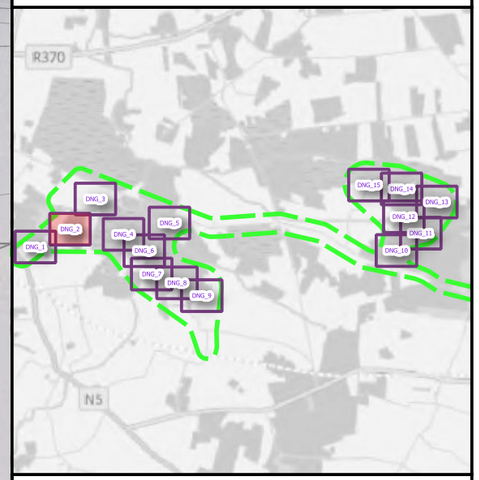
Basin 3

WX01

NEW WATERCOURSE CROSSING TO ALLOW FOR ACCESS TRACK. CULVERT SIZED TO OPW SECTION 50 STANDARDS. REFER TO WATERCOURSE CROSSING SCHEDULE.

0 50 100 150 200 m

KEY PLAN



LEGEND

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- Attenuation Basin
- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX01	66.72	Clear span bridge or bottomless culvert

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 2

PROJECT / FIGURE NO. M02232-01_DNG_2

DRAWN BY	SCALE	REVISION	DATE
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Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
4	Attenuated discharge to watercourse	152	2	1	2 x 1 x 0.6
5	Attenuated discharge to watercourse	234	2	2	2 x 1.5 x 0.6
6	Attenuated discharge to watercourse	5165	4.5	96	16 x 5 x 1.2

575100 575200 575300 575400 575500 575600 575700
790600 790500 790400 790300 790200

N

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

T01

TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 6

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 5

WX02

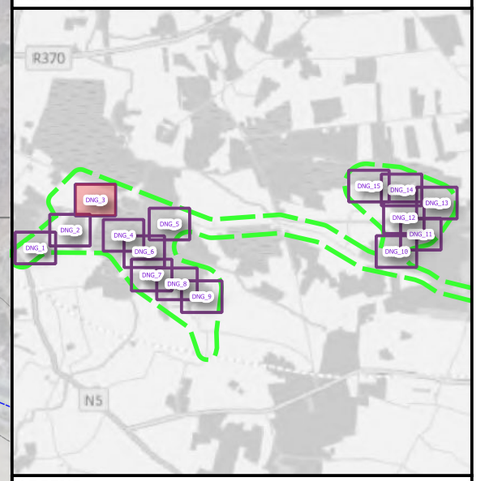
TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 4

NEW WATERCOURSE CROSSING TO ALLOW FOR ACCESS TRACK. CULVERT SIZED TO OPW SECTION 50 STANDARDS. REFER TO WATERCOURSE CROSSING SCHEDULE.

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
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- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints
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- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Permanent Drainage Features
- Dirty Track Drainage Pipe
- Clean Drainage Pipes
- Swale / Track Drainage with Check Dams & Breakouts
- Attenuation Basin
- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX02	66.62	Clear span bridge or bottomless culvert

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DESCRIPTION: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 3

PROJECT / FIGURE NO.: M02232-01_DNG_3

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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PLANNING DESIGN

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5. Temporary or permanent drainage / silt management features including settlement features and drainage crossings should be installed prior to or in parallel with construction of new access roads / hardstanding to prevent the conveyance of silts to receiving watercourses.
6. Interim measures to be employed in all instances where work carried out is likely to cause adverse environmental impacts through increased silt loadings being generated during the construction phase.
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TRACK / INFRASTRUCTURE DRAINAGE
12. Temporary upslope cutoff / diversion drainage to be installed in advance of main earthworks in areas indicated in order to minimise surface water ingress to excavations
13. Settlement/attenuation ponds are retained following completion of construction activities.
14. Batters of swales to have dimensions as per separately issued typical detail drawing. Swale to be re-vegetated with local species.
15. Slopes of swales to be vegetated or protected from erosion until vegetation has been established. Stripped vegetative layer from excavations to be stored locally and used to line slopes and base of swale. Vegetative layer to be placed into swale after construction of the swale.
16. Clean stone check dams to be installed in all drainage channels in order to promote settlement of suspended solids and control flow rates. Check dams generally to be locally won well graded stone. Aggregate size for stone check dams to be typically 5-40mm clean stone. On steep sections small stone to be anchored through the placement of 100mm stone on the downhill face of the check dam
17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
19. All HDPE pipes shall be twinwall type, BBA HAPAS approved.
20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
22. The level of silt in runoff during construction is to be monitored visually and excessive silt levels in any area to be temporarily managed through use of silt fences / constructed settlement features.
23. Build-up of silt levels at check dams to be removed and disposed of. Silt levels at check dams to be visually inspected as part of an ongoing maintenance programme during the construction phase. Where check dams become clogged with silt or vegetation, stone check dam to be removed and replaced subsequent to the removal of silt.

Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
7	Attenuated discharge overland by level spreader	4626	4.1	84	14 x 5 x 1.2
8	Attenuated discharge to watercourse	1000	2	12	5 x 3 x 0.8
9	Attenuated discharge to watercourse	6141	5.4	114	19 x 5 x 1.2

N

575600 575700 575800 575900 576000 576100

790100 790000 789900 789800 789700 789600

T03

TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 7

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 8

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 9

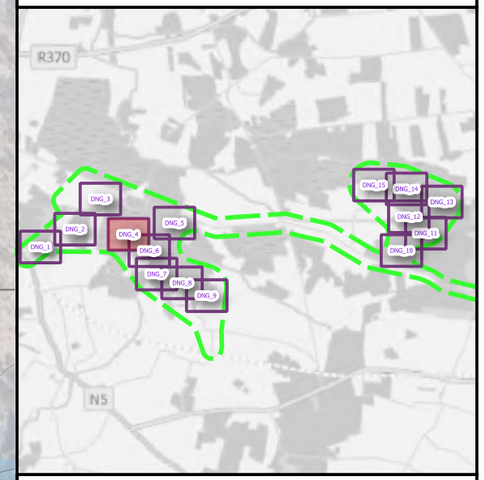
NEW WATERCOURSE CROSSING TO ALLOW FOR ACCESS TRACK. CULVERT SIZED TO OPW SECTION 50 STANDARDS. REFER TO WATERCOURSE CROSSING SCHEDULE.

WX03

T04

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure

- Existing Roads to be Upgraded
- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints

- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Permanent Drainage Features

- Dirty Track Drainage Pipe
- Clean Drainage Pipes
- Swale / Track Drainage with Check Dams & Breakouts
- Attenuation Basin
- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX03	66	Clear span bridge or bottomless culvert

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 5

PROJECT / FIGURE NO. M02232-01_DNG_4

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

576300 576400 576500 576600 576700 576800 576900

790200 790100 790000 789900 789800

NOTES:

GENERAL
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WATERCOURSE & TRACK DRAINAGE CROSSINGS
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21. Refer to Watercourse Crossing Schedule for min. soffit levels.

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Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
10	Attenuated discharge overland by level spreader	681	2	6	4 x 2 x 0.8

N

Basin 10

TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

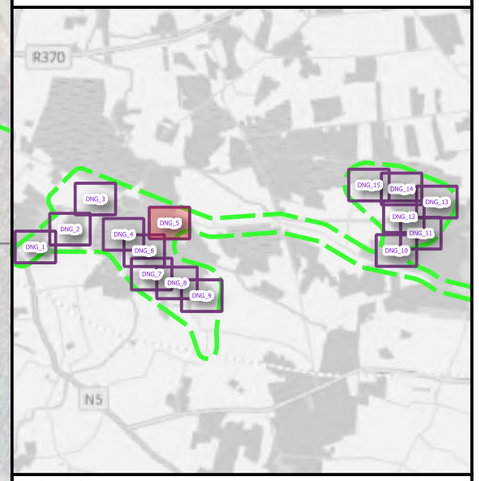
REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

NEW WATERCOURSE CROSSING TO ALLOW FOR ACCESS TRACK. CULVERT SIZED TO OPW SECTION 50 STANDARDS. REFER TO WATERCOURSE CROSSING SCHEDULE.

WX04

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Existing Roads to be Upgraded
- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Permanent Drainage Features
- Dirty Track Drainage Pipe
- Clean Drainage Pipes
- Swale / Track Drainage with Check Dams & Breakouts
- Attenuation Basin
- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX04	65.8	Clear span bridge or bottomless culvert

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DESCRIPTION: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 6

PROJECT / FIGURE NO.: M02232-01_DNG_5

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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PLANNING DESIGN

575900 576000 576100 576200 576300 576400 576500

789800 789700 789600 789500 789400

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WATERCOURSE & TRACK DRAINAGE CROSSINGS
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TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 8

Basin 9

WATERCOURSE CROSSING TO ALLOW

WX03

WATERCOURSE CROSSING SCHEDULE

T04

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

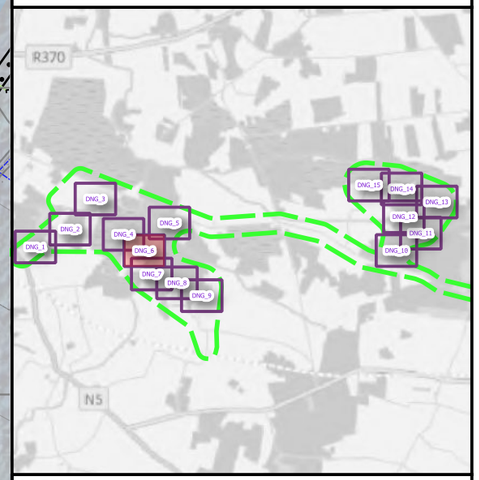
Basin 11

Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
8	Attenuated discharge to watercourse	1000	2	12	5 x 3 x 0.8
9	Attenuated discharge to watercourse	6141	5.4	114	19 x 5 x 1.2
11	Attenuated discharge overland by level spreader	6068	5.3	108	18 x 5 x 1.2

N

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Existing Roads to be Upgraded
- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Permanent Drainage Features
- Dirty Track Drainage Pipe
- Clean Drainage Pipes
- Swale / Track Drainage with Check Dams & Breakouts
- Attenuation Basin
- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX03	66	Clear span bridge or bottomless culvert

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DESCRIPTION: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 4

PROJECT / FIGURE NO.: M02232-01_DNG_6

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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PLANNING DESIGN

576000 576100 576200 576300 576400 576500 576600

789400 789300 789200 789100 789000

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Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
11	Attenuated discharge overland by level spreader	6068	5.3	108	18 x 5 x 1.2

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

Basin 11

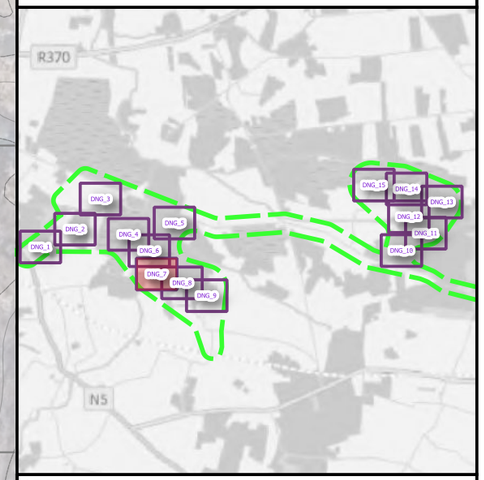
TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

T05

N

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

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DESCRIPTION	CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 7
PROJECT / FIGURE NO.	M02232-01_DNG_7
DRAWN BY	DH
SCALE	1:2000
REVISION	1
DATE	26/03/2026

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MAINTENANCE
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Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
12	Attenuated discharge overland by level spreader	5366	4.7	96	16 x 5 x 1.2
13	Attenuated discharge to watercourse	6390	5.6	114	19 x 5 x 1.2
14	Attenuated discharge to watercourse	1820	2	30	10 x 3 x 1

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

Basin 12

T06

WX05

Basin 14

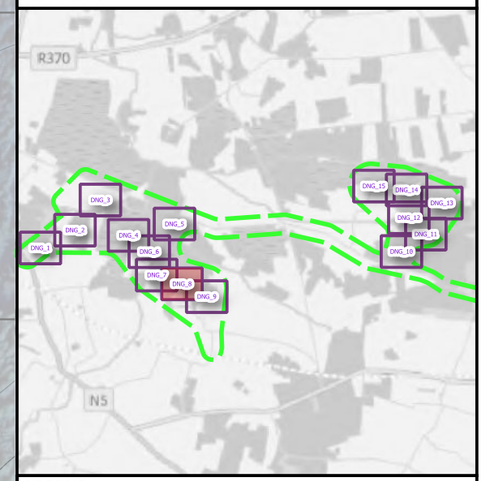
N

576500 576600 576700 576800 576900 577000

789300 789200 789100 789000 788900 788800

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure

- Existing Roads to be Upgraded
- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints

- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Permanent Drainage Features

- Dirty Track Drainage Pipe
- Clean Drainage Pipes
- Swale / Track Drainage with Check Dams & Breakouts
- Attenuation Basin
- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX05	68.4	Clear span bridge or bottomless culvert

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 8

PROJECT / FIGURE NO. M02232-01_DNG_8

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

NOTES:

GENERAL
1. Drawings are for planning and are not intended for construction and should not be used as such. For avoidance of doubt, surface water management design is intended to be further developed post-consent of the planning application.
2. All locations of suds features identified are approximate and to be refined on an observational basis dependant on local topography and track alignment / micrositing.
3. Additional temporary drainage / mitigation will be provided during the construction phase on an observational basis.
4. All drainage management features shown should be read in conjunction with relevant typical detail drawings.

POLLUTION PREVENTION
5. Temporary or permanent drainage / silt management features including settlement features and drainage crossings should be installed prior to or in parallel with construction of new access roads / hardstanding to prevent the conveyance of silts to receiving watercourses.
6. Interim measures to be employed in all instances where work carried out is likely to cause adverse environmental impacts through increased silt loadings being generated during the construction phase.
7. Oil fuel should be stored within containment and cement should be mixed within compound / containment, tools washed in the same area and water recycled (in the cement mix).
8. Direct discharge of untreated track drainage to watercourses shall not be permitted.
9. DO NOT pump water direct to watercourses.
10. DO NOT strip vegetation from existing ditches unless absolutely necessary.
11. If water pollution is identified the following steps should be adhered to:
STOP - Work in the immediate area should be stopped and the source of the pollution identified
CONTAIN - The source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.
NOTIFY - The relevant authorities and Client/Developer should be notified immediately to ensure that measures can be implemented downstream to protect fish habitat and other sensitive areas.

TRACK / INFRASTRUCTURE DRAINAGE
12. Temporary upslope cutoff / diversion drainage to be installed in advance of main earthworks in areas indicated in order to minimise surface water ingress to excavations
13. Settlement/attenuation ponds are retained following completion of construction activities.
14. Batters of swales to have dimensions as per separately issued typical detail drawing. Swale to be re-vegetated with local species.
15. Slopes of swales to be vegetated or protected from erosion until vegetation has been established. Stripped vegetative layer from excavations to be stored locally and used to line slopes and base of swale. Vegetative layer to be placed into swale after construction of the swale.
16. Clean stone check dams to be installed in all drainage channels in order to promote settlement of suspended solids and control flow rates. Check dams generally to be locally won well graded stone. Aggregate size for stone check dams to be typically 5-40mm clean stone. On steep sections small stone to be anchored through the placement of 100mm stone on the downhill face of the check dam
17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
19. All HDPE pipes shall be twinwall type, BBA HAPAS approved.
20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
22. The level of silt in runoff during construction is to be monitored visually and excessive silt levels in any area to be temporarily managed through use of silt fences / constructed settlement features.
23. Build-up of silt levels at check dams to be removed and disposed of. Silt levels at check dams to be visually inspected as part of an ongoing maintenance programme during the construction phase. Where check dams become clogged with silt or vegetation, stone check dam to be removed and replaced subsequent to the removal of silt.

Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
13	Attenuated discharge to watercourse	6390	5.6	114	19 x 5 x 1.2
14	Attenuated discharge to watercourse	1820	2	30	10 x 3 x 1
15	Attenuated discharge overland by level spreader	333	2	2	2 x 1.5 x 0.8

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

T07

WX05

NEW WATERCOURSE CROSSING TO ALLOW FOR ACCESS TRACK. CULVERT SIZED TO OPW SECTION 50 STANDARDS. REFER TO WATERCOURSE CROSSING SCHEDULE.

Basin 13

Basin 14

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 15

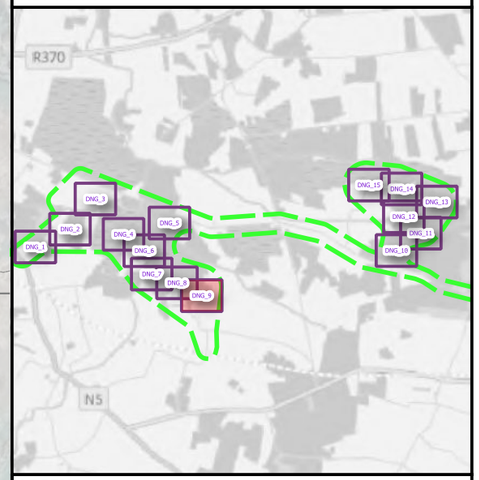
N

0 50 100 150 200 m

576900 577000 577100 577200 577300 577400

789100 789000 788900 788800 788700 788600

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Existing Roads to be Upgraded
- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Permanent Drainage Features
- Dirty Track Drainage Pipe
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- Proposed Watercourse Crossing

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX05	68.4	Clear span bridge or bottomless culvert

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 9

PROJECT / FIGURE NO. M02232-01_DNG_9

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

580000 580100 580200 580300 580400 580500 580600

789800 789700 789600 789500 789400

NOTES:

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17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
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21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
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Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
16	Attenuated discharge overland by level spreader	717	2	8	4 x 2 x 1

N

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

SUBSTATION TO DRAIN TO MAIN DRAINAGE.

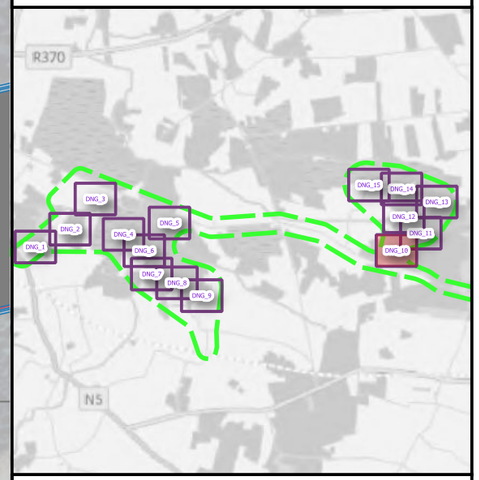
REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 16

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Existing Roads to be Upgraded
- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

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- Clean Drainage Pipes
- Swale / Track Drainage with Check Dams & Breakouts
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- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 10

PROJECT / FIGURE NO. M02232-01_DNG_10

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

580400 580500 580600 580700 580800 580900 581000

790100 790000 789900 789800 789700

NOTES:

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WATERCOURSE & TRACK DRAINAGE CROSSINGS
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MAINTENANCE
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Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
17	Attenuated discharge to watercourse	12003	10.5	221	23 x 8 x 1.2
18	Attenuated discharge to watercourse	995	2	12	5 x 3 x 0.8
19	Attenuated discharge to watercourse	6643	5.8	120	20 x 5 x 1.2

N

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 18

Basin 17

NEW WATERCOURSE CROSSING TO ALLOW FOR ACCESS TRACK. CULVERT SIZED TO OPW SECTION 50 STANDARDS. REFER TO WATERCOURSE CROSSING SCHEDULE.

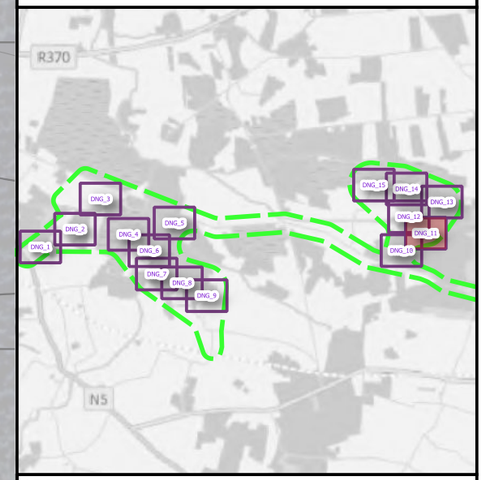
WX06

REGULAR CROSS DRAINAGE CULVERTS (EVERY C. 40 M) TO FLOATED TRACK TO PRESERVE PEAT HYROLOGY.

SUBSTATION TO DRAIN TO MAIN DRAINAGE.

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Existing Roads to be Upgraded
- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Permanent Drainage Features
- Dirty Track Drainage Pipe
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- Attenuation Basin
- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX06	68.19	Clear span bridge or bottomless culvert

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DESCRIPTION: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 11

PROJECT / FIGURE NO.: M02232-01_DNG_11

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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PLANNING DESIGN

580200 580300 580400 580500 580600 580700

790300 790200 790100 790000 789900

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Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
19	Attenuated discharge to watercourse	6643	5.8	120	20 x 5 x 1.2

N

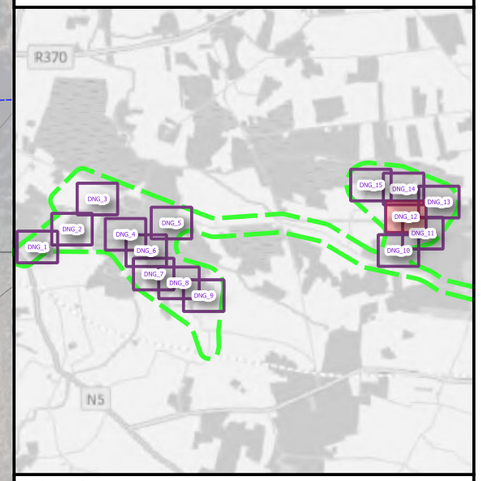
T11

Basin 19

TREATED CLEAN WATER TO BE DISCHARGED TO WATERCOURSE. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
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- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
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DESCRIPTION: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 12

PROJECT / FIGURE NO.: M02232-01_DNG_12

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

580700 580800 580900 581000 581100 581200 581300

790600 790500 790400 790300 790200

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15. Slopes of swales to be vegetated or protected from erosion until vegetation has been established. Stripped vegetative layer from excavations to be stored locally and used to line slopes and base of swale. Vegetative layer to be placed into swale after construction of the swale.
16. Clean stone check dams to be installed in all drainage channels in order to promote settlement of suspended solids and control flow rates. Check dams generally to be locally won well graded stone. Aggregate size for stone check dams to be typically 5-40mm clean stone. On steep sections small stone to be anchored through the placement of 100mm stone on the downhill face of the check dam
17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
19. All HDPE pipes shall be twinwall type, BBA HAPAS approved.
20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
22. The level of silt in runoff during construction is to be monitored visually and excessive silt levels in any area to be temporarily managed through use of silt fences / constructed settlement features.
23. Build-up of silt levels at check dams to be removed and disposed of. Silt levels at check dams to be visually inspected as part of an ongoing maintenance programme during the construction phase. Where check dams become clogged with silt or vegetation, stone check dam to be removed and replaced subsequent to the removal of silt.

Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
20	Attenuated discharge overland by level spreader	6289	5.5	114	19 x 5 x 1.2

N

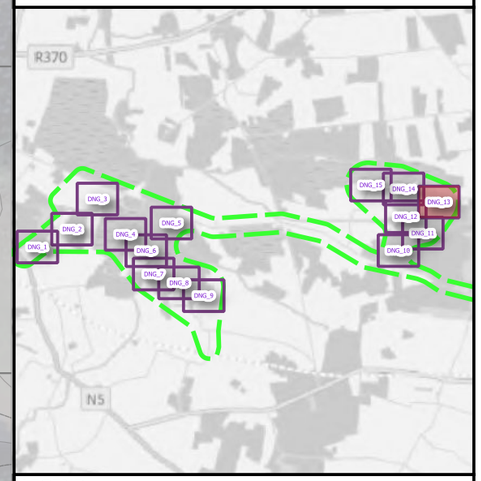
T10

Basin 20

TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Existing Roads to be Upgraded
- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Permanent Drainage Features
- Dirty Track Drainage Pipe
- Clean Drainage Pipes
- Swale / Track Drainage with Check Dams & Breakouts
- Attenuation Basin
- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 13

PROJECT / FIGURE NO. M02232-01_DNG_13

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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PLANNING DESIGN

580100 580200 580300 580400 580500 580600 580700

790800 790700 790600 790500 790400

NOTES:

GENERAL
1. Drawings are for planning and are not intended for construction and should not be used as such. For avoidance of doubt, surface water management design is intended to be further developed post-consent of the planning application.
2. All locations of suds features identified are approximate and to be refined on an observational basis dependant on local topography and track alignment / micrositing.
3. Additional temporary drainage / mitigation will be provided during the construction phase on an observational basis.
4. All drainage management features shown should be read in conjunction with relevant typical detail drawings.

POLLUTION PREVENTION
5. Temporary or permanent drainage / silt management features including settlement features and drainage crossings should be installed prior to or in parallel with construction of new access roads / hardstanding to prevent the conveyance of silts to receiving watercourses.
6. Interim measures to be employed in all instances where work carried out is likely to cause adverse environmental impacts through increased silt loadings being generated during the construction phase.
7. Oil fuel should be stored within containment and cement should be mixed within compound / containment, tools washed in the same area and water recycled (in the cement mix).
8. Direct discharge of untreated track drainage to watercourses shall not be permitted.
9. DO NOT pump water direct to watercourses.
10. DO NOT strip vegetation from existing ditches unless absolutely necessary.
11. If water pollution is identified the following steps should be adhered to:
STOP - Work in the immediate area should be stopped and the source of the pollution identified
CONTAIN - The source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.
NOTIFY - The relevant authorities and Client/Developer should be notified immediately to ensure that measures can be implemented downstream to protect fish habitat and other sensitive areas.

TRACK / INFRASTRUCTURE DRAINAGE
12. Temporary upslope cutoff / diversion drainage to be installed in advance of main earthworks in areas indicated in order to minimise surface water ingress to excavations
13. Settlement/attenuation ponds are retained following completion of construction activities.
14. Batters of swales to have dimensions as per separately issued typical detail drawing. Swale to be re-vegetated with local species.
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18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
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20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
22. The level of silt in runoff during construction is to be monitored visually and excessive silt levels in any area to be temporarily managed through use of silt fences / constructed settlement features.
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Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
21	Attenuated discharge overland by level spreader	1331	2	21	7 x 3 x 1
22	Attenuated discharge overland by level spreader	6374	5.6	114	19 x 5 x 1.2

TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 22

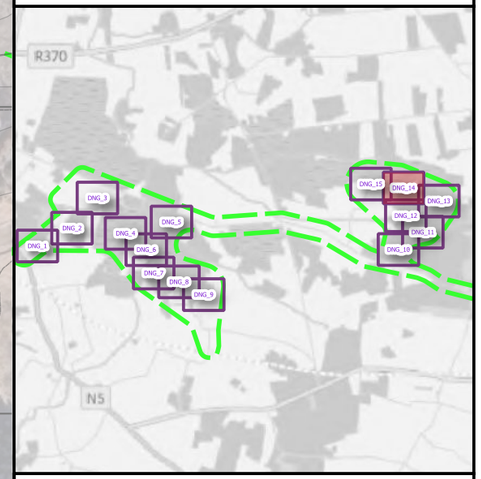
TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 21

T09

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Existing Roads to be Upgraded
- Proposed Floated Sections
- Proposed Infrastructure
- Cut
- Fill

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Permanent Drainage Features
- Dirty Track Drainage Pipe
- Clean Drainage Pipes
- Swale / Track Drainage with Check Dams & Breakouts
- Attenuation Basin
- Flow Control with Outlet to Watercourse
- Flow Control with Outlet to Level Spreader (Discharge Overland)
- Proposed Watercourse Crossing

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DESCRIPTION: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 14

PROJECT / FIGURE NO.: M02232-01_DNG_14

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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PLANNING DESIGN

579600 579700 579800 579900 580000 580100

790900 790800 790700 790600 790500 790400

NOTES:

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Basin	Outfall	Drained Area sqm	Disch. Rate lps	Vol cu.m	Dims (LxWxD) m
23	Attenuated discharge overland by level spreader	5537	4.9	102	17 x 5 x 1.2

N

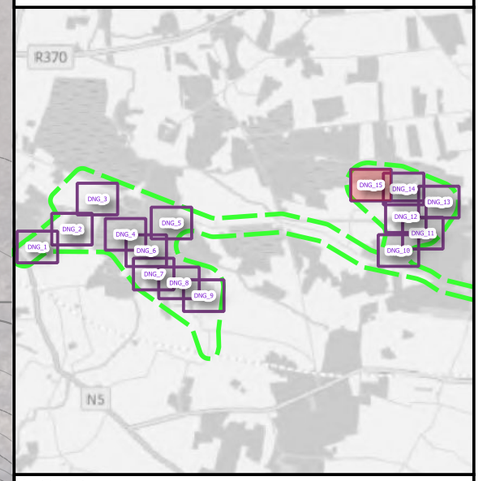
TREATED CLEAN WATER TO BE DISCHARGED OVERLAND BY LEVEL SPREADER. ATTENUATED TO GREENFIELD (QBAR) EQUIVALENT RATE.

Basin 23

T08

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
Existing Roads to be Upgraded
Proposed Floated Sections
Proposed Infrastructure
Cut
Fill

Hydrology Features & Constraints

Water Feature Constraints
Major Watercourses
Minor Watercourses
Other Ephemeral / Minor Drainage
Watercourse Buffers

Permanent Drainage Features
Dirty Track Drainage Pipe
Clean Drainage Pipes
Swale / Track Drainage with Check Dams & Breakouts
Attenuation Basin
Flow Control with Outlet to Watercourse
Flow Control with Outlet to Level Spreader (Discharge Overland)
Proposed Watercourse Crossing

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - PERMANENT DRAINAGE LAYOUT SHEET 15

PROJECT / FIGURE NO. M02232-01_DNG_15

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	1	26/03/2026

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PLANNING DESIGN

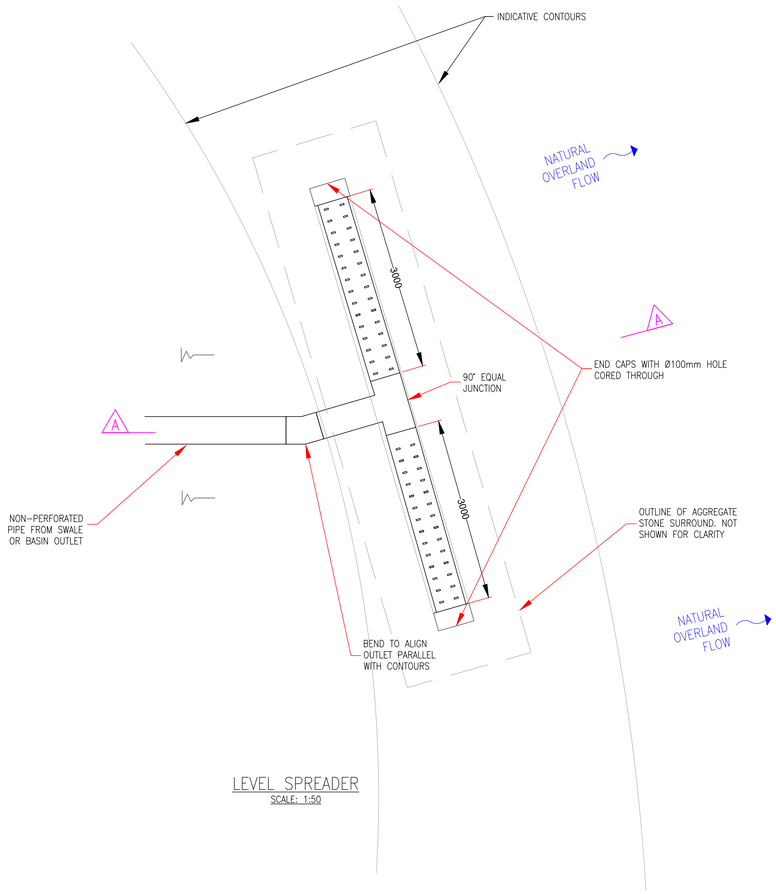
Annex B

Permanent Drainage - Details

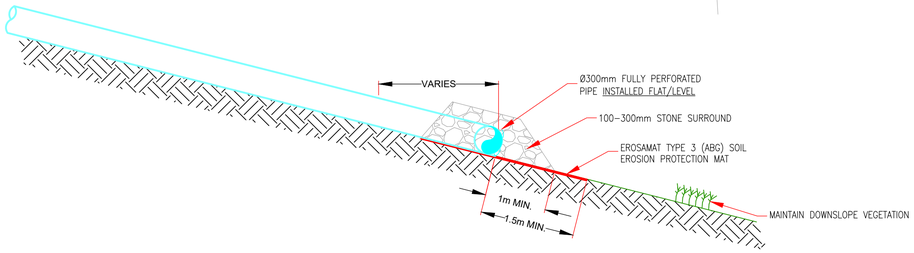
101 Level Spreader / Swale & Checkdam

102 Attenuation Basin

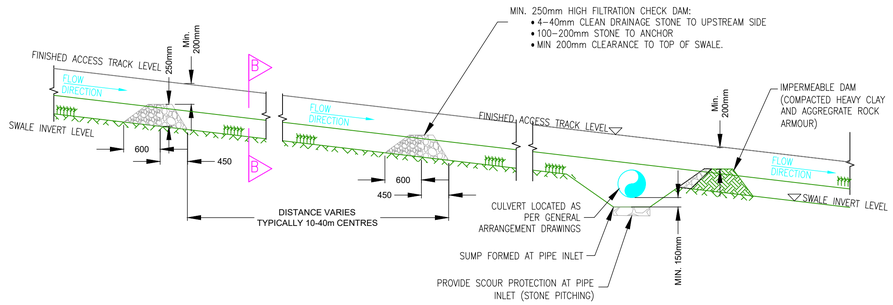
103 Piped Culvert



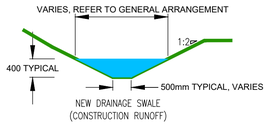
LEVEL SPREADER
SCALE: 1:50



LEVEL SPREADER SECTION A-A
SCALE: 1:50



TYPICAL TRACKSIDE SWALE & CHECK DAMS
SCALE 1:50



TYPICAL TRACKSIDE SWALE SECTION
SCALE 1:50

CHECK-DAM SPACINGS (MAXIMUM)	
CHANNEL GRADIENT	SPACING (m)
<1%	80
1-2.5%	40
2.5-5%	20
>5%	10

NOTE: DURING CONSTRUCTION PHASE THE LEVEL OF SUSPENDED SOLIDS IN TRACK RUN-OFF IS LIKELY TO NECESSITATE THE INCREASED FREQUENCY OF TEMPORARY CHECK DAMS FOR INCREASED SETTLEMENT POTENTIAL

TRACK DRAINAGE NOTES

1. ROAD CONSTRUCTION TO BE AS PER CIVIL WORKS DESIGN & SPECIFICATION. (BY OTHERS)
2. REFER TO LAYOUT PLAN DRAWINGS FOR DETAILS OF CHECK DAM / CROSS DRAIN / CUTOFF DRAIN / OUTFALL LOCATIONS ETC. MICRO-SITING OF DRAINAGE ELEMENTS TO BE DETERMINED ON SITE IN CONJUNCTION WITH DESIGNER TO SUIT SPECIFIC CONDITIONS ENCOUNTERED.
3. FEATURES SHOWN ARE TO SUIT PERMANENT INFRASTRUCTURE. TEMPORARY SITE DRAINAGE OVER AND ABOVE THAT SHOWN ON DRAWINGS MAY BE REQUIRED TO SUIT TEMPORARY ROAD ALIGNMENTS AND LEVELS.
4. ALL EXCAVATED SLOPES TO BE BATTERED BACK TO A SAFE ANGLE OF REPOSE.

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	KS	26/03/2026	FOR PLANNING

STATUS
PLANNING

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Mossley Mill, Lower Ground (West)
Carnmoney Road North
Newtownabbey
Co. Antrim, BT36 5QA

PROJECT
CARRIGEEN RENEWABLE ENERGY DEVELOPMENT
CO. ROSCOMMON

CLIENT
CARRAIGIN POWER LTD

DRAWING TITLE
SURFACE WATER MANAGEMENT
TYPICAL DRAINAGE DETAILS
LEVEL SPREADER, CHECK DAMS

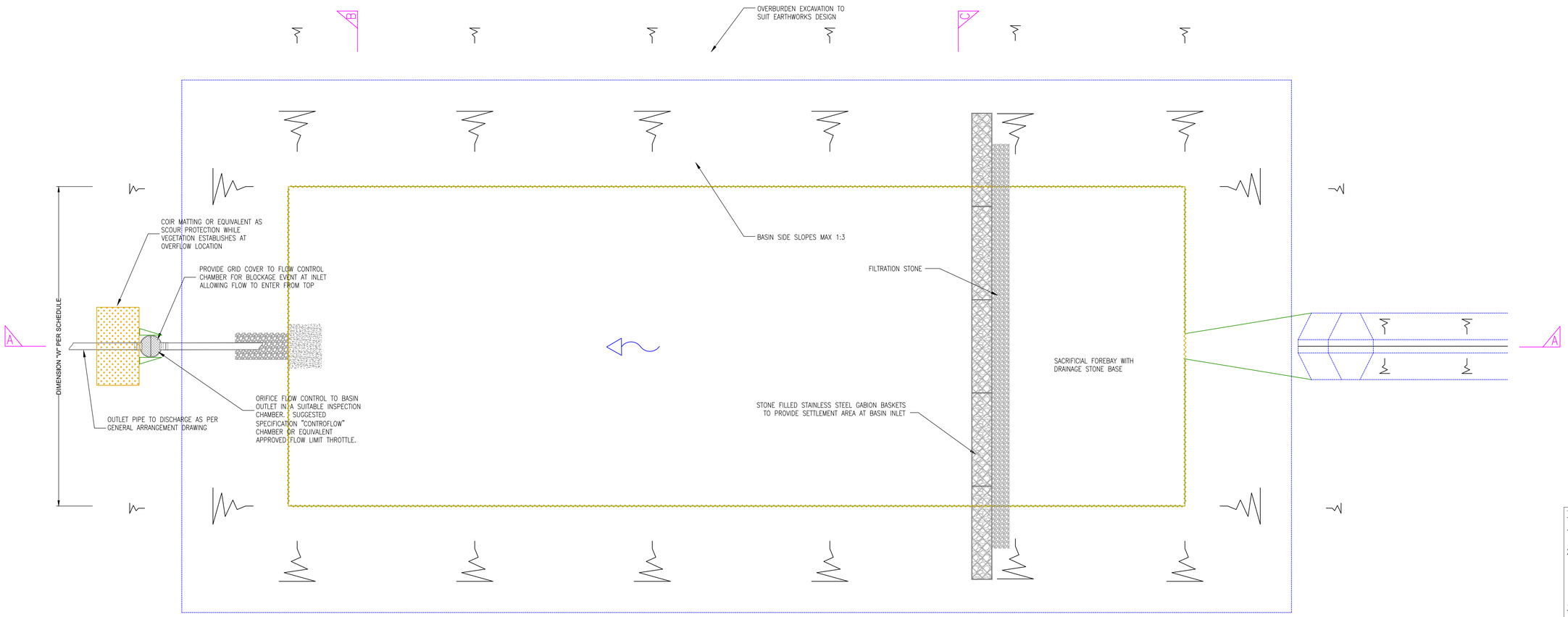
SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

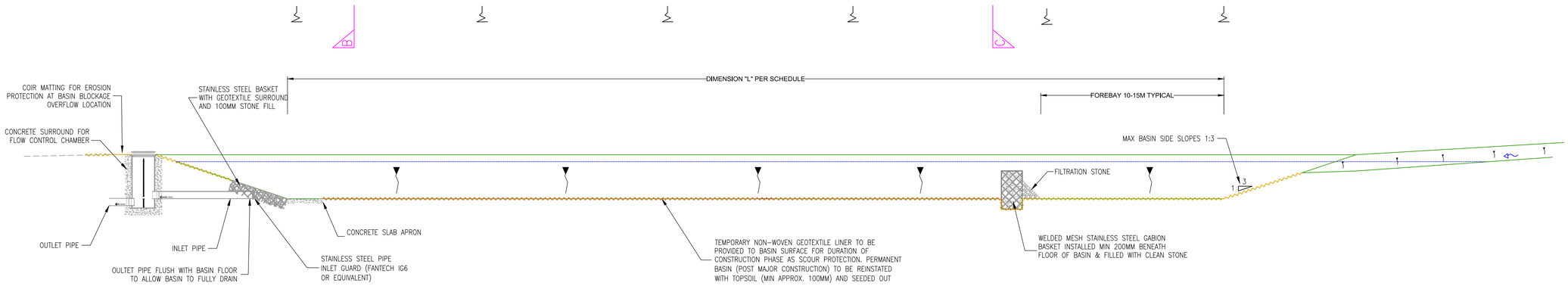
DRAWN	CHECKED	DATE
DL	DKS	26/03/2026

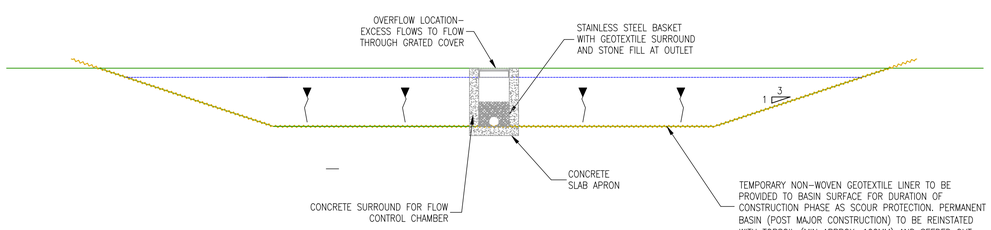
PROJECT No.	DRAWING No.	ISSUE NO.
M02232-01	DWG_101	1

DETENTION BASIN PLAN

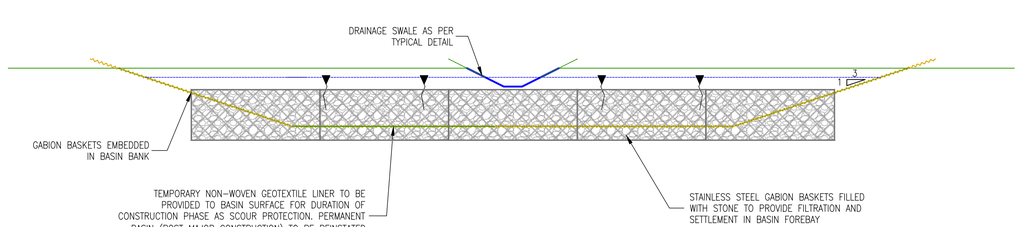
SCALE 1:50







SECTION B-B



SECTION C-C

TRACK DRAINAGE NOTES

1. ROAD CONSTRUCTION TO BE AS PER CIVIL WORKS DESIGN & SPECIFICATION. (BY OTHERS)
2. REFER TO LAYOUT PLAN DRAWINGS FOR DETAILS OF CHECK DAM / CROSS DRAIN / CUTOFF DRAIN / OUTFALL LOCATIONS ETC. MICRO-SITING OF DRAINAGE ELEMENTS TO BE DETERMINED ON SITE IN CONJUNCTION WITH DESIGNER TO SUIT SPECIFIC CONDITIONS ENCOUNTERED.
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4. ALL EXCAVATED SLOPES TO BE BATTERED BACK TO A SAFE ANGLE OF REPOSE.

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	KS	26/03/2026	FOR PLANNING

STATUS: PLANNING

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W: www.mccloyconsulting.com
Mossley Mill, Lower Ground (West)
Carnmoney Road North
Newtownabbey
Co. Antrim, BT36 5QA

PROJECT: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT CO. ROSCOMMON

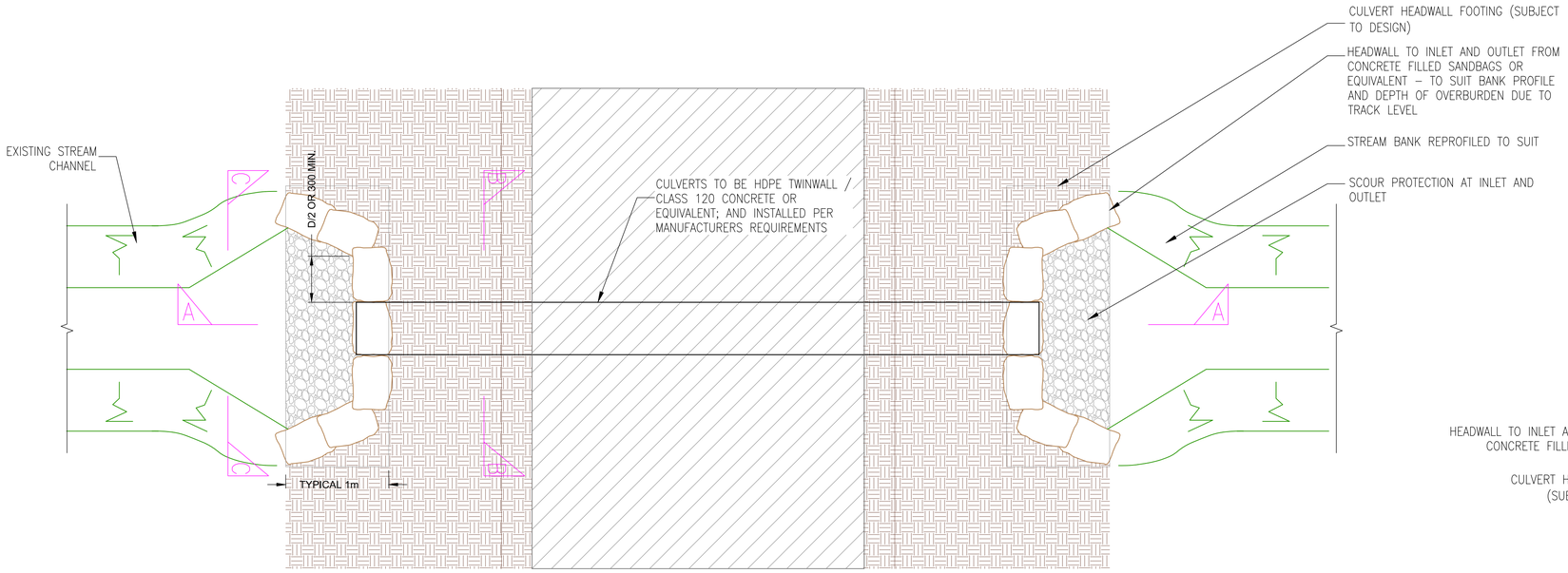
CLIENT: CARRAIGIN POWER LTD

DRAWING TITLE: SURFACE WATER MANAGEMENT ATTENUATION BASIN DETAILS

SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

DRAWN	CHECKED	DATE
DL	DKS	26/03/2026

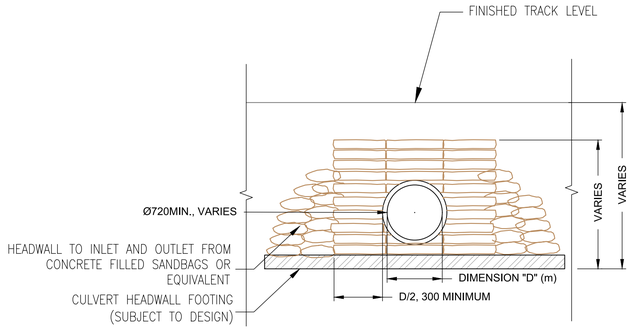
PROJECT No.	DRAWING No.	ISSUE NO.
M02232-01	DWG_102	1



PLAN
SCALE 1:40

NOTES FOR CONSTRUCTION METHODS & ENVIRONMENTAL PROTECTION

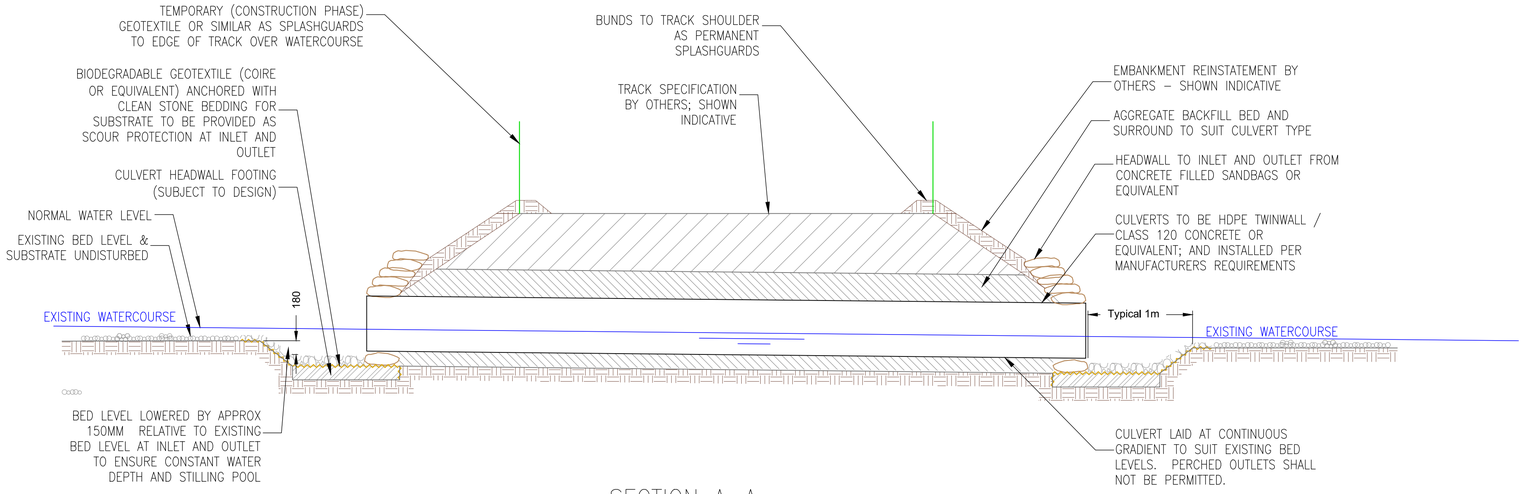
1. WORKS TO BE PROGRAMMED TO SUIT PERIODS OF LOW RIVER FLOW AND RAINFALL. DUE COGNISANCE GIVEN TO THE PREVAILING GROUND CONDITIONS AND SEASONAL WEATHER CONDITIONS.
2. CULVERT LOCATION TO BE DAMMED UPSTREAM BY USE OF SANDBAGS OR EQUIVALENT AND OVERPUMPED IN ORDER TO PROVIDE A DRY WORKING ENVIRONMENT.
3. IN CHANNEL SILT FENCING TO BE INSTALLED DOWNSTREAM OF THE WORKS AND DOWNSTREAM OF OVERPUMPING FOR THE DURATION OF THE CULVERT INSTALLATION WORKS.



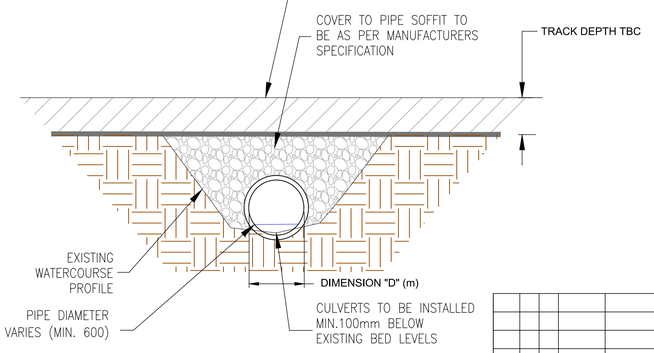
ELEVATION C–C (WITH HEADWALL)
1:40

CULVERT WATERCOURSE CROSSING

SCALE AS SHOWN



SECTION A–A
SCALE 1:40



SECTION B–B
SCALE 1:40

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	KS	26/03/2026	FOR PLANNING

STATUS: PLANNING

McCloy Consulting
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Newtownabbey
Co. Antrim, BT36 5QA

PROJECT: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT CO. ROSCOMMON

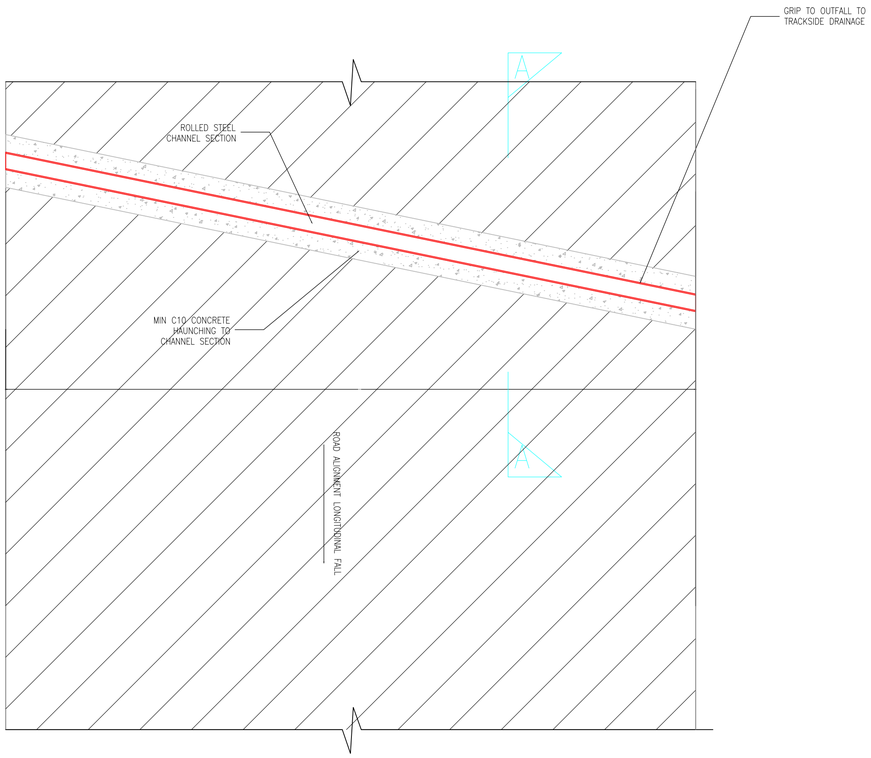
CLIENT: CARRAIGIN POWER LTD

DRAWING TITLE: PIPED CULVERT DETAIL

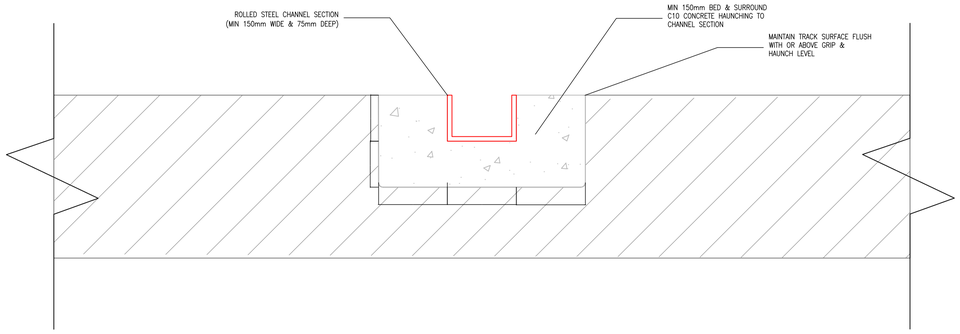
SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

DRAWN	CHECKED	DATE
DL	DKS	26/03/2026

PROJECT No.	DRAWING No.	ISSUE NO.
M02232-01	DWG_103	1



ROAD GRIP – PLAN
SCALE 1:25



ROAD GRIP – SECTION A–A
SCALE 1:25

EXAMPLE OF ROAD GRIP INSTALLATION
NTS

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	KS	26/03/2026	FOR PLANNING

STATUS: PLANNING

McCloy Consulting
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Mossley Mill, Lower Ground (West)
Carnmoney Road North
Newtownabbey
Co. Antrim, BT36 5QA

PROJECT: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT CO. ROSCOMMON

CLIENT: CARRAIGIN POWER LTD

DRAWING TITLE: DRAINAGE GRIP DETAIL

SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

DRAWN	CHECKED	DATE
DL	DKS	26/03/2026

PROJECT No.	DRAWING No.	ISSUE NO.
M02232-01	DWG_104	1

Annex C

Temporary Drainage - Layouts

574100 574200 574300 574400 574500 574600 574700

789800 789700 789600 789500 789400

NOTES:

GENERAL
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4. All drainage management features shown should be read in conjunction with relevant typical detail drawings.

POLLUTION PREVENTION
5. Temporary or permanent drainage / silt management features including settlement features and drainage crossings should be installed prior to or in parallel with construction of new access roads / hardstanding to prevent the conveyance of silts to receiving watercourses.
6. Interim measures to be employed in all instances where work carried out is likely to cause adverse environmental impacts through increased silt loadings being generated during the construction phase.
7. Oil fuel should be stored within containment and cement should be mixed within compound / containment, tools washed in the same area and water recycled (in the cement mix).
8. Direct discharge of untreated track drainage to watercourses shall not be permitted.
9. DO NOT pump water direct to watercourses.
10. DO NOT strip vegetation from existing ditches unless absolutely necessary.
11. If water pollution is identified the following steps should be adhered to:
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NOTIFY - The relevant authorities and Client/Developer should be notified immediately to ensure that measures can be implemented downstream to protect fish habitat and other sensitive areas.

TRACK / INFRASTRUCTURE DRAINAGE
12. Temporary upslope cutoff / diversion drainage to be installed in advance of main earthworks in areas indicated in order to minimise surface water ingress to excavations
13. Settlement/attenuation ponds are retained following completion of construction activities.
14. Batters of swales to have dimensions as per separately issued typical detail drawing. Swale to be re-vegetated with local species.
15. Slopes of swales to be vegetated or protected from erosion until vegetation has been established. Stripped vegetative layer from excavations to be stored locally and used to line slopes and base of swale. Vegetative layer to be placed into swale after construction of the swale.
16. Clean stone check dams to be installed in all drainage channels in order to promote settlement of suspended solids and control flow rates. Check dams generally to be locally won well graded stone. Aggregate size for stone check dams to be typically 5-40mm clean stone. On steep sections small stone to be anchored through the placement of 100mm stone on the downhill face of the check dam
17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
19. All HDPE pipes shall be twinwall type, BBA HAPAS approved.
20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
22. The level of silt in runoff during construction is to be monitored visually and excessive silt levels in any area to be temporarily managed through use of silt fences / constructed settlement features.
23. Build-up of silt levels at check dams to be removed and disposed of. Silt levels at check dams to be visually inspected as part of an ongoing maintenance programme during the construction phase. Where check dams become clogged with silt or vegetation, stone check dam to be removed and replaced subsequent to the removal of silt.

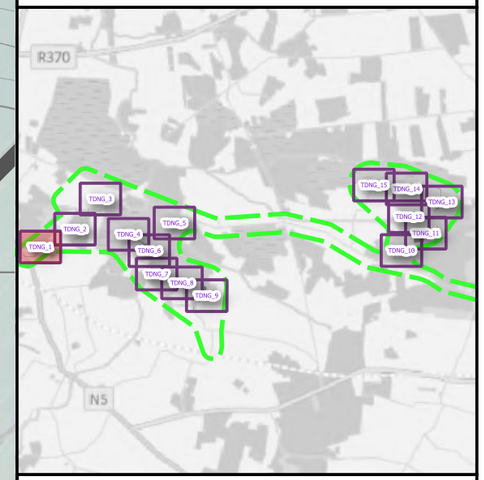
LINED CONCRETE / CEMENT WASH OUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

TEMPORARY COMPOUND. ALL FUEL / OIL STORAGE TO BE ON IMPERMEABLE BUNDED SURFACE. TEMPORARY WASTEWATER FROM WELFARE FACILITIES TO SEALED TANK.

N

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
Temporary Works Area
Existing Roads to be Upgraded
Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
Major Watercourses
Minor Watercourses
Other Ephemeral / Minor Drainage
Watercourse Buffers

Temporary Drainage Features
Clean Water Interceptor
Dirty Water Drainage
Temporary Piped Drainage
Drainage Breakout
Clean Drainage Pipes
Proposed Watercourse Crossing
Silt Fence
Settlement_Link
Settlement Basin
Borrowpit Grips
Borrowpit_Polygons
Borrowpit Lagoon_L
Berms

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DESCRIPTION	CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 1
PROJECT / FIGURE NO.	M02232-01_TDNG_1

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	2	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

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17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
19. All HDPE pipes shall be twinwall type, BBA HAPAS approved.
20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
22. The level of silt in runoff during construction is to be monitored visually and excessive silt levels in any area to be temporarily managed through use of silt fences / constructed settlement features.
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574700 574800 574900 575000 575100 575200 575300

790100 790000 789900 789800 789700

N

LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

IN-CHANNEL SILT BARRIERS TO BE USED DURING / AFTER CULVERT INSTALLATION.

T02

WX01

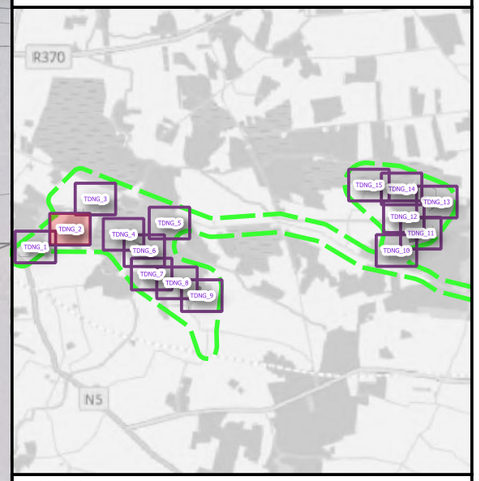
SILT FENCES TO BE USED AS SPLASH GUARDS FOR DURATION OF CONSTRUCTION PHASE.

POLLUTION PREVENTION GUIDANCE APPLIES TO CONSTRUCTION OF WATERCOURSE CROSSING / CULVERT. WORK TO AVOID INCLEMENT WEATHER.

TEMPORARY CLEAN CUTOFF DRAINAGE TO BE INSTALLED PRIOR TO EARTHWORKS TO ENSURE CLEAN / DIRTY WATER SEPERATION.

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Temporary Works Area
- Existing Roads to be Upgraded
- Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Temporary Drainage Features
- Clean Water Interceptor
- Dirty Water Drainage
- Temporary Piped Drainage
- Drainage Breakout
- Clean Drainage Pipes
- Proposed Watercourse Crossing
- Silt Fence
- Settlement_Link
- Settlement Basin
- Borrowpit Grips
- Borrowpit_Polygons
- Borrowpit Lagoon_L
- Berms

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX01	66.72	Clear span bridge or bottomless culvert

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 2

PROJECT / FIGURE NO. M02232-01_TDNG_2

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	2	26/03/2026

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575100 575200 575300 575400 575500 575600 575700

790600 790500 790400 790300 790200

N

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LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

T01

IN-CHANNEL SILT BARRIERS TO BE USED DURING / AFTER CULVERT INSTALLATION.

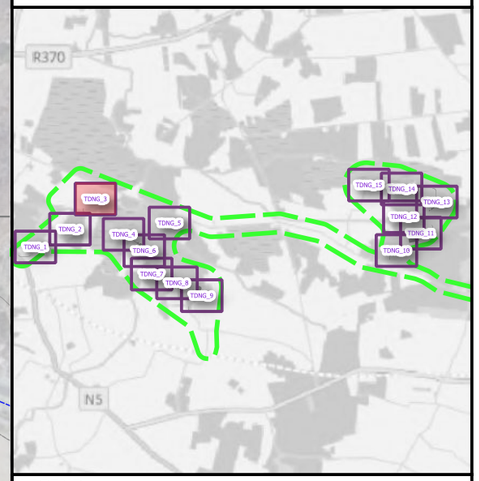
SILT FENCES TO BE USED AS SPLASH GUARDS FOR DURATION OF CONSTRUCTION PHASE.

WX02

POLLUTION PREVENTION GUIDANCE APPLIES TO CONSTRUCTION OF WATERCOURSE CROSSING / CULVERT. WORK TO AVOID INCLEMENT WEATHER.

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Temporary Works Area
- Existing Roads to be Upgraded
- Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
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- Watercourse Buffers

Temporary Drainage Features
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- Drainage Breakout
- Clean Drainage Pipes
- Proposed Watercourse Crossing
- Silt Fence
- Settlement_Link
- Settlement Basin
- Borrowpit Grips
- Borrowpit_Polygons
- Borrowpit Lagoon_L
- Berms

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX02	66.62	Clear span bridge or bottomless culvert

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 3

PROJECT / FIGURE NO. M02232-01_TDNG_3

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	2	26/03/2026

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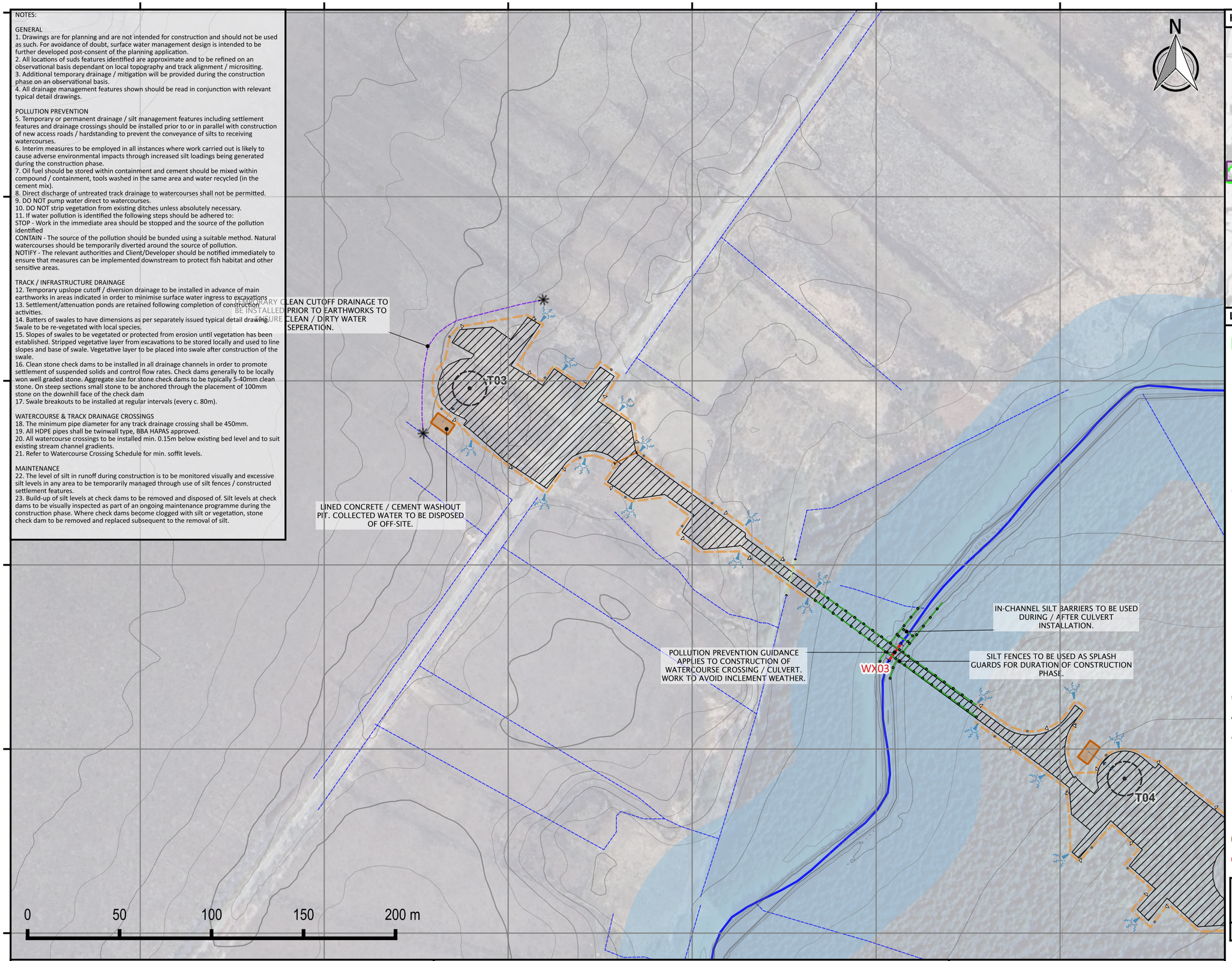
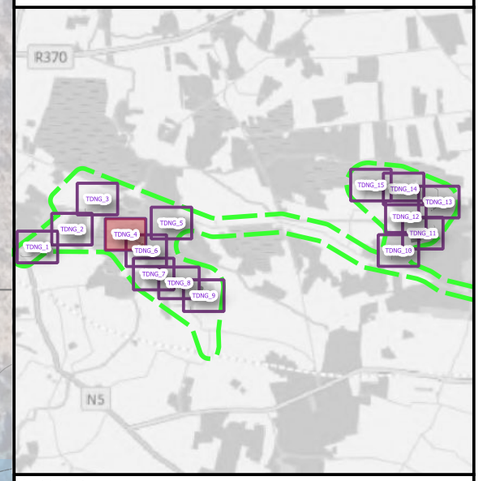


KEY PLAN



LEGEND

- EIAR Boundary

Infrastructure
- Temporary Works Area
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Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX03	66	Clear span bridge or bottomless culvert

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DESCRIPTION	CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 5
PROJECT / FIGURE NO.	M02232-01_TDNG_4
DRAWN BY	DH
SCALE	1:2000
REVISION	2
DATE	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

576300 576400 576500 576600 576700 576800 576900

790200 790100 790000 789900 789800

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N

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LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

IN-CHANNEL SILT BARRIERS TO BE USED DURING / AFTER CULVERT INSTALLATION.

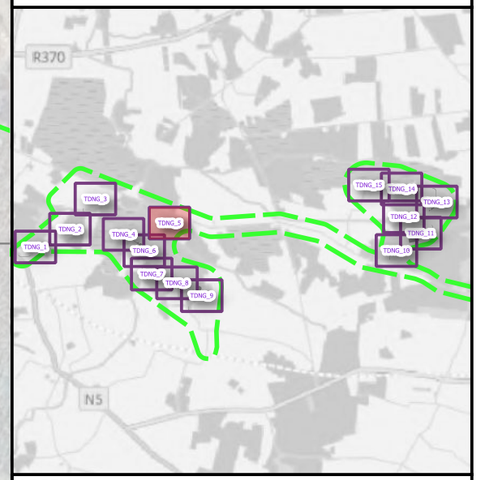
SILT FENCES TO BE USED AS SPLASH GUARDS FOR DURATION OF CONSTRUCTION PHASE.

WX04

POLLUTION PREVENTION GUIDANCE APPLIES TO CONSTRUCTION OF WATERCOURSE CROSSING / CULVERT. WORK TO AVOID INCLEMENT WEATHER.

0 50 100 150 200 m

KEY PLAN



LEGEND

- EIAR Boundary

Infrastructure
- Temporary Works Area
- Existing Roads to be Upgraded
- Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Temporary Drainage Features
- Clean Water Interceptor
- Dirty Water Drainage
- Temporary Piped Drainage
- Drainage Breakout
- Clean Drainage Pipes
- Proposed Watercourse Crossing
- Silt Fence
- Settlement_Link
- Settlement Basin
- Borrowpit Grips
- Borrowpit_Polygons
- Borrowpit Lagoon_L
- Berms

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX04	65.8	Clear span bridge or bottomless culvert

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 6

PROJECT / FIGURE NO. M02232-01_TDNG_5

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	2	26/03/2026

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PLANNING DESIGN

575900 576000 576100 576200 576300 576400 576500

789800 789700 789600 789500 789400

NOTES:

GENERAL
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3. Additional temporary drainage / mitigation will be provided during the construction phase on an observational basis.
4. All drainage management features shown should be read in conjunction with relevant typical detail drawings.

POLLUTION PREVENTION
5. Temporary or permanent drainage / silt management features including settlement features and drainage crossings should be installed prior to or in parallel with construction of new access roads / hardstanding to prevent the conveyance of silts to receiving watercourses.
6. Interim measures to be employed in all instances where work carried out is likely to cause adverse environmental impacts through increased silt loadings being generated during the construction phase.
7. Oil fuel should be stored within containment and cement should be mixed within compound / containment, tools washed in the same area and water recycled (in the cement mix).
8. Direct discharge of untreated track drainage to watercourses shall not be permitted.
9. DO NOT pump water direct to watercourses.
10. DO NOT strip vegetation from existing ditches unless absolutely necessary.
11. If water pollution is identified the following steps should be adhered to:
STOP - Work in the immediate area should be stopped and the source of the pollution identified
CONTAIN - The source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.
NOTIFY - The relevant authorities and Client/Developer should be notified immediately to ensure that measures can be implemented downstream to protect fish habitat and other sensitive areas.

TRACK / INFRASTRUCTURE DRAINAGE
12. Temporary upslope cutoff / diversion drainage to be installed in advance of main earthworks in areas indicated in order to minimise surface water ingress to excavations
13. Settlement/attenuation ponds are retained following completion of construction activities.
14. Batters of swales to have dimensions as per separately issued typical detail drawing. Swale to be re-vegetated with local species.
15. Slopes of swales to be vegetated or protected from erosion until vegetation has been established. Stripped vegetative layer from excavations to be stored locally and used to line slopes and base of swale. Vegetative layer to be placed into swale after construction of the swale.
16. Clean stone check dams to be installed in all drainage channels in order to promote settlement of suspended solids and control flow rates. Check dams generally to be locally won well graded stone. Aggregate size for stone check dams to be typically 5-40mm clean stone. On steep sections small stone to be anchored through the placement of 100mm stone on the downhill face of the check dam
17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
19. All HDPE pipes shall be twinwall type, BBA HAPAS approved.
20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
22. The level of silt in runoff during construction is to be monitored visually and excessive silt levels in any area to be temporarily managed through use of silt fences / constructed settlement features.
23. Build-up of silt levels at check dams to be removed and disposed of. Silt levels at check dams to be visually inspected as part of an ongoing maintenance programme during the construction phase. Where check dams become clogged with silt or vegetation, stone check dam to be removed and replaced subsequent to the removal of silt.

IN-CHANNEL SILT BARRIERS TO BE USED DURING / AFTER CULVERT INSTALLATION.

SILT FENCES TO BE USED AS SPLASH GUARDS FOR DURATION OF CONSTRUCTION PHASE.

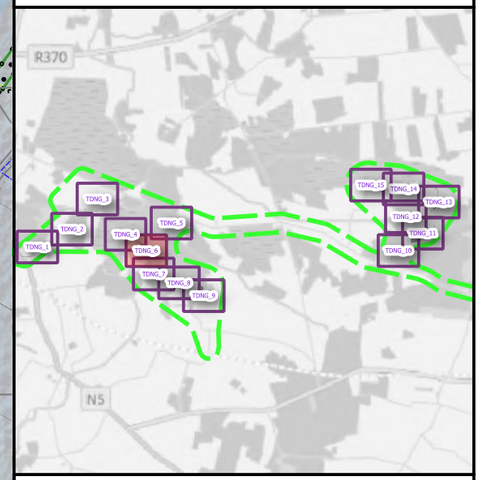
LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

T04

N

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Temporary Works Area
- Existing Roads to be Upgraded
- Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
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- Settlement_Link
- Settlement Basin
- Borrowpit Grips
- Borrowpit_Polygons
- Borrowpit Lagoon_L
- Berms

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX03	66	Clear span bridge or bottomless culvert

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DESCRIPTION: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 4

PROJECT / FIGURE NO.: M02232-01_TDNG_6

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	2	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

576000 576100 576200 576300 576400 576500 576600

789400 789300 789200 789100 789000

NOTES:

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17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
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N

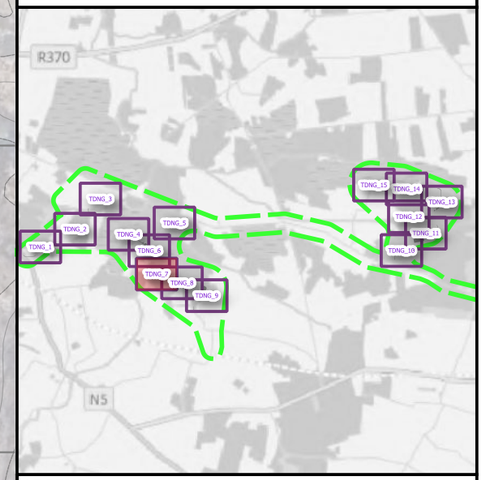
T05

LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

SETTLEMENT LAGOON FOR TEMPORARY BORROWPIT DRAINAGE. TEMPORARY GRIPS TO BE DUG IN BORROWPIT FLOOR TO MANAGE RUNOFF TO THE LAGOON. OUTLET TO DISCHARGE INTO DIRTY WATER DRAINAGE.

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
Temporary Works Area
Existing Roads to be Upgraded
Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
Major Watercourses
Minor Watercourses
Other Ephemeral / Minor Drainage
Watercourse Buffers

Temporary Drainage Features
Clean Water Interceptor
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Drainage Breakout
Clean Drainage Pipes
Proposed Watercourse Crossing
Silt Fence
Settlement_Link
Settlement Basin
Borrowpit Grips
Borrowpit_Polygons
Borrowpit Lagoon_L
Berms

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DESCRIPTION: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 7			
PROJECT / FIGURE NO.: M02232-01_TDNG_7			
DRAWN BY: DH	SCALE: 1:2000	REVISION: 2	DATE: 26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

576500 576600 576700 576800 576900 577000

789300 789200 789100 789000 788900 788800

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WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
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20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
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N

SETTLEMENT LAGOON FOR TEMPORARY BORROWPIT DRAINAGE. TEMPORARY GRIPS TO BE DUG IN BORROWPIT FLOOR TO MANAGE RUNOFF TO THE LAGOON. OUTLET TO DISCHARGE INTO DIRTY WATER DRAINAGE.

T06

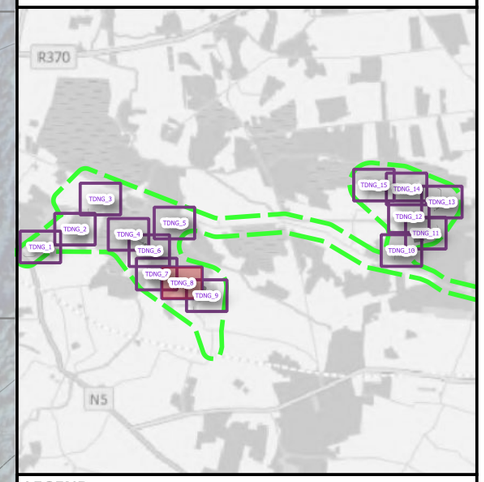
TEMPORARY CLEAN CUTOFF DRAINAGE TO BE INSTALLED PRIOR TO EARTHWORKS TO ENSURE CLEAN / DIRTY WATER SEPERATION.

POLLUTION PREVENTION GUIDANCE APPLIES TO CONSTRUCTION OF WATERCOURSE CROSSING / CULVERT. WORK TO AVOID INCLEMENT WEATHER.

WX05

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Temporary Works Area
- Existing Roads to be Upgraded
- Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Temporary Drainage Features
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- Proposed Watercourse Crossing
- Silt Fence
- Settlement_Link
- Settlement Basin
- Borrowpit Grips
- Borrowpit_Polygons
- Borrowpit Lagoon_L
- Berms

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX05	68.4	Clear span bridge or bottomless culvert

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 8

PROJECT / FIGURE NO. M02232-01_TDNG_8

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	2	26/03/2026

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PLANNING DESIGN

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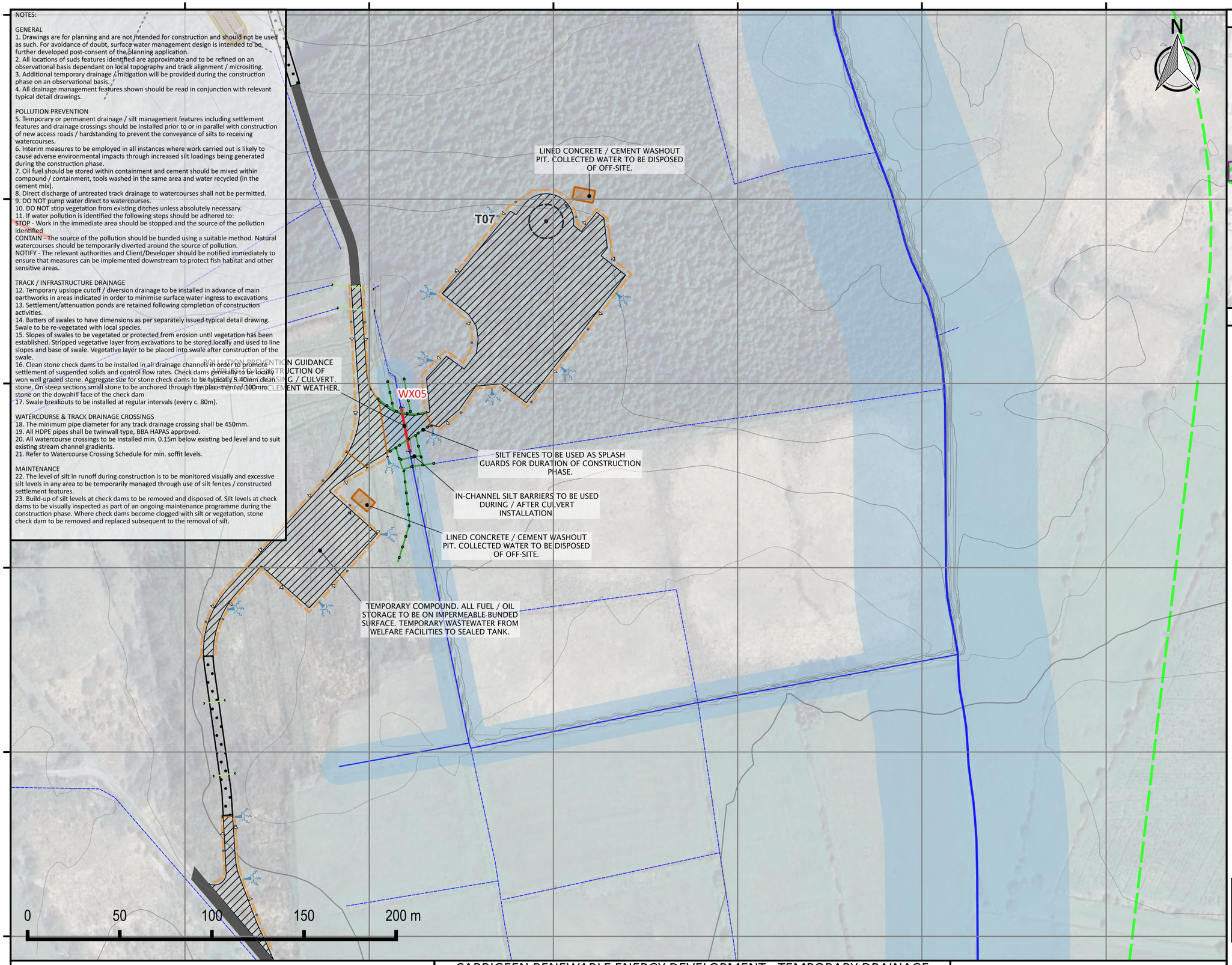
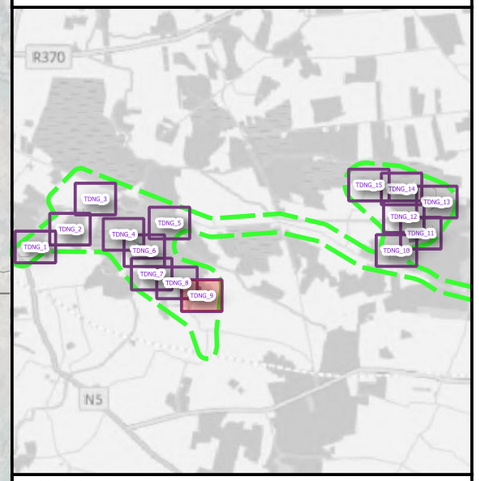


KEY PLAN



LEGEND

- EIAR Boundary

Infrastructure
- Temporary Works Area
- Existing Roads to be Upgraded
- Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
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- Borrowpit Lagoon_L
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Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX05	68.4	Clear span bridge or bottomless culvert

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 9

PROJECT / FIGURE NO. M02232-01_TDNG_9

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	2	26/03/2026

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PLANNING DESIGN

580000 580100 580200 580300 580400 580500 580600

789800 789700 789600 789500 789400

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N

LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

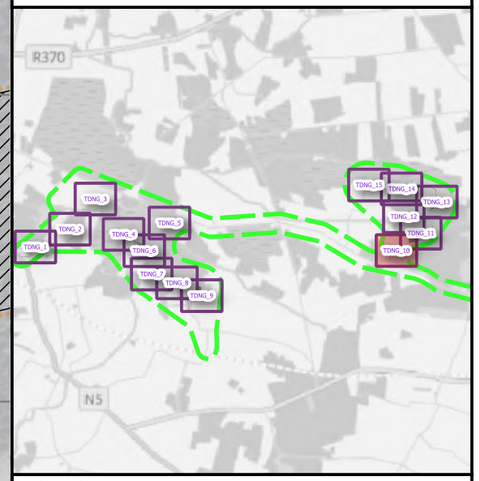
TEMPORARY COMPOUND. ALL FUEL / OIL STORAGE TO BE ON IMPERMEABLE BUNDED SURFACE. TEMPORARY WASTEWATER FROM WELFARE FACILITIES TO SEALED TANK.

LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

TEMPORARY COMPOUND. ALL FUEL / OIL STORAGE TO BE ON IMPERMEABLE BUNDED SURFACE. TEMPORARY WASTEWATER FROM WELFARE FACILITIES TO SEALED TANK.

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure

Temporary Works Area

Existing Roads to be Upgraded

Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints

Major Watercourses

Minor Watercourses

Other Ephemeral / Minor Drainage

Watercourse Buffers

Temporary Drainage Features

Clean Water Interceptor

Dirty Water Drainage

Temporary Piped Drainage

Drainage Breakout

Clean Drainage Pipes

Proposed Watercourse Crossing

Silt Fence

Settlement_Link

Settlement Basin

Borrowpit Grips

Borrowpit_Polygons

Borrowpit Lagoon_L

Berms

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w: www.mccloyconsulting.com

DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 10

PROJECT / FIGURE NO. M02232-01_TDNG_10

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	2	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

580400 580500 580600 580700 580800 580900 581000

790100 790000 789900 789800 789700

NOTES:

GENERAL
1. Drawings are for planning and are not intended for construction and should not be used as such. For avoidance of doubt, surface water management design is intended to be further developed post-consent of the planning application.
2. All locations of suds features identified are approximate and to be refined on an observational basis dependant on local topography and track alignment / micrositing.
3. Additional temporary drainage / mitigation will be provided during the construction phase on an observational basis.
4. All drainage management features shown should be read in conjunction with relevant typical detail drawings.

POLLUTION PREVENTION
5. Temporary or permanent drainage / silt management features including settlement features and drainage crossings should be installed prior to or in parallel with construction of new access roads / hardstanding to prevent the conveyance of silts to receiving watercourses.
6. Interim measures to be employed in all instances where work carried out is likely to cause adverse environmental impacts through increased silt loadings being generated during the construction phase.
7. Oil fuel should be stored within containment and cement should be mixed within compound / containment, tools washed in the same area and water recycled (in the cement mix).
8. Direct discharge of untreated track drainage to watercourses shall not be permitted.
9. DO NOT pump water direct to watercourses.
10. DO NOT strip vegetation from existing ditches unless absolutely necessary.
11. If water pollution is identified the following steps should be adhered to:
STOP - Work in the immediate area should be stopped and the source of the pollution identified
CONTAIN - The source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.
NOTIFY - The relevant authorities and Client/Developer should be notified immediately to ensure that measures can be implemented downstream to protect fish habitat and other sensitive areas.

TRACK / INFRASTRUCTURE DRAINAGE
12. Temporary upslope cutoff / diversion drainage to be installed in advance of main earthworks in areas indicated in order to minimise surface water ingress to excavations
13. Settlement/attenuation ponds are retained following completion of construction activities.
14. Batters of swales to have dimensions as per separately issued typical detail drawing. Swale to be re-vegetated with local species.
15. Slopes of swales to be vegetated or protected from erosion until vegetation has been established. Stripped vegetative layer from excavations to be stored locally and used to line slopes and base of swale. Vegetative layer to be placed into swale after construction of the swale.
16. Clean stone check dams to be installed in all drainage channels in order to promote settlement of suspended solids and control flow rates. Check dams generally to be locally won well graded stone. Aggregate size for stone check dams to be typically 5-40mm clean stone. On steep sections small stone to be anchored through the placement of 100mm stone on the downhill face of the check dam
17. Swale breakouts to be installed at regular intervals (every c. 80m).

WATERCOURSE & TRACK DRAINAGE CROSSINGS
18. The minimum pipe diameter for any track drainage crossing shall be 450mm.
19. All HDPE pipes shall be twinwall type, BBA HAPAS approved.
20. All watercourse crossings to be installed min. 0.15m below existing bed level and to suit existing stream channel gradients.
21. Refer to Watercourse Crossing Schedule for min. soffit levels.

MAINTENANCE
22. The level of silt in runoff during construction is to be monitored visually and excessive silt levels in any area to be temporarily managed through use of silt fences / constructed settlement features.
23. Build-up of silt levels at check dams to be removed and disposed of. Silt levels at check dams to be visually inspected as part of an ongoing maintenance programme during the construction phase. Where check dams become clogged with silt or vegetation, stone check dam to be removed and replaced subsequent to the removal of silt.

T11

IN-CHANNEL SILT BARRIERS TO BE USED DURING / AFTER CULVERT INSTALLATION.

POLLUTION PREVENTION GUIDANCE APPLIES TO CONSTRUCTION OF WATERCOURSE CROSSING / CULVERT. WORK TO AVOID INCLEMENT WEATHER.

SILT FENCES TO BE USED AS SPLASH GUARDS FOR DURATION OF CONSTRUCTION PHASE.

WX06

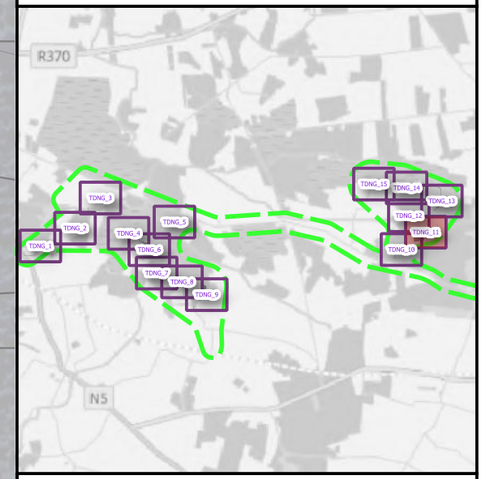
LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF SITE.

TEMPORARY COMPOUND. ALL FUEL / OIL STORAGE TO BE ON IMPERMEABLE BUNDED SURFACE. TEMPORARY WASTEWATER FROM WELFARE FACILITIES TO SEALED TANK.

0 50 100 150 200 m

N

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Temporary Works Area
- Existing Roads to be Upgraded
- Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Temporary Drainage Features
- Clean Water Interceptor
- Dirty Water Drainage
- Temporary Piped Drainage
- Drainage Breakout
- Clean Drainage Pipes
- Proposed Watercourse Crossing
- Silt Fence
- Settlement_Link
- Settlement Basin
- Borrowpit Grips
- Borrowpit_Polygons
- Borrowpit Lagoon_L
- Berms

Watercourse Crossing Ref	Min. Soffit (mOD)	Description
WX06	68.19	Clear span bridge or bottomless culvert

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DESCRIPTION CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 11

PROJECT / FIGURE NO. M02232-01_TDNG_11

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	2	26/03/2026

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PLANNING DESIGN

580200 580300 580400 580500 580600 580700

790300 790200 790100 790000 789900

NOTES:

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TEMPORARY CLEAN CUTOFF DRAINAGE TO BE INSTALLED PRIOR TO EARTHWORKS TO ENSURE CLEAN / DIRTY WATER SEPERATION.

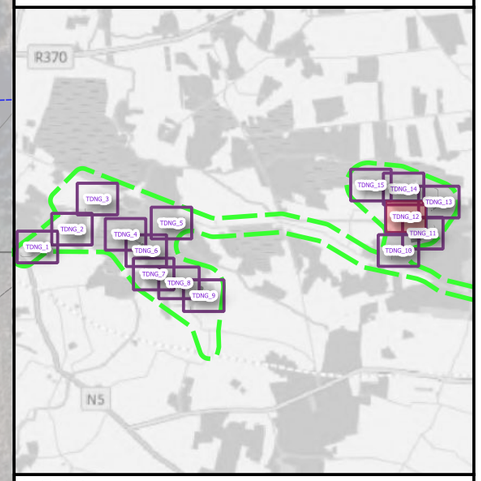
LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

T11

N

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure
- Temporary Works Area
- Existing Roads to be Upgraded
- Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Temporary Drainage Features
- Clean Water Interceptor
- Dirty Water Drainage
- Temporary Piped Drainage
- Drainage Breakout
- Clean Drainage Pipes
- Proposed Watercourse Crossing
- Silt Fence
- Settlement_Link
- Settlement Basin
- Borrowpit Grips
- Borrowpit_Polygons
- Borrowpit Lagoon_L
- Berms

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DESCRIPTION	CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 12
PROJECT / FIGURE NO.	M02232-01_TDNG_12
DRAWN BY	DH
SCALE	1:2000
REVISION	2
DATE	26/03/2026

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PLANNING DESIGN

580700 580800 580900 581000 581100 581200 581300

790600 790500 790400 790300 790200

NOTES:

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WATERCOURSE & TRACK DRAINAGE CROSSINGS
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21. Refer to Watercourse Crossing Schedule for min. soffit levels.

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LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

TEMPORARY CLEAN CUTOFF DRAINAGE TO BE INSTALLED PRIOR TO EARTHWORKS TO ENSURE CLEAN / DIRTY WATER SEPERATION.

T10

N

0 50 100 150 200 m

KEY PLAN

LEGEND

EIAR Boundary

Infrastructure
- Temporary Works Area
- Existing Roads to be Upgraded
- Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Temporary Drainage Features
- Clean Water Interceptor
- Dirty Water Drainage
- Temporary Piped Drainage
- Drainage Breakout
- Clean Drainage Pipes
- Proposed Watercourse Crossing
- Silt Fence
- Settlement_Link
- Settlement Basin
- Borrowpit Grips
- Borrowpit_Polygons
- Borrowpit Lagoon_L
- Berms

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DESCRIPTION: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 13			
PROJECT / FIGURE NO.: M02232-01_TDNG_13			
DRAWN BY: DH	SCALE: 1:2000	REVISION: 2	DATE: 26/03/2026

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PLANNING DESIGN

NOTES:

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WATERCOURSE & TRACK DRAINAGE CROSSINGS
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MAINTENANCE
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580100 580200 580300 580400 580500 580600 580700

790800 790700 790600 790500 790400

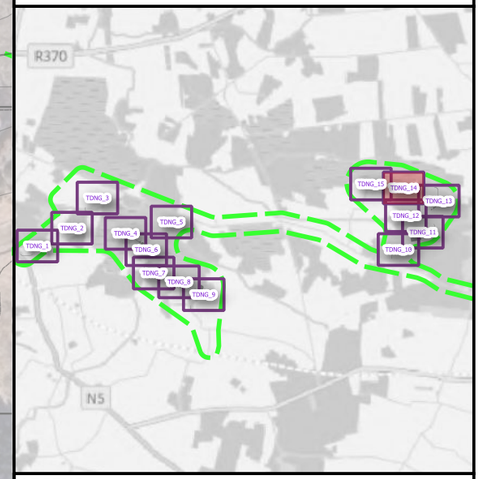
N

LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

T09

0 50 100 150 200 m

KEY PLAN



LEGEND

EIAR Boundary

Infrastructure

Temporary Works Area

Existing Roads to be Upgraded

Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints

Major Watercourses

Minor Watercourses

Other Ephemeral / Minor Drainage

Watercourse Buffers

Temporary Drainage Features

Clean Water Interceptor

Dirty Water Drainage

Temporary Piped Drainage

Drainage Breakout

Clean Drainage Pipes

Proposed Watercourse Crossing

Silt Fence

Settlement_Link

Settlement Basin

Borrowpit Grips

Borrowpit_Polygons

Borrowpit Lagoon_L

Berms

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DESCRIPTION	CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 14
PROJECT / FIGURE NO.	M02232-01_TDNG_14
DRAWN BY	DH
SCALE	1:2000
REVISION	2
DATE	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

579600 579700 579800 579900 580000 580100

790900 790800 790700 790600 790500 790400

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LINED CONCRETE / CEMENT WASHOUT PIT. COLLECTED WATER TO BE DISPOSED OF OFF-SITE.

T08

N

0 50 100 150 200 m

KEY PLAN

LEGEND

EIAR Boundary

Infrastructure
- Temporary Works Area
- Existing Roads to be Upgraded
- Proposed Floated Sections

Hydrology Features & Constraints

Water Feature Constraints
- Major Watercourses
- Minor Watercourses
- Other Ephemeral / Minor Drainage
- Watercourse Buffers

Temporary Drainage Features
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- Dirty Water Drainage
- Temporary Piped Drainage
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DESCRIPTION: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT - TEMPORARY DRAINAGE LAYOUT SHEET 15

PROJECT / FIGURE NO.: M02232-01_TDNG_15

DRAWN BY	SCALE	REVISION	DATE
DH	1:2000	2	26/03/2026

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BACKGROUND MAP CONTAINS OPENSTREETMAP DATA © OSM CONTRIBUTORS (2026)

PLANNING DESIGN

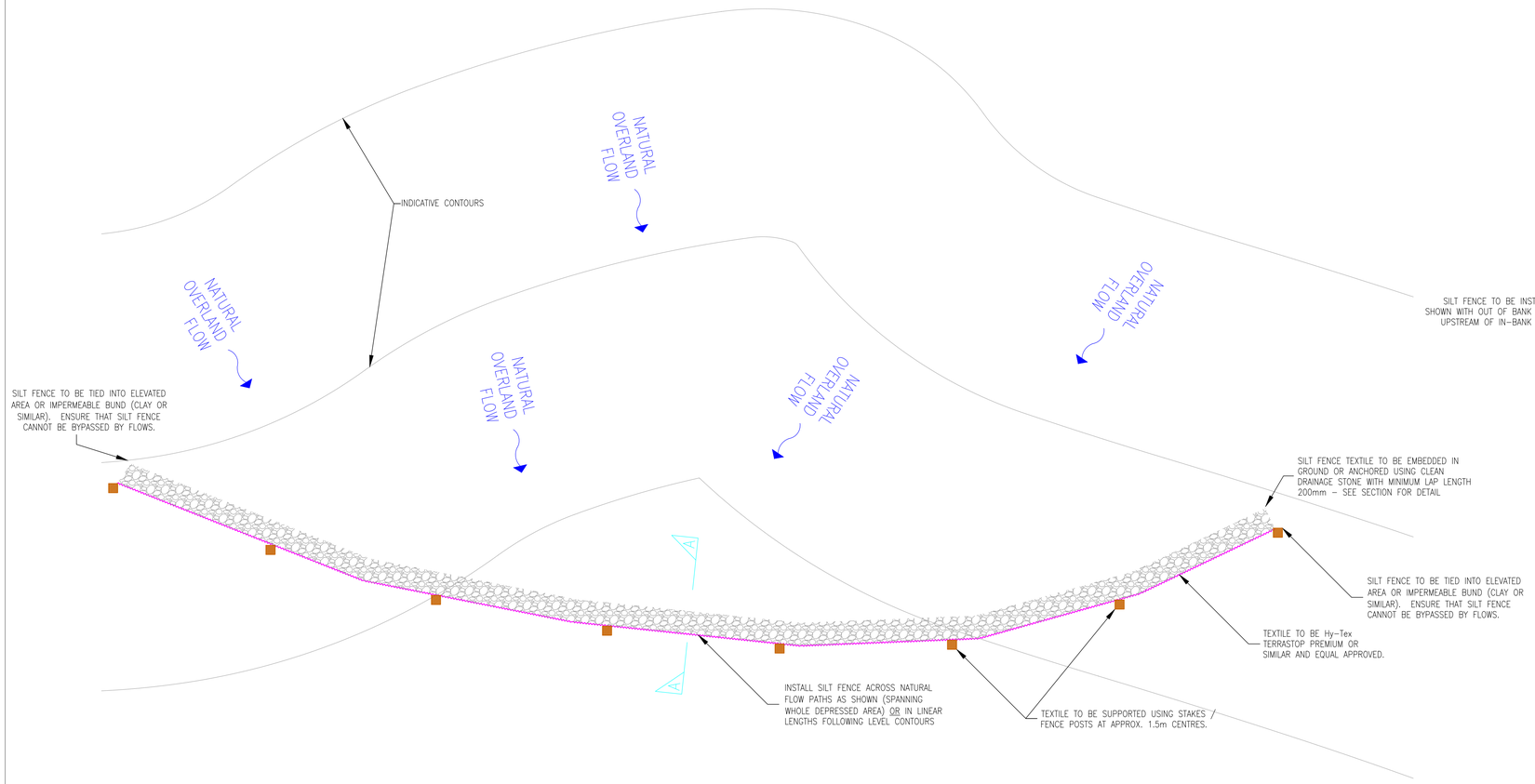
Annex D

Temporary Drainage - Details

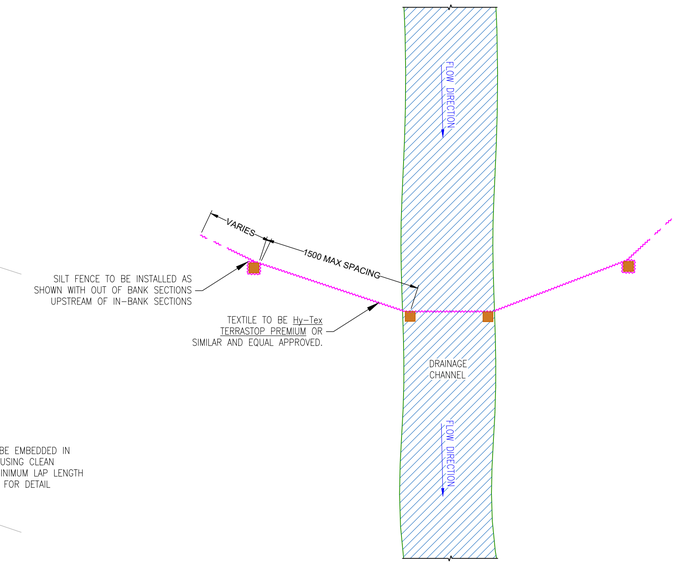
201 Silt Fence

202 Settlement Basin

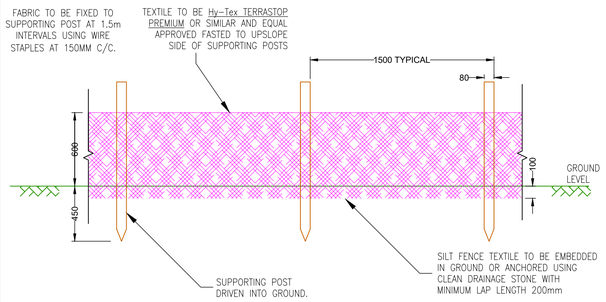
203 Clean Cutoff Drainage / Breakout



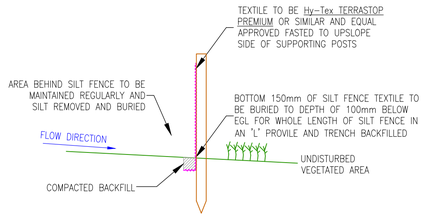
TYPICAL OVERLAND SILT FENCE PLAN
SCALE 1:25



TYPICAL CHANNEL SILT FENCE PLAN
SCALE 1:25



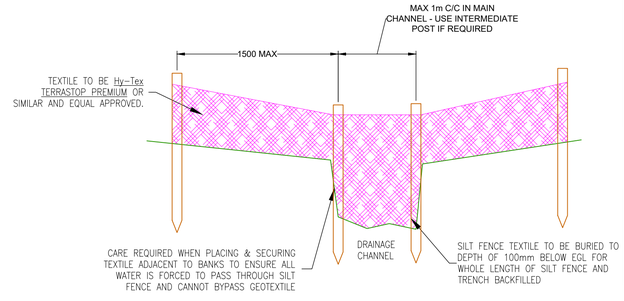
ELEVATION
SCALE 1:25



SECTION A–A
BURIED TYPE OPTION
SCALE 1:25

EXAMPLE OF CHANNEL SILT FENCE INSTALLATION
NTS

NOTE – IN–CHANNEL SILT FENCE BARRIERS ARE SUITABLE ONLY FOR PEAT / FORESTRY DRAINS AND ARE NOT FOR INSTALLATION IN WATERCOURSES



TYPICAL CHANNEL SILT FENCE ELEVATION
SCALE 1:25

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	KS	26/03/2026	FOR PLANNING

STATUS: PLANNING

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PROJECT: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT CO. ROSCOMMON

CLIENT: CARRAIGIN POWER LTD

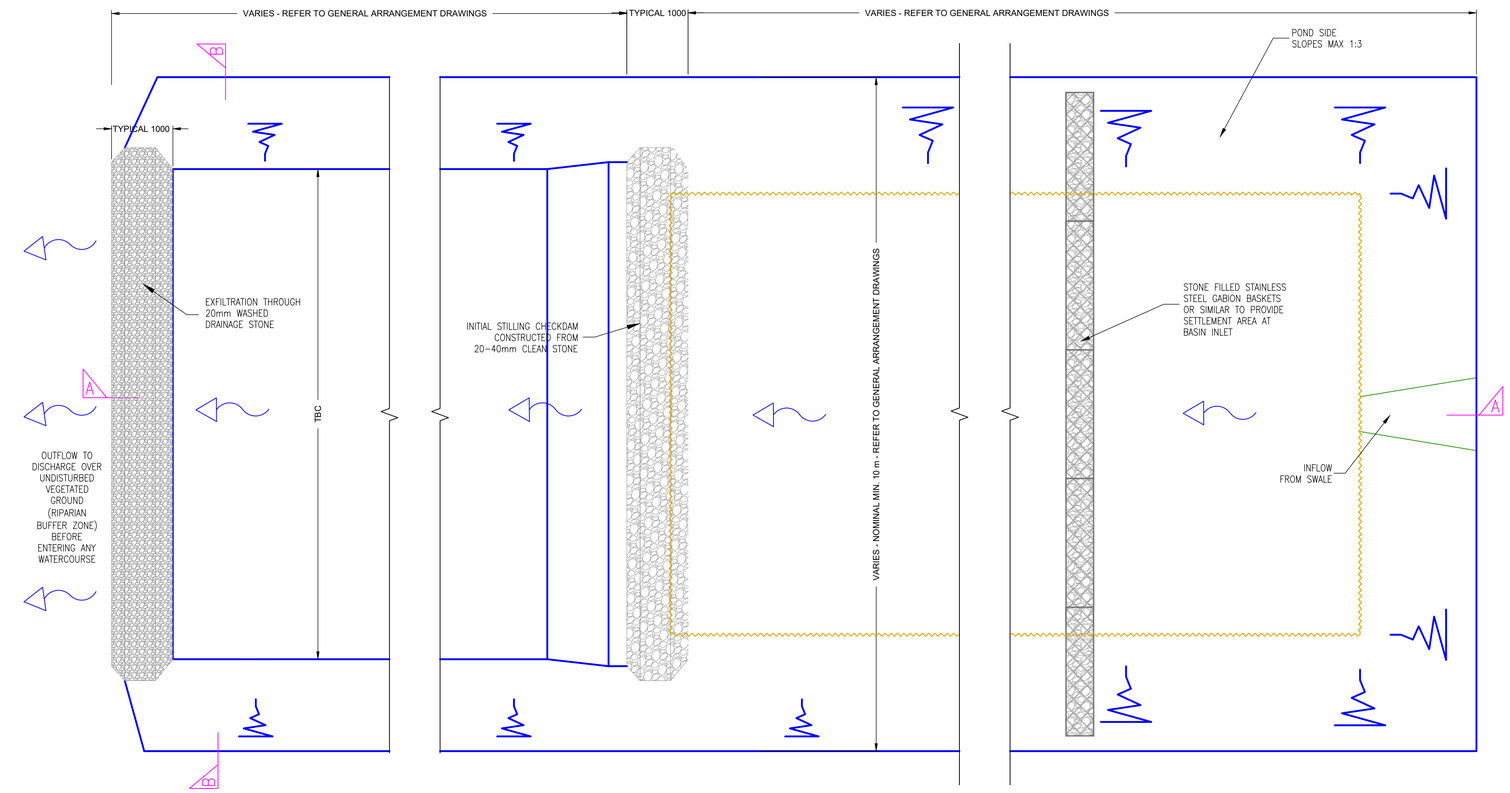
DRAWING TITLE: SURFACE WATER MANAGEMENT SILT FENCE

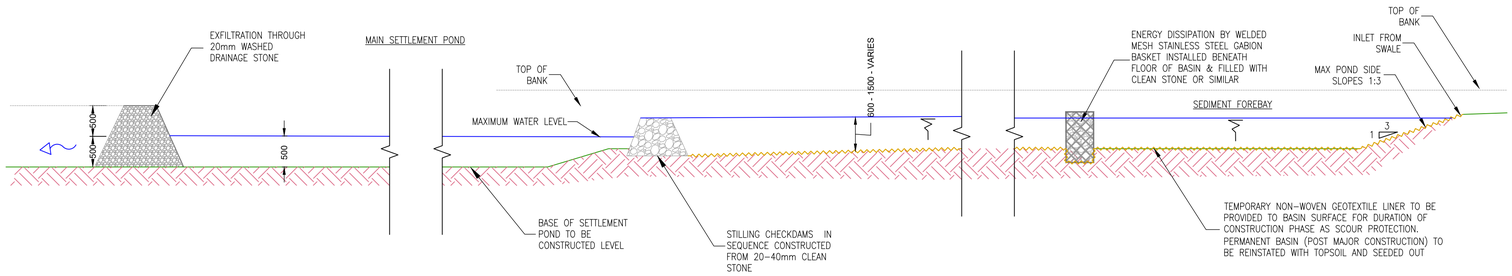
SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

DRAWN	CHECKED	DATE
DL	DKS	26/03/2026

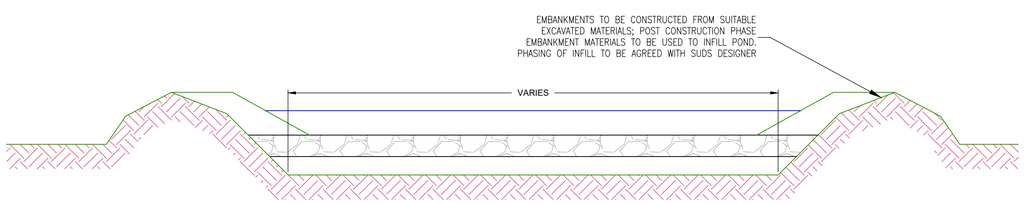
PROJECT No.	DRAWING No.	ISSUE NO.
M02232-01	DWG_201	1

PLANNING DESIGN





SECTION A-A



SECTION B-B

PLANNING DESIGN

1	DL	KS	26/03/2026	FOR PLANNING
ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION

STATUS

PLANNING

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PROJECT

CARRIGEEN RENEWABLE ENERGY DEVELOPMENT CO. ROSCOMMON

CLIENT

CARRAIGIN POWER LTD

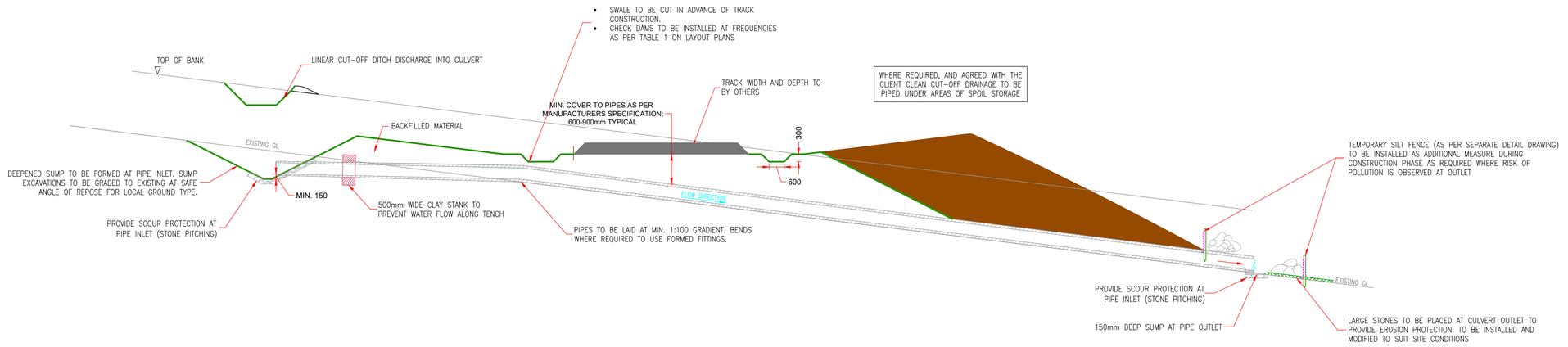
DRAWING TITLE

SURFACE WATER MANAGEMENT SETTLEMENT BASIN

SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

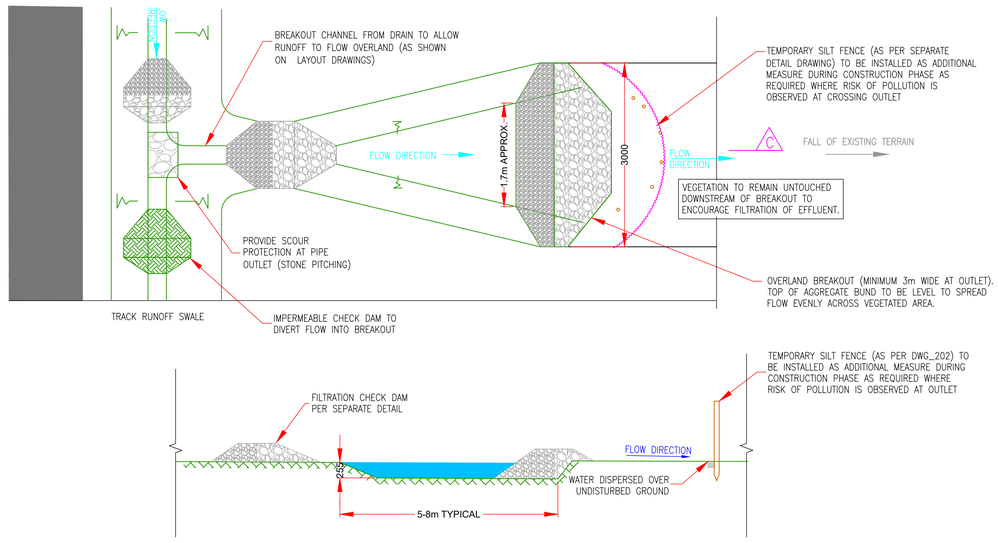
DRAWN	CHECKED	DATE
DL	DKS	26/03/2026

PROJECT No.	DRAWING No.	ISSUE NO.
M02232-01	DWG_202	1



TYPICAL UPSLOPE CUT-OFF DITCH CULVERT & OUTLET

SCALE - 1:100



TYPICAL BREAKOUT – PLAN AND SECTION

NOTES

1. SUDS SYSTEM TO BE CONSTRUCTED PRIOR TO, OR AT THE SAME TIME AS THE ACCESS ROAD & HARDSTANDINGS. INTERIM MEASURES SUCH AS THE PLACEMENT OF SILT FENCES TO BE USED AROUND WATERCOURSES AND RETAINED IN PLACE UNTIL SUDS ARE ESTABLISHED AND PROVIDING SUFFICIENT SILT REMOVAL.
2. LEVEL OF SEDIMENT AND DEBRIS TO BE MONITORED ON SILT FENCING AND REMOVED AND DEPOSITED IN A SUITABLE AREA, A MINIMUM OF 50m FROM A WATERCOURSE OR WATERBODY.
3. ALTERNATIVE FORMS OF SEDIMENT CONTROL MAY BE SUITABLE AND USED BUT MUST BE MONITORED ON AN OBSERVATIONAL BASIS AND IF DEEMED UNSUITABLE HY-TEX SILT FENCES MAY BE UTILISED.
4. IN AREAS WHERE THERE ARE HIGH SILT LOADINGS OF RUN-OFF SILT NETTING MAY BE USED IN SERIES WITH A MINIMUM GAP OF 1m BETWEEN ROWS TO PROVIDE ADDITIONAL TREATMENT.

ISSUE	DRN	APP	DATE	NOTES / DESCRIPTION
1	DL	KS	26/03/2026	FOR PLANNING

STATUS: PLANNING

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PROJECT: CARRIGEEN RENEWABLE ENERGY DEVELOPMENT CO. ROSCOMMON

CLIENT: CARRAIGIN POWER LTD

DRAWING TITLE: SURFACE WATER MANAGEMENT CLEAN CUTOFF DRAINAGE

SCALE	ORIGINAL SIZE
AS SHOWN@A1	A1

DRAWN	CHECKED	DATE
DL	DKS	26/03/2026

PROJECT No.	DRAWING No.	ISSUE NO.
M02232-01	DWG_203	1

Annex E

Supporting Calculations

Annex E1

Tracks & Hardstandings; Qbar Calculations

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

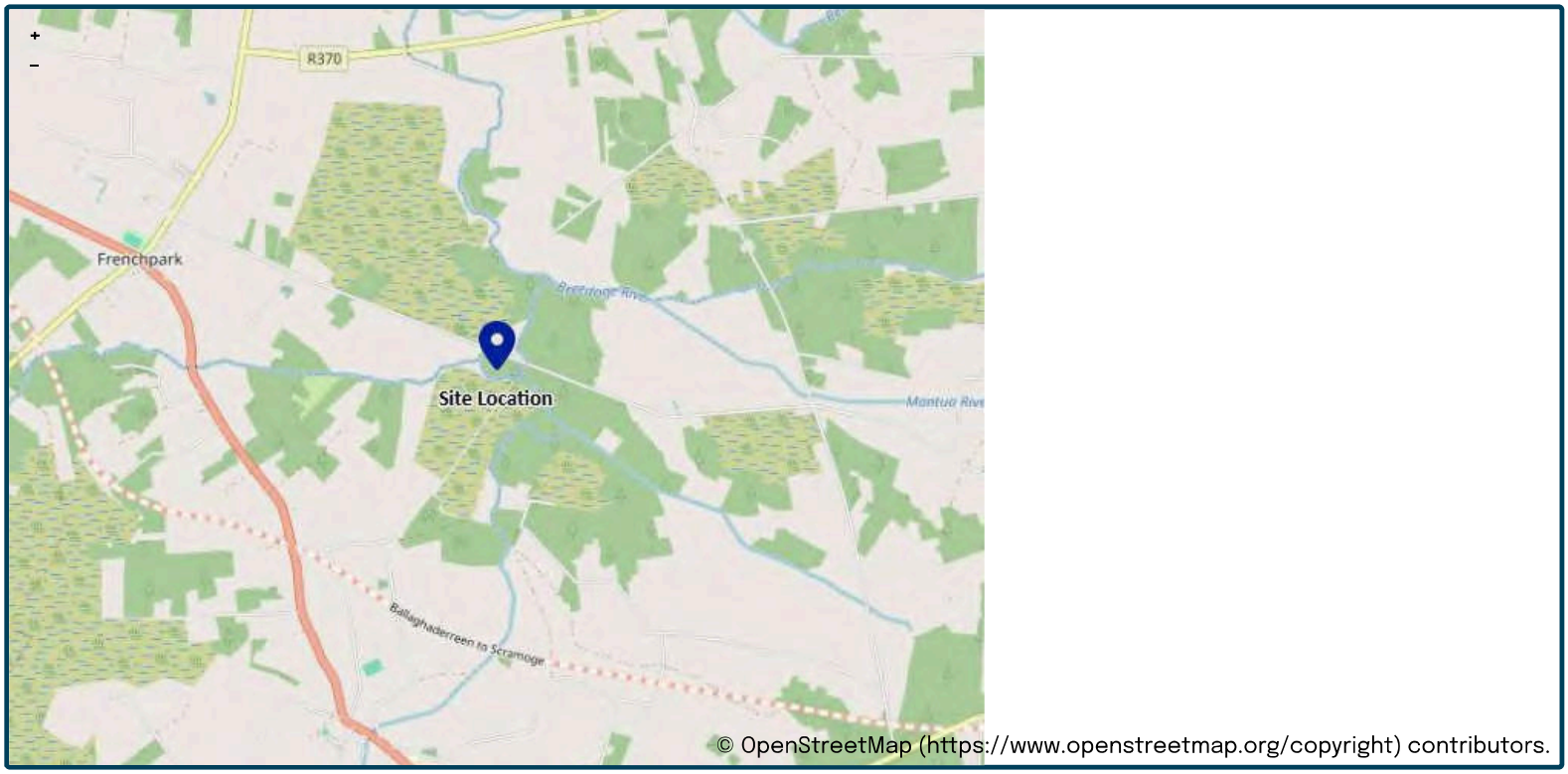
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	23/03/2026
Calculated by	DH
Reference	M02232-01
Model version	2.2.3

Location

Site name	Carrigeen
Site location	Co. Roscommon



Site easting (Irish Grid)	176001
Site northing (Irish Grid)	290141
Site easting (Irish Transverse Mercator)	575957
Site northing (Irish Transverse Mercator)	790156

Site details

Total site area (ha)	8.6184 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1168 mm		1168
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	75.7 l/s		

Growth curve factors

	My value		Map value
Hydrological region	13		13
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.4		
30 year growth factor	1.65		
100 year growth factor	1.95		
200 year growth factor	2.15		

Results

Method	IH124	
Flow rate 1 year (l/s)	64.4	l/s
Flow rate 2 year (l/s)	71.9	l/s
Flow rate 10 years (l/s)	106.0	l/s
Flow rate 30 years (l/s)	125.0	l/s
Flow rate 100 years (l/s)	147.7	l/s
Flow rate 200 years (l/s)	162.8	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Annex E2

Tracks & Hardstandings; Attenuation Calculations

Calculation Summary

Purpose: To summarise calculations to determine basin size for attenuation and treatment for the preliminary design

Inputs

Qbar for site	75.7	lps
%runoff from unbound surfaces for effective area:	50%	
%-losses allowed for by breakouts etc	0%	

Catchment ID	AREA	Atten. Vol (pro-rata, area) - cu.m	Depth	Width	Min. Length	Qbar Rate (lps)	Section Area sq m	Velocity m/s	Residence (hrs)	Updated Length	Notes	Finalised Dimensions LxWxD (m)
1	1022	14	0.8	3.00	6	2.0	1.2	0.0039	0.42	9	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	9x3x0.8
2	7072	126	1.2	5.00	21	6.2	3	0.0109	0.54	25	Dimensions increased to suit water quality requirements	25x5x1.2
3	224	2	0.6	1.50	2	2.0	0.45	0.0023	0.24	5	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	5x1.5x0.6
4	152	1	0.6	1.00	2	2.0	0.3	0.0023	0.24	5	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	5x1x0.6
5	234	2	0.6	1.50	2	2.0	0.45	0.0024	0.23	6	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	6x1.5x0.6
6	5165	96	1.2	5.00	16	4.5	3	0.0080	0.56	19	Dimensions increased to suit water quality requirements	19x5x1.2
7	4626	84	1.2	5.00	14	4.1	3	0.0071	0.55	17	Dimensions increased to suit water quality requirements	17x5x1.2
8	1000	12	0.8	3.00	5	2.0	1.2	0.0038	0.36	9	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	9x3x0.8
9	6141	114	1.2	5.00	19	5.4	3	0.0095	0.56	22	Dimensions increased to suit water quality requirements	22x5x1.2
10	681	6	0.8	2.00	4	2.0	0.8	0.0039	0.28	9	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	9x2x0.8
11	6068	108	1.2	5.00	18	5.3	3	0.0093	0.54	22	Dimensions increased to suit water quality requirements	22x5x1.2
12	5366	96	1.2	5.00	16	4.7	3	0.0083	0.54	19	Dimensions increased to suit water quality requirements	19x5x1.2
13	6390	114	1.2	5.00	19	5.6	3	0.0098	0.54	23	Dimensions increased to suit water quality requirements	23x5x1.2
14	1820	30	1	3.00	10	2.0	1.5	0.0056	0.50	13	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	13x3x1
15	333	2	0.8	1.50	2	2.0	0.6	0.0026	0.22	6	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	6x1.5x0.8
16	717	8	1	2.00	4	2.0	1	0.0033	0.34	8	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	8x2x1
17	12003	221	1.2	8.00	23	10.5	4.8	0.0115	0.55	27	Dimensions increased to suit water quality requirements	27x8x1.2
18	995	12	0.8	3.00	5	2.0	1.2	0.0038	0.36	9	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	9x3x0.8
19	6643	120	1.2	5.00	20	5.8	3	0.0102	0.54	24	Dimensions increased to suit water quality requirements	24x5x1.2
20	6289	114	1.2	5.00	19	5.5	3	0.0097	0.55	23	Dimensions increased to suit water quality requirements	23x5x1.2
21	1331	21	1	3.00	7	2.0	1.5	0.0041	0.47	10	Dimensions increased to suit water quality requirementsRate adjusted to suit minimum allowed for blockage mitigation	10x3x1
22	6374	114	1.2	5.00	19	5.6	3	0.0098	0.54	23	Dimensions increased to suit water quality requirements	23x5x1.2
23	5537	102	1.2	5.00	17	4.9	3	0.0085	0.55	20	Dimensions increased to suit water quality requirements	20x5x1.2
0	0	0	0	0.00	0	0.0	0	0.0000	0.00	0		0x0x0
0	0	0	0	0.00	0	0.0	0	0.0000	0.00	0		0x0x0
0	0	0	0	0.00	0	0.0	0	0.0000	0.00	0		0x0x0
0	0	0	0	0.00	0	0.0	0	0.0000	0.00	0		0x0x0
0	0	0	0	0.00	0	0.0	0	0.0000	0.00	0		0x0x0
0	0	0	0	0.00	0	0.0	0	0.0000	0.00	0		0x0x0

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 1

Catchment Details:			
Buildings	0	m^2	x 95 %
Dense surfacing	1022	m^2	x 50 %
Effective Area	511	m^2	

Storage Details:		
Length	9	m
Width	3	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:		
Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	5.003
10 min	14.1	101.4	7.438
15 min	17.5	84.2	8.952
30 min	24.2	58.2	11.261
45 min	28.4	45.5	12.027
60 min	31.5	37.8	12.116
2 hours	39.7	23.8	9.960
6 hours	55.6	11.1	0.000
24 hours	83.2	4.2	0.000

Outflow Details:		
Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:	
Outcome:	Pass
Critical Storm Duration	56 min
Hmax	0.449 m
Time to half empty	50.6 min

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 2

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	7072	m^2	x 50 %
Effective Area	3536	m^2	

Storage Details:

Length	25	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	36.914
10 min	14.1	101.4	56.055
15 min	17.5	84.2	68.821
30 min	24.2	58.2	91.675
45 min	28.4	45.5	103.852
60 min	31.5	37.8	111.339
2 hours	39.7	23.8	123.926
6 hours	55.6	11.1	102.146
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	6.2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.57 hrs
Hmax	1.001 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 3

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	224	m^2	x 50 %
Effective Area	112	m^2	

Storage Details:

Length	5	m
Width	1.5	m
Depth	0.6	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	0.628
10 min	14.1	101.4	0.693
15 min	17.5	84.2	0.557
30 min	24.2	58.2	0.000
45 min	28.4	45.5	0.000
60 min	31.5	37.8	0.000
2 hours	39.7	23.8	0.000
6 hours	55.6	11.1	0.000
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	10 min
Hmax	0.094 m
Time to half empty	2.9 min

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 4

Catchment Details:			
Buildings	0	m^2	x 95 %
Dense surfacing	152	m^2	x 50 %
Effective Area	76	m^2	

Storage Details:		
Length	5	m
Width	1	m
Depth	0.6	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:		
Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	0.233
10 min	14.1	101.4	0.085
15 min	17.5	84.2	0.000
30 min	24.2	58.2	0.000
45 min	28.4	45.5	0.000
60 min	31.5	37.8	0.000
2 hours	39.7	23.8	0.000
6 hours	55.6	11.1	0.000
24 hours	83.2	4.2	0.000

Outflow Details:		
Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:	
Outcome:	Pass
Critical Storm Duration	6 min
Hmax	0.047 m
Time to half empty	0.9 min

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 5

Catchment Details:			
Buildings	0	m^2	x 95 %
Dense surfacing	234	m^2	x 50 %
Effective Area	117	m^2	

Storage Details:		
Length	6	m
Width	1.5	m
Depth	0.6	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:		
Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	0.683
10 min	14.1	101.4	0.778
15 min	17.5	84.2	0.662
30 min	24.2	58.2	0.000
45 min	28.4	45.5	0.000
60 min	31.5	37.8	0.000
2 hours	39.7	23.8	0.000
6 hours	55.6	11.1	0.000
24 hours	83.2	4.2	0.000

Outflow Details:		
Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:	
Outcome:	Pass
Critical Storm Duration	10 min
Hmax	0.087 m
Time to half empty	3.2 min

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 6

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	5165	m^2	x 50 %
Effective Area	2582.5	m^2	

Storage Details:

Length	19	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	26.968
10 min	14.1	101.4	40.957
15 min	17.5	84.2	50.288
30 min	24.2	58.2	67.005
45 min	28.4	45.5	75.924
60 min	31.5	37.8	81.417
2 hours	39.7	23.8	90.711
6 hours	55.6	11.1	75.209
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	4.5	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.58 hrs
Hmax	0.965 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 7

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	4626	m^2	x 50 %
Effective Area	2313	m^2	

Storage Details:

Length	17	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	24.133
10 min	14.1	101.4	36.641
15 min	17.5	84.2	44.978
30 min	24.2	58.2	59.887
45 min	28.4	45.5	67.813
60 min	31.5	37.8	72.670
2 hours	39.7	23.8	80.744
6 hours	55.6	11.1	65.857
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	4.1	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.53 hrs
Hmax	0.958 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 8

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	1000	m^2	x 50 %
Effective Area	500	m^2	

Storage Details:

Length	9	m
Width	3	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	4.883
10 min	14.1	101.4	7.252
15 min	17.5	84.2	8.720
30 min	24.2	58.2	10.941
45 min	28.4	45.5	11.652
60 min	31.5	37.8	11.700
2 hours	39.7	23.8	9.436
6 hours	55.6	11.1	0.000
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	55 min
Hmax	0.434 m
Time to half empty	48.9 min

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 9

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	6141	m^2	x 50 %
Effective Area	3070.5	m^2	

Storage Details:

Length	22	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	32.049
10 min	14.1	101.4	48.666
15 min	17.5	84.2	59.746
30 min	24.2	58.2	79.577
45 min	28.4	45.5	90.137
60 min	31.5	37.8	96.623
2 hours	39.7	23.8	107.495
6 hours	55.6	11.1	88.349
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	5.4	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.55 hrs
Hmax	0.986 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 10

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	681	m^2	x 50 %
Effective Area	340.5	m^2	

Storage Details:

Length	9	m
Width	2	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	3.134
10 min	14.1	101.4	4.556
15 min	17.5	84.2	5.364
30 min	24.2	58.2	6.302
45 min	28.4	45.5	6.212
60 min	31.5	37.8	5.671
2 hours	39.7	23.8	1.832
6 hours	55.6	11.1	0.000
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	37 min
Hmax	0.354 m
Time to half empty	26.5 min

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 11

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	6068	m^2	x 50 %
Effective Area	3034	m^2	

Storage Details:

Length	22	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	31.679
10 min	14.1	101.4	48.109
15 min	17.5	84.2	59.068
30 min	24.2	58.2	78.695
45 min	28.4	45.5	89.162
60 min	31.5	37.8	95.604
2 hours	39.7	23.8	106.475
6 hours	55.6	11.1	88.072
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	5.3	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.58 hrs
Hmax	0.978 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 12

Catchment Details:			
Buildings	0	m^2	x 95 %
Dense surfacing	5366	m^2	x 50 %
Effective Area	2683	m^2	

Storage Details:		
Length	19	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:		
Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	28.010
10 min	14.1	101.4	42.535
15 min	17.5	84.2	52.223
30 min	24.2	58.2	69.568
45 min	28.4	45.5	78.811
60 min	31.5	37.8	84.496
2 hours	39.7	23.8	94.062
6 hours	55.6	11.1	77.599
24 hours	83.2	4.2	0.000

Outflow Details:		
Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	4.7	l/s

Results:	
Outcome:	Pass
Critical Storm Duration	2.57 hrs
Hmax	1 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 13

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	6390	m^2	x 50 %
Effective Area	3195	m^2	

Storage Details:

Length	23	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	33.355
10 min	14.1	101.4	50.651
15 min	17.5	84.2	62.186
30 min	24.2	58.2	82.838
45 min	28.4	45.5	93.843
60 min	31.5	37.8	100.610
2 hours	39.7	23.8	111.990
6 hours	55.6	11.1	92.340
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	5.6	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.57 hrs
Hmax	0.983 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 14

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	1820	m^2	x 50 %
Effective Area	910	m^2	

Storage Details:

Length	13	m
Width	3	m
Depth	1	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	9.379
10 min	14.1	101.4	14.183
15 min	17.5	84.2	17.347
30 min	24.2	58.2	22.865
45 min	28.4	45.5	25.635
60 min	31.5	37.8	27.198
2 hours	39.7	23.8	28.981
6 hours	55.6	11.1	17.552
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	1.93 hrs
Hmax	0.743 m
Time to half empty	2 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 15

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	333	m^2	x 50 %
Effective Area	166.5	m^2	

Storage Details:

Length	6	m
Width	1.5	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	1.226
10 min	14.1	101.4	1.615
15 min	17.5	84.2	1.703
30 min	24.2	58.2	1.242
45 min	28.4	45.5	0.278
60 min	31.5	37.8	0.000
2 hours	39.7	23.8	0.000
6 hours	55.6	11.1	0.000
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	16 min
Hmax	0.189 m
Time to half empty	7.1 min

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 16

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	717	m^2	x 50 %
Effective Area	358.5	m^2	

Storage Details:

Length	8	m
Width	2	m
Depth	1	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	3.331
10 min	14.1	101.4	4.860
15 min	17.5	84.2	5.743
30 min	24.2	58.2	6.826
45 min	28.4	45.5	6.826
60 min	31.5	37.8	6.351
2 hours	39.7	23.8	2.690
6 hours	55.6	11.1	0.000
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	37 min
Hmax	0.433 m
Time to half empty	28.9 min

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 17

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	12003	m^2	x 50 %
Effective Area	6001.5	m^2	

Storage Details:

Length	27	m
Width	8	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	62.659
10 min	14.1	101.4	95.154
15 min	17.5	84.2	116.827
30 min	24.2	58.2	155.637
45 min	28.4	45.5	176.326
60 min	31.5	37.8	189.054
2 hours	39.7	23.8	210.499
6 hours	55.6	11.1	173.864
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	10.5	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.57 hrs
Hmax	0.984 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 18

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	995	m^2	x 50 %
Effective Area	497.5	m^2	

Storage Details:

Length	9	m
Width	3	m
Depth	0.8	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	4.855
10 min	14.1	101.4	7.210
15 min	17.5	84.2	8.668
30 min	24.2	58.2	10.868
45 min	28.4	45.5	11.567
60 min	31.5	37.8	11.605
2 hours	39.7	23.8	9.316
6 hours	55.6	11.1	0.000
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	55 min
Hmax	0.431 m
Time to half empty	48.5 min

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 19

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	6643	m^2	x 50 %
Effective Area	3321.5	m^2	

Storage Details:

Length	24	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	34.682
10 min	14.1	101.4	52.669
15 min	17.5	84.2	64.667
30 min	24.2	58.2	86.156
45 min	28.4	45.5	97.617
60 min	31.5	37.8	104.671
2 hours	39.7	23.8	116.580
6 hours	55.6	11.1	96.465
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	5.8	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.58 hrs
Hmax	0.981 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 20

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	6289	m^2	x 50 %
Effective Area	3144.5	m^2	

Storage Details:

Length	23	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	32.831
10 min	14.1	101.4	49.857
15 min	17.5	84.2	61.213
30 min	24.2	58.2	81.549
45 min	28.4	45.5	92.390
60 min	31.5	37.8	99.061
2 hours	39.7	23.8	110.302
6 hours	55.6	11.1	91.129
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	5.5	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.57 hrs
Hmax	0.969 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 21

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	1331	m^2	x 50 %
Effective Area	665.5	m^2	

Storage Details:

Length	10	m
Width	3	m
Depth	1	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	6.697
10 min	14.1	101.4	10.050
15 min	17.5	84.2	12.203
30 min	24.2	58.2	15.754
45 min	28.4	45.5	17.296
60 min	31.5	37.8	17.956
2 hours	39.7	23.8	17.325
6 hours	55.6	11.1	1.229
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	2	l/s

Results:

Outcome:	Pass
Critical Storm Duration	1.3 hrs
Hmax	0.606 m
Time to half empty	1.3 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 22

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	6374	m^2	x 50 %
Effective Area	3187	m^2	

Storage Details:

Length	23	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	33.267
10 min	14.1	101.4	50.515
15 min	17.5	84.2	62.017
30 min	24.2	58.2	82.605
45 min	28.4	45.5	93.570
60 min	31.5	37.8	100.307
2 hours	39.7	23.8	111.608
6 hours	55.6	11.1	91.806
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	5.6	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.55 hrs
Hmax	0.98 m
Time to half empty	2.8 hrs

CRM Stormflow Stormwater Management Software

Client:	Carraigin Power Ltd
Project:	Carrigeen Renewable Energy Development
Location:	Co. Roscommon
Catchment:	Subcatchment 23

Catchment Details:

Buildings	0	m^2	x 95 %
Dense surfacing	5537	m^2	x 50 %
Effective Area	2768.5	m^2	

Storage Details:

Length	20	m
Width	5	m
Depth	1.2	m
Porosity	100	%
Area Increase	0	%

Rainfall Details - FSR Method:

Return Period	100	years
Climate Change Factor	20	%
r value	0.28	
M5-60	16	mm

	mm	mm/h	storage (m^3)
5 min	9.1	131.6	28.888
10 min	14.1	101.4	43.861
15 min	17.5	84.2	53.842
30 min	24.2	58.2	71.694
45 min	28.4	45.5	81.187
60 min	31.5	37.8	87.008
2 hours	39.7	23.8	96.698
6 hours	55.6	11.1	78.987
24 hours	83.2	4.2	0.000

Outflow Details:

Infiltration rate	0	m/hr
Attenuation Control	Fixed Outflow	
Control Diameter	-	mm
Discharge rate	4.9	l/s

Results:

Outcome:	Pass
Critical Storm Duration	2.53 hrs
Hmax	0.976 m
Time to half empty	2.8 hrs

Annex F

Watercourse Crossing Schedule

Notes:

- Crossings are to be designed for free inlet conditions 1% AEP + climate change in line with OPW Section 50 standards. Works to watercourse crossings will be subject to future authorisation by the OPW under Section 50 of the Arterial Drainage Act 1945.
- Min. soffit levels are based on hydrology and hydraulic assessment described in Flood Risk Assessment (document ref. M02232-01_FL01).
- Crossings of 'major' watercourses to be clear span bridges or bottomless culverts (PCC or equivalent) with span based on estimated bank-to-bank width and to avoid disruption to riverbed to suit fisheries requirements.
- Crossings of 'minor' watercourses to be circular culverts installed at a level lower than existing bed levels in order to create a 'stilling' effect and reduce potential for increased local flow velocities in the culvert.

Crossing Schedule:

Watercourse Crossing Reference	Water Feature	Easting	Northing	Min. Soffit Level (mOD)
WX01	'Major' Watercourse	575056	789876	66.72
WX02	'Major' Watercourse	575206	790224	66.62
WX03	'Major' Watercourse	576010	789753	66.00
WX04	'Major' Watercourse	576552	789843	65.80
WX05	'Minor' Watercourse	577019	788876	68.40
WX06	'Major' Watercourse	580806	789851	68.19