Appendix 12A

Flood Risk and Drainage Assessment

[THIS PAGE INTENTIONALLY LEFT BLANK]

Flood Risk Drainage Assessment

Tynagh North OCGT

EP Energy Developments Ltd.

Project number: 60661667

January 2023

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
Aparna Jamgade Apprentice	Peter O'Connor MRICS MCIWN		
Technical Teams Various	Peter O'Connor Associate Director	Simon Wells Associate Director	Simon Wells Associate Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	January 2023	Planning	SW	Simon Wells	Associate Director

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

EP Energy Developments Limited

Prepared by:

AECOM Infrastructure & Environment UK Limited
9th Floor, The Clarence West Building
2 Clarence Street West
Belfast BT2 7GP
United Kingdom

T: +44 28 9060 7200
aecom.com

Table of Contents

1 Introduction 1
2 Site Information 3
2.1 Site Location 3
2.2 Site Description and Topography 4
2.3 Geology 5
2.4 Watercourses 6
3 Stage 1 – Flood Risk Identification 8
3.1 Hydrometric Data 8
3.2 OPW Hazard Maps 9
3.3 Groundwater Wells and Springs 11
3.4 OPW Land Benefitting Maps 12
3.5 Flooding from Overland Flow 13
3.6 Galway County Development Plan 14
3.7 Screening Assessment Conclusion – Stage 1 15
4 Stage 2 – Initial Flood Risk Assessment 16
4.1 Determination of Vulnerability 16
4.2 Determination of Flood Zone 16
4.2.1 Coastal Flooding 17
4.2.2 Fluvial Flooding 17
4.2.3 Pluvial Flooding 18
4.2.4 Groundwater Flooding 18
4.3 Justification Test Requirement 18
4.4 Environmental Impact Assessment 19
4.5 Stage 2 Flood Risk Assessment Conclusion 19
5 Stage 3 - Detailed Flood Risk Assessment 20
5.1 Proposed Development 20
5.2 Foul Drainage 20
5.2.1 Existing Foul Drainage 20
5.2.2 Proposed Foul Drainage 20
5.3 Surface Water Drainage 21
5.3.1 Existing Surface Water Drainage 21
5.3.2 Proposed Surface Water Drainage 21
5.3.2.1 Preliminary Calculation 22
5.4 Mitigation Measures 23
6 Conclusion 24
Appendix A - Proposed Development Red Line Boundary and Site Layout 25
Appendix B - Existing Site Topography 26
Appendix C - Existing Drainage Layout 27
Appendix D - Proposed Development Drainage Layout 28
Appendix E - Greenfield run-off rate estimation 29
Appendix F - Surface water storage requirements 30

Figures

Figure 1-1 Proposed Development (Tynagh North) Location ... 1
Figure 2-1 Existing Infrastructure and the Proposed Development (Tynagh North) ... 3
Figure 2-2 Local Topography ... 5
Figure 2-3 Bedrock Geology (Source: GSISR, 2023) ... 6
Figure 2-4 Location of nearby watercourses (Source: www.floodinfo.ie) ... 7
Figure 2-5 Existing Lagoon (South of the Site) ... 7
Figure 3-1 Location of Hydrometric Gauging Station ... 9
Figure 3-2 OPW Flood Hazard Map ... 10
Figure 3-3 Past Flood Events (Source: www.floodinfo.ie) ... 11
Figure 3-4 Groundwater Wells and Springs ... 12
Figure 3-5 Groundwater Wells and Springs (Source: www.floodinfo.ie) ... 13
Figure 4-1 Flood Hazard Extents (Source: www.floodinfo.ie) ... 18

Tables

Table 3-1 Hydrometric Gauging Station ... 8
Table 3-2 Historic Flood Events ... 10
Table 3-3 Flood Zones Planning Implications ... 15
Table 4-1 Classification of Vulnerability ... 16
Table 4-2 Flood Zone Description ... 16
Table 4-3 Justification Test Matrix ... 18
Table 5-1 Estimated greenfield run-off rates ... 22
Table 5-2 Estimated site discharge rates ... 22
Table 5-3 Estimated storage volumes ... 22

1 Introduction

AECOM were commissioned by EP Energy Development Limited ('the Applicant') to produce a Flood Risk and Drainage Assessment (FRDA) in relation to for an Open Cycle Gas Turbine (OCGT) plant, acoustic barriers, secondary fuel storage and unloading facility, distillate fuel gantry, water storage tanks, surface water drainage system and all associated ancillary development, site works and services ('the Proposed Development') on land to the north of Tynagh Power Station in Derryfrench, Loughrea, Co. Galway.

The Site is located 1.8km north of the village of Tynagh, Co. Galway. The Proposed Development (Tynagh North) is bordered to the immediate south by the existing Combined Cycle Gas Turbine (CCGT) Power Station. Sperrin Galvanisers Ltd, an IPPC licensed facility, is located to the south-west of the Site.

The Proposed Development (Tynagh North) in relation to the surrounding areas is shown in Figure 1-1.

Figure 1-1 Proposed Development (Tynagh North) Location

The Department of Environment, Heritage, and Local Government (DEHLG) has introduced '*The Planning System and Flood Risk Management - Guidelines for Planning Authorities*' (DEHLG, 2009), which establish the requirement of a Flood Risk Assessment (FRA), which will accompany the planning application, at the earliest stages of development under Planning Code. In accordance with these guidelines, AECOM has undertaken a Site-Specific FRA for the Proposed Development.

The report will demonstrate in the following assessments stages:

- **Stage 1 – Flood risk identification** – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and LAP's or a proposed development site.
- **Stage 2 – Initial FRA** – to confirm sources of flooding that affect a plan area or proposed development site.

- **Stage 3 – Detailed FRA** – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development and of the selectiveness of any proposed mitigation measures.

This document is a combined Flood Risk and Drainage Assessment (FRDA), written to accompany Chapter 12: Water Environment of the Environmental Impact Assessment Report (EIAR) for the Tynagh North OCGT. Other environmental assessments beyond the scope of this FRDA (e.g., water quality, hydrogeology, water resources, hydromorphology, etc.) are described in the EIAR.

In November 2021, a planning application and EIAR were submitted to GCC for a separate development project, a 299MW OCGT plant on the western portion of the existing Tynagh Power Station site. Submitted Development Ref: 21/2192 proposes to demolish the existing Tynagh Power Station site workshop, administration building and car park, relocate these items to the brownfield lands to the immediate north of the Tynagh Power Station facility and develop a separate OCGT plant on the western part of the Power Station Site. Submitted Development Ref: 21/2192 is currently awaiting determination by An Bord Pleanála (ABP) (PL 07.313538) following a Third-Party appeal against Galway County Council's decision to grant permission.

Tynagh North OCGT would be accessed via the existing Tynagh Power Station to the south but would function independently of both it and independently of the Submitted Development Ref. 21/2192, with a separate diesel offloading and storage facility (required in the emergency event of an interruption to the gas supply at the same time as a high demand for electricity generation). Tynagh North OCGT would be capable of generating 350MW of electricity and, as with Submitted Development Ref. 21/2192, would benefit from proximity to the existing gas and electrical grid infrastructure that serves Tynagh Power Station.

Subject to planning approval being obtained for the Submitted Development Ref: 21/2192, the Applicant intends to build out and operate both Submitted Development Ref: 21/2192 and the Tynagh North OCGT.

2 Site Information

2.1 Site Location

The Proposed Development (Tynagh North) is situated in Derryfrench, Loughrea, Co. Galway, Ireland (Irish Grid Reference X: 174450; Y: 213165). The entire Site is located within the administrative area of Galway County Council (GCC). The Site is under the control of the Applicant.

The Site on which the Proposed Development will be located is to the north of the existing CCGT Power Station, bordered to the east by the former Tynagh Mine. It is also bordered to the immediate south and south-west by Submitted Development Ref: 21/2192. The area available for the Proposed Development (the 'red line' planning application area) is approximately 5.53ha and is shown in Appendix A. Development proposals will comprise of a new 350MW OCGT fuelled by natural gas. Figure 2-1 illustrates the surrounding existing infrastructure and environment of the Proposed Development.

A similar application, Submitted Development Ref: 21/2192, submitted to GCC in November 2021 proposed a OCGT plant on the western portion of the existing Tynagh power station site and planned to demolish the existing Power Station site workshop, administration building and car park and relocate these items to the lands adjoining and to the immediate north of the power station facility. The Proposed Development, Tynagh North (the subject of this EIAR) is for development of an OCGT facility on lands immediately to the north of the existing CCGT Power Station site and would function independently of it. Tynagh North OCGT would generate 350MW of electricity and have the same benefits in terms of access to existing gas and electrical connections to the power station site. Subject to planning approval, the Applicant would develop both Submitted Development Ref: 21/2192 and Tynagh North OCGT.

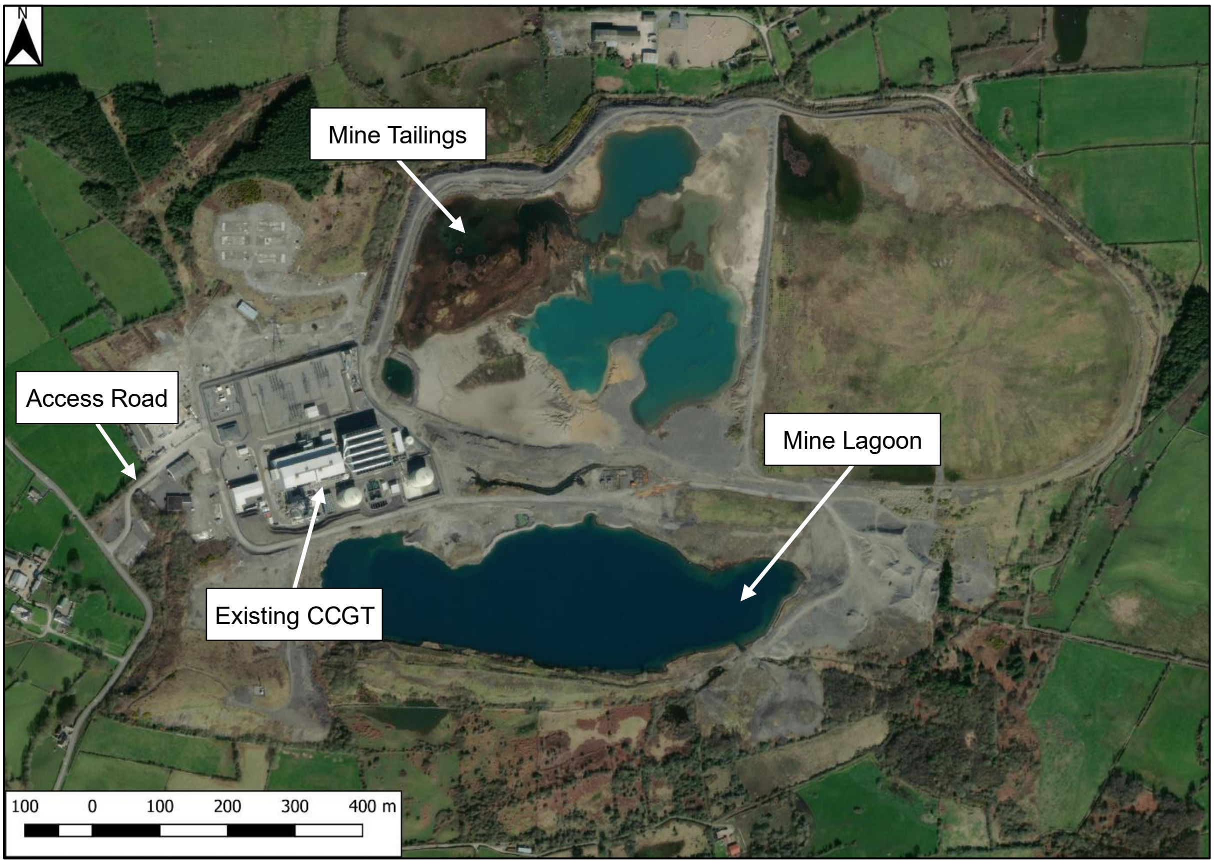


Figure 2-1 Existing Infrastructure and the Proposed Development (Tynagh North)

2.2 Site Description and Topography

The Proposed Development is to be located within the existing power station lands on the northern side of the Tynagh Power Station site (Irish Grid Reference X: 174450; Y: 213165). The entire site is under the control of EP Energy Development Ltd.

The Site on which the Proposed Development will be located is to the immediate north of the existing Tynagh Power Station. The Site comprises brownfield land (former mine site), an electricity pylon (and overhead power lines), a disused galvanised shed and woodland and grassland in the northern and north-eastern sections. Ground levels on the southern portion of the Site are relatively flat and slopes eastwards from approximately 66.5m Above Ordnance Datum (AOD) in the west to 62.5mAOD in the east close to the former Tailings Pond. The north-western portion of the site comprises a large spoil mound at approximately 72mAOD which contains temporary building foundations for prefabricated buildings used during the construction of the existing power station. The north-eastern portion of the site comprises woodland, scrub and grassland. The Site is bisected by an electricity pylon and 220kV overhead power lines running south-north from the power station substation site. The area available for the Proposed Development (the 'red line' planning application area) is 5.53ha.

The Site is accessed from the south through the existing Tynagh Power Station facility from the LP4310 Gurtymadden to Tynagh Road which joins with the N65 Loughrea to Portumna Road approximately 4km north of the Site at Gurtymadden crossroads. To the south of the Site the Gurtymadden to Tynagh Road junctions with the Loughrea to Tynagh Road at Lisheen.

The topographic survey of the Site was undertaken by Murphy Geospatial in July 2021, and this has been used to inform a description of topography and ground levels at the Proposed Development Site.

The topographic survey of the site indicates that the Site slopes from western boundary to centre of the Site with levels between 73.43m to 68.35m Above Ordnance Datum (m AOD). Part of the eastern boundary has a woodland area (not included in the survey). The levels from the end of this area fall in a north-westerly direction, with levels between 72.62m and 62.15m AOD. The south boundary to the Tynagh Power Station lies between 69.98m and 67.22m AOD. Similarly, the southwest boundary decreases from 67.85m to 64.87m AOD. Existing gravel roads provide access levels between 72.68m and 64.51m AOD.

Refer to Appendix B for the topographical survey of the existing site.

The proposed internal access road which will be extended from the existing road located on the east side of the power station is at the level of 67.09m AOD. A newly constructed east-west road will provide access to the upcoming fuel oil storage facility. It will run along the periphery of the Switchyard, Air Intake, OCGT, Stack and Fin Fan Coolers. Refer to the Proposed Site Layout plan included in Appendix A of this report. The final formation level of the Proposed Development ground level will be 67.5mAOD.

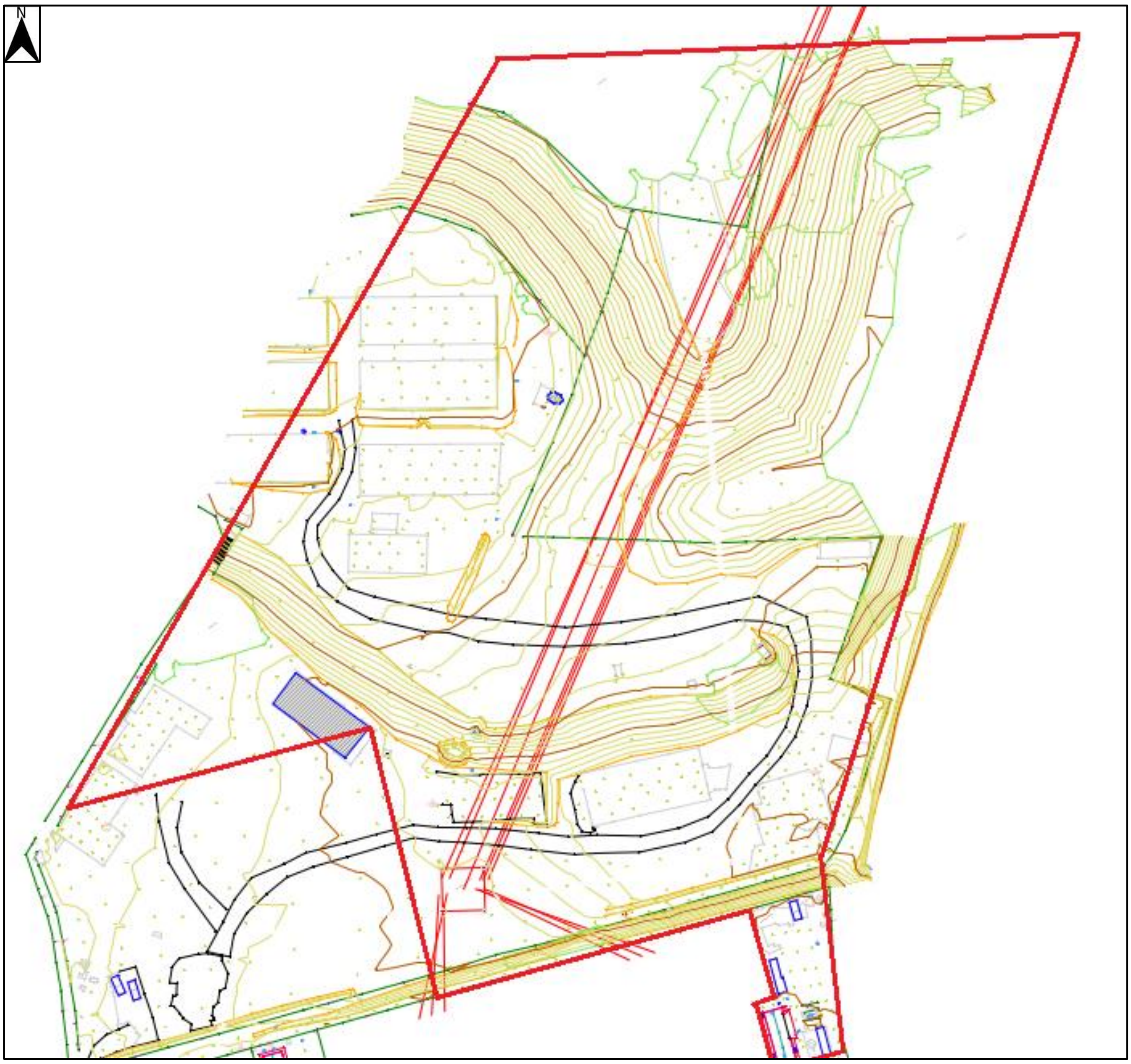


Figure 2-2 Local Topography

Refer to Appendix C for record drawings of the existing current surface water and foul water drainage network at Tynagh Power Station. The drawing indicates that the existing power station site is positively drained to the eastern boundary of the Site where the on-site wastewater treatment plant is located. More details regarding the existing drainage network are provided in Section 5 of this report.

The topographic survey indicates that the gravel area located along the western boundary and the central area of the proposed site has existing drainage infrastructure.

2.3 Geology

A review of the Geological Survey of Ireland Spatial Resources (GSISR) provides datasets for bedrock, quaternary, groundwater, marine, geological heritage etc. The online mapping (Figure 2-3 below) indicates the site is underlain by dark limestone and shale. The formation comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser-grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcar

Natural infiltration rates are therefore likely to be high; however, any infiltration rates specified in the final drainage design (if applicable) should be determined by in-situ testing to BRE Digest 365 specifications.

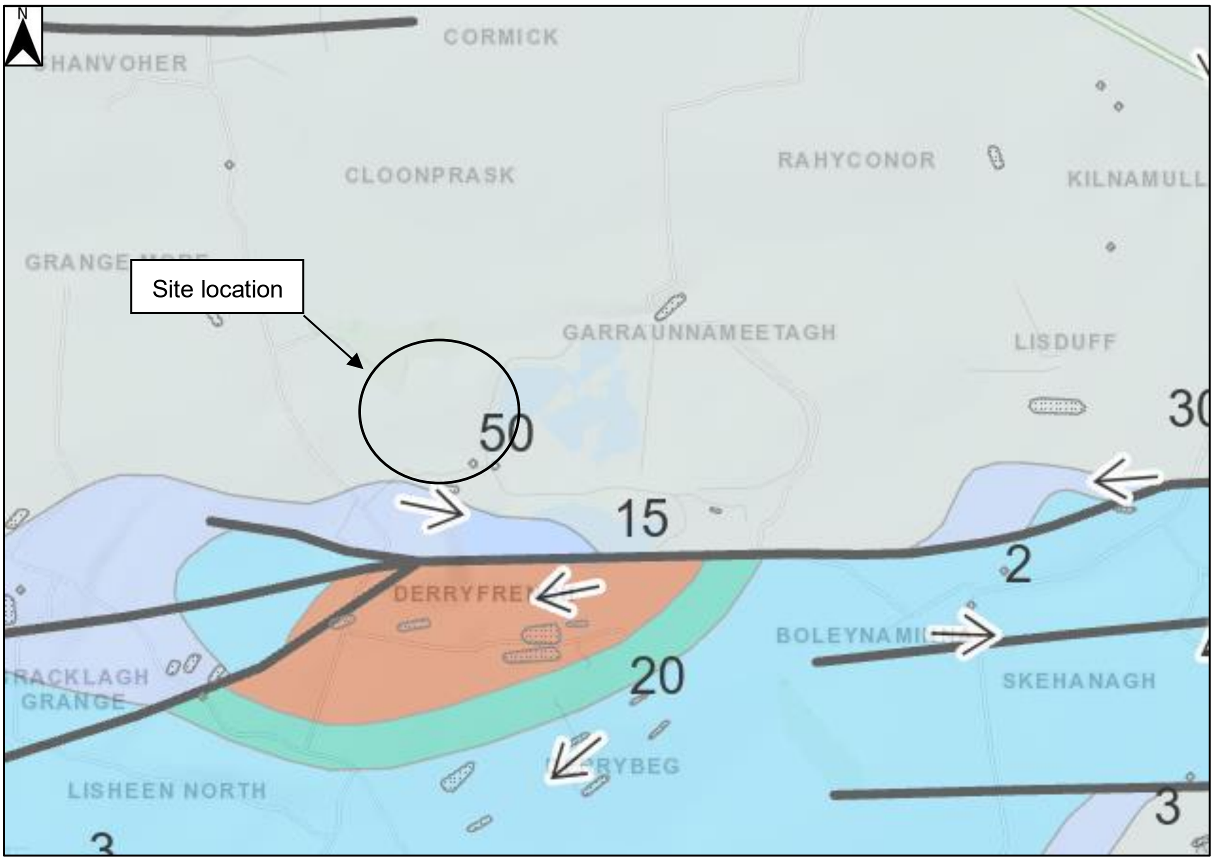


Figure 2-3 Bedrock Geology (Source: GSISR, 2023)

2.4 Watercourses

Office of Public Works's (OPW) national flood information portal provides location specific access to flood risk and flood management information. The website floodInfo.ie provides interactive map to view up-to-date flood hazard, flood risk, drainage map etc information.

Drainage map is subdivided into Arterial Drainage Scheme (ADS), Drainage Districts (DD) and Land Commission (LC). As per ADS, the channels layer identifies the watercourses. which. This arterial channel links is C1/20/5/3, C1/20/5/2, C1/20/5, C1/20, C1 (Kilcrow River). The Kilcrow river is located approximately 2.3 km to the northwest from the proposed development and flows in a southward's direction forming a confluence with Duniry River. The Duniry River also discharges in the Lough Derg - 12km south of the proposed site. Further, River Shannon flows approximately 17km east of the site. The Shannon River flows from the north from Athlone southwards and south westerly towards Lough Derg.

Figure 2-4 below is extracted from the floodinfo.ie mapping website, indicating the location of arterial channels within the site constraints. It also indicates that there is a stream to the south of the existing enclosed lagoon (C1/20/3/1). It is estimated that the stream is located approximately 500m south of the Proposed Development. It flows in an easterly direction where it forms a confluence with the Kilcrow River.

There are no flood defences located on the Proposed Development Site or within the vicinity of the Site.

The former Tynagh Mine open pit mine has been allowed to re-flood and is an enclosed open water body which is approximately 280m to the south-east of the Site at its closest point. The former Tynagh Mine tailings ponds remain and include open water bodies which are approximately 40m to the east of the Site at their closest point.

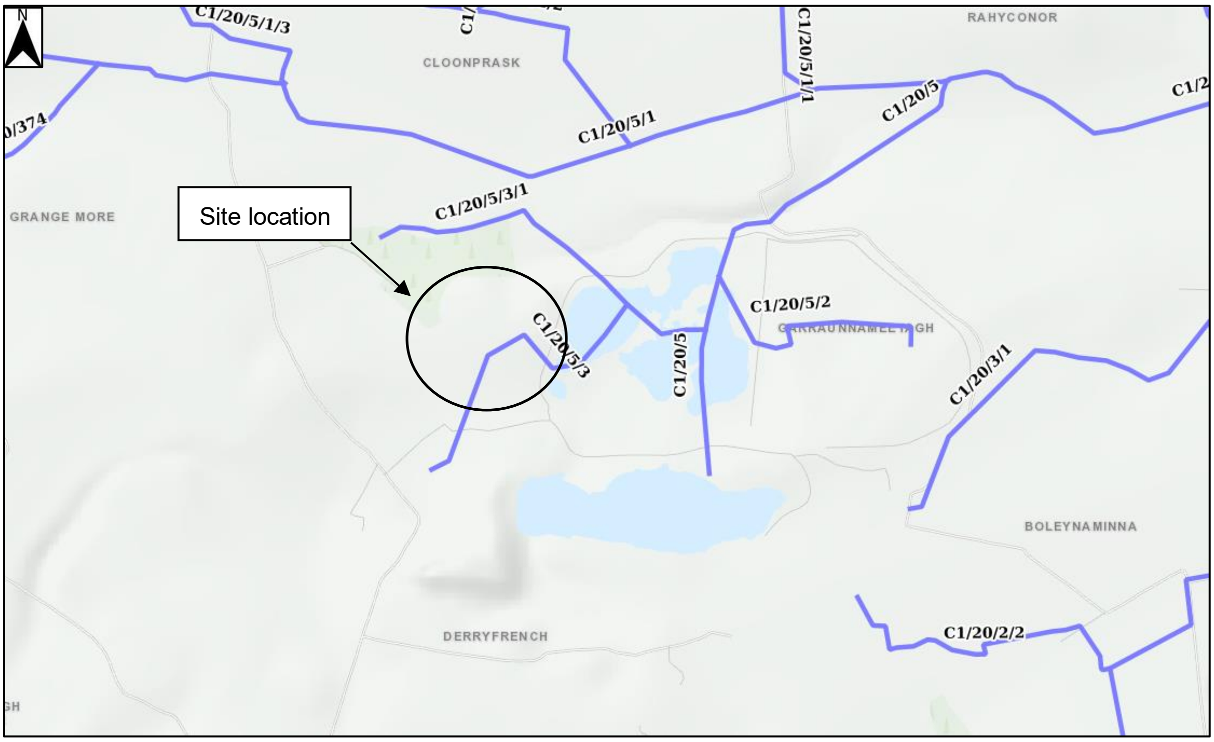


Figure 2-4 Location of nearby watercourses (Source: www.floodinfo.ie)

Figure 2-5 Existing Lagoon (South of the Site)

3 Stage 1 – Flood Risk Identification

The purpose of Stage 1 of this assessment is to establish whether a flood-risk issue exists or may exist in the future. If there is a potential flood risk issue then, in accordance with '*The Planning System and Flood Risk Management – Guidelines for Planning Authorities* (DOEHLG 2009)', the FRA procedure should move to 'Stage 2 – Initial Flood Risk Assessment'. If no potential flood risk is identified during Stage 1 then the overall FRA can be concluded.

The following information and data have been collated as part of the screening assessment for the Proposed Development.

As part of the Government's Strategy for the OPW, Ireland has assessed and mapped the flood extent, hazard, and risk for a range of flood events from frequent, minor flood events up to very rare, extreme events. The OPW hosts an online interactive map viewer illustrating Flood Hazard Maps (https://www.floodinfo.ie/map/floodmaps/) describe the characteristics of the predicted flood for each scenario and include information such as flood extent, flood depth and level, and the flow of floodwater.

An interactive mapping tool illustrates flood maps (fluvial), flood plans, drainage maps (pluvial), and coastal maps (coastal) in both detailed and estimated form. Detailed modelling has been completed in many of the highly populated urban areas in Ireland with all other locations strategically estimated in regard to flood extent and inundation.

3.1 Hydrometric Data

Existing sources of hydrometric data from the Environmental Protection Agency (EPA) (https://gis.epa.ie/EPAMaps/Water) were investigated, as summarised in Table 3-1. This investigation has determined that there is only one gauging station (Irish Grid Reference: X= 177222; Y= 213439) approximately 3km to the east of the Site as shown in Figure 3-1.

The gauging station is located on the Kilcrow River which is classified as a stream. Table 3-1 summarises the hydrometric data associated with Gauging Station *25315* and indicates the status of the gauging station as inactive.

Table 3-1 Hydrometric Gauging Station

Station No.	Name	Status	Waterbody	Owner	Available Data
25315	Coolbaun West	Inactive	Stream	Galway County Council	Spot flow measurements only - No continuous water level or flow records available.

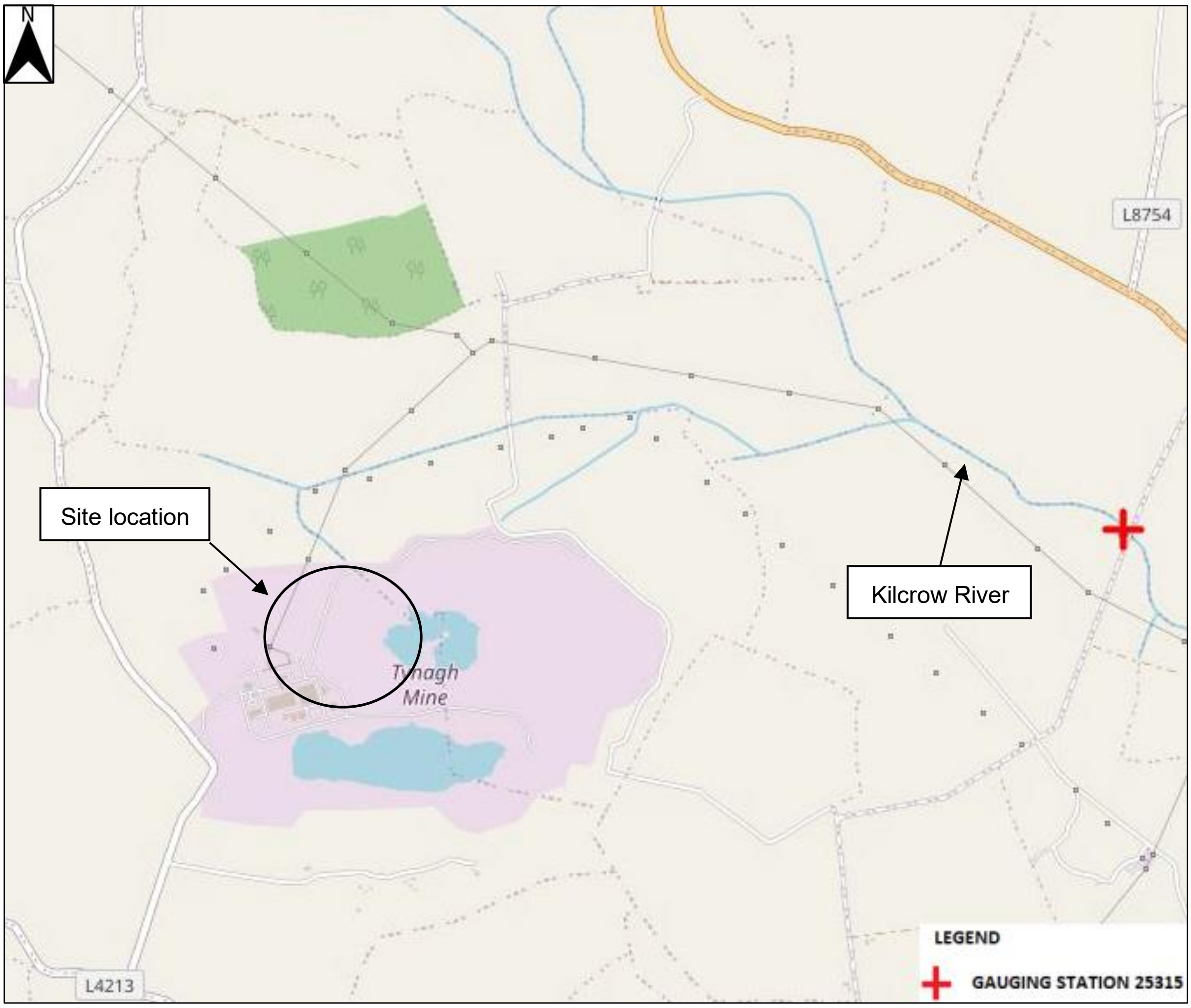


Figure 3-1 Location of Hydrometric Gauging Station

3.2 OPW Hazard Maps

The Office of Public Works (OPW) Flood Hazard Maps Website (www.floodmaps.ie) was consulted in relation to available historical or anecdotal information on any flooding incidences or occurrence in the vicinity of the Site.

No flood events have been recorded within the Site boundary of the Proposed Development. Figure 3-2 shows mapping from the aforementioned website, which indicates that there is one recurring flood event (ID: 1923) approximately 1km south-west of the Site off the site of the Tynagh Power Station. The remaining flooding incidents are greater than 2.5km from the Site, and the OPW Flood Hazard Map only describes flooding incidents within 2.5km from the Site.

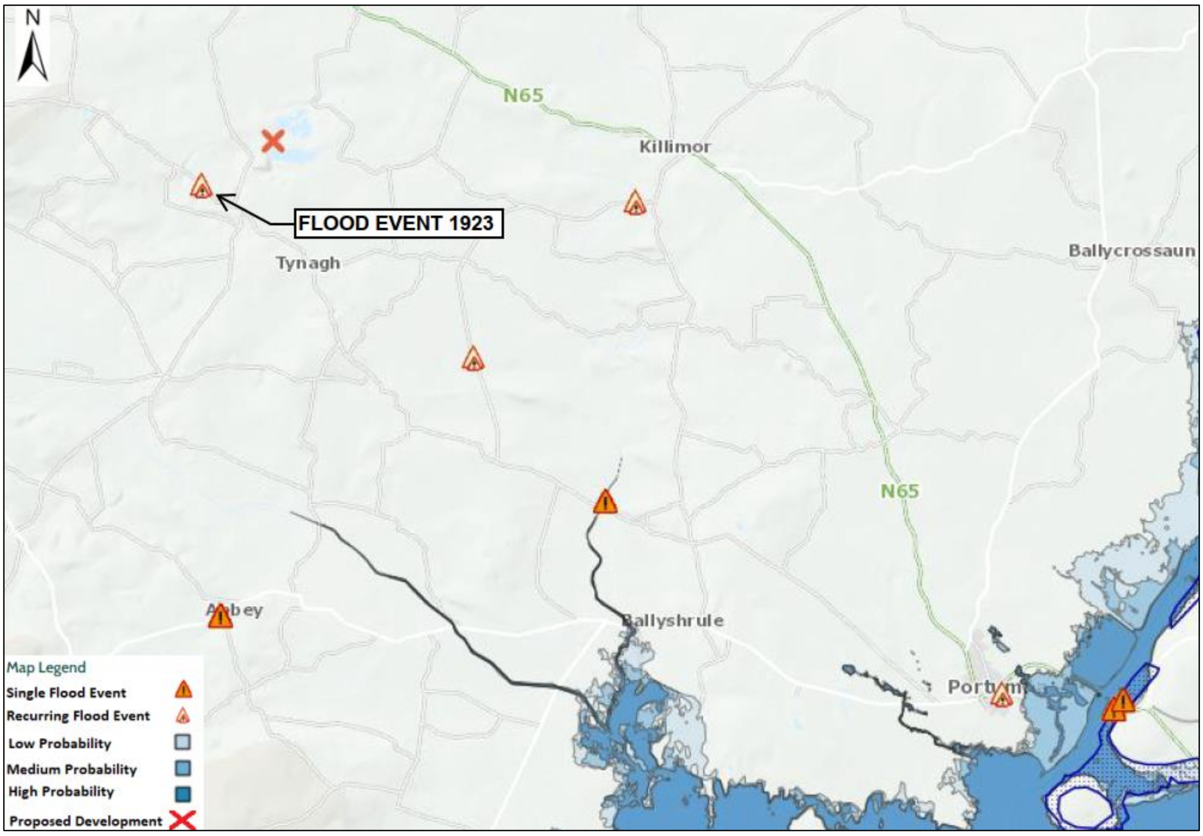


Figure 3-2 OPW Flood Hazard Map

Table 3-2 provides a description of the flooding event ID-1923.

Table 3-2 Historic Flood Events

ID No.	Event Type	Title	Description
ID-1923	Recurring	Bracklagh Grange, Tynagh	Low lying land floods every year after heavy rain.

There is no history of flooding recorded within the Site, this may be due to the historical usage of the existing mine site and the presence of surface waterbodies and the network of nearby streams discharging to the Kilcrow River.

Figure 3-3 below illustrates the flood map generated at the Site location which indicates the extents of the past flood events and extents. A small area located approximately 500m south to the Site and in close proximity to the existing mine lagoon is defined as a historic flood area (Winter 2015/2016 Surface Water Flooding).

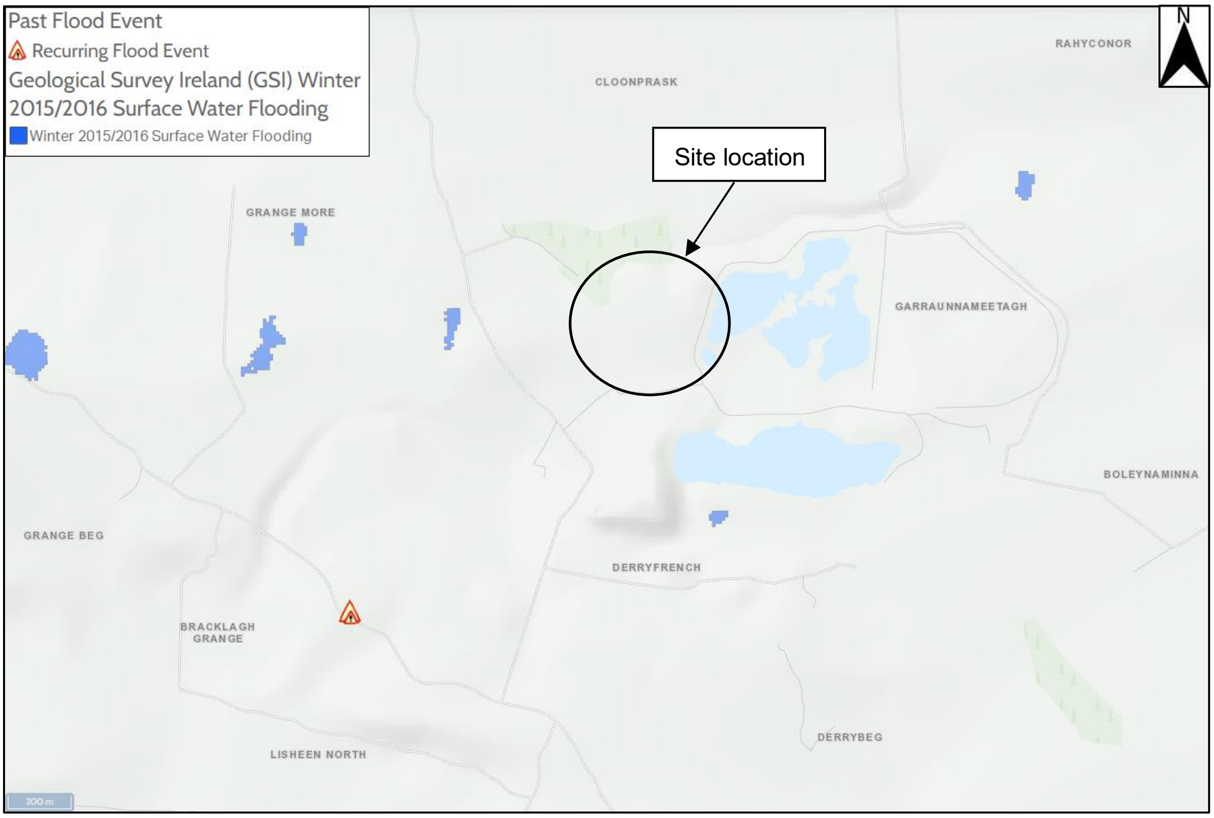


Figure 3-3 Past Flood Events (Source: www.floodinfo.ie)

3.3 Groundwater Wells and Springs

An investigation into the rise and abstraction of water from underground wells and springs around the former mine site was undertaken by the Department of Communications, Climate Change and Environment (http://dcenr.maps.arcgis.com). The purpose of the assessment was to identify if there are any areas of rising groundwater that could contribute to flooding.

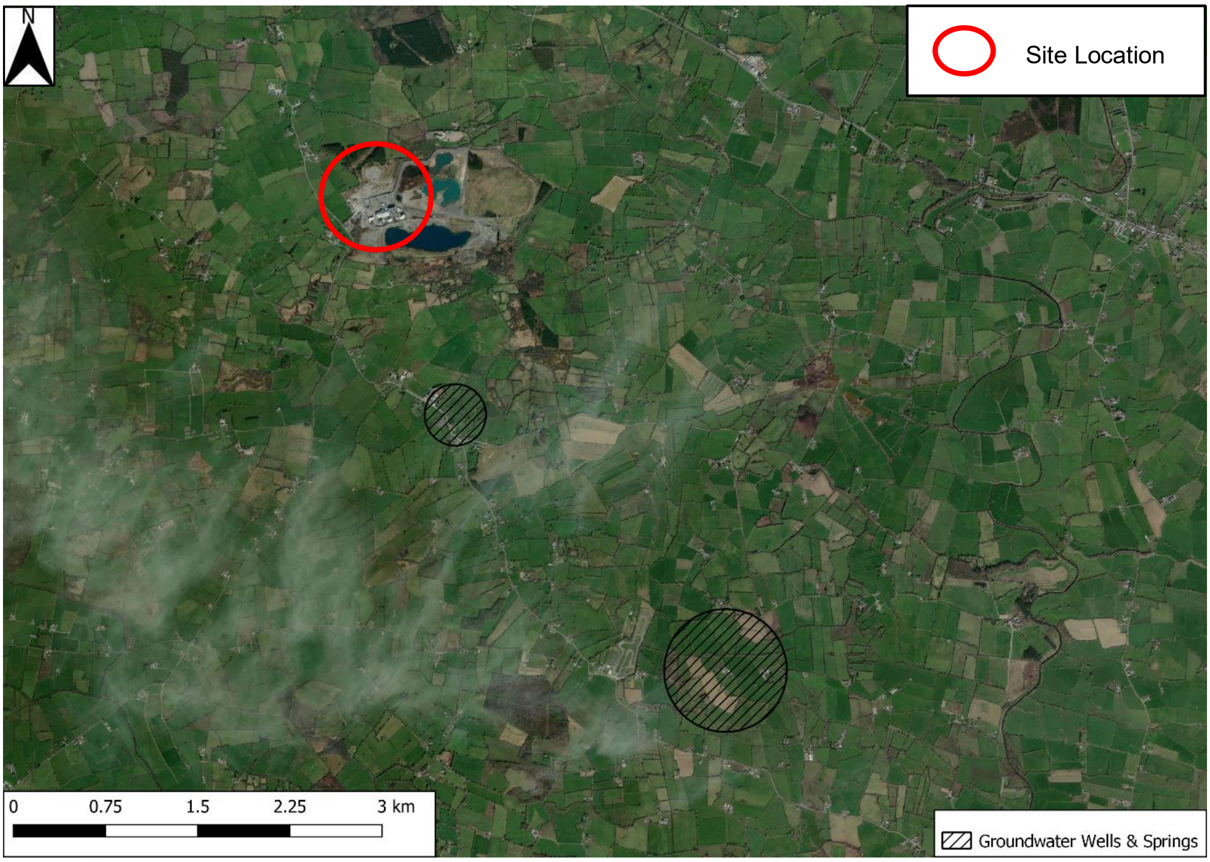


Figure 3-4 Groundwater Wells and Springs

The mapping of local groundwater wells, springs and boreholes in Figure 3-4 indicates the nearest borehole is located approximately 1.4km to the south of the Site. Records indicate the borehole (GIS Name: 1721SWW002) is used for agriculture and domestic uses.

3.4 OPW Land Benefitting Maps

Arterial Drainage Schemes (ADSs) were carried out under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. Rivers, lakes, weirs and bridges were modified to enhance conveyance, embankments were built to control the movement of flood water and various other work was carried out under Part II of the Arterial Drainage Act, 1945.

The purpose of the schemes was to improve land for agriculture, to ensure that the three-year flood was retained in bank, this was achieved by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows. Flood protection in the benefiting lands was increased as a result of the Arterial Drainage Schemes. It is noted that these schemes were only designed to retain the three-year flood which is a standard well below what would be required for development of any land.

Figure 3-5 indicates the stream network to the north and the northwest of the Site benefits from OPW Arterial Drainage Schemes, with the closest scheme being the C1/20/5/3 Killimor/Cappagh scheme.

It is noted that some of the channels have since been infilled and abandoned or relocated as the former, now closed, Tynagh Mine site developed over time.

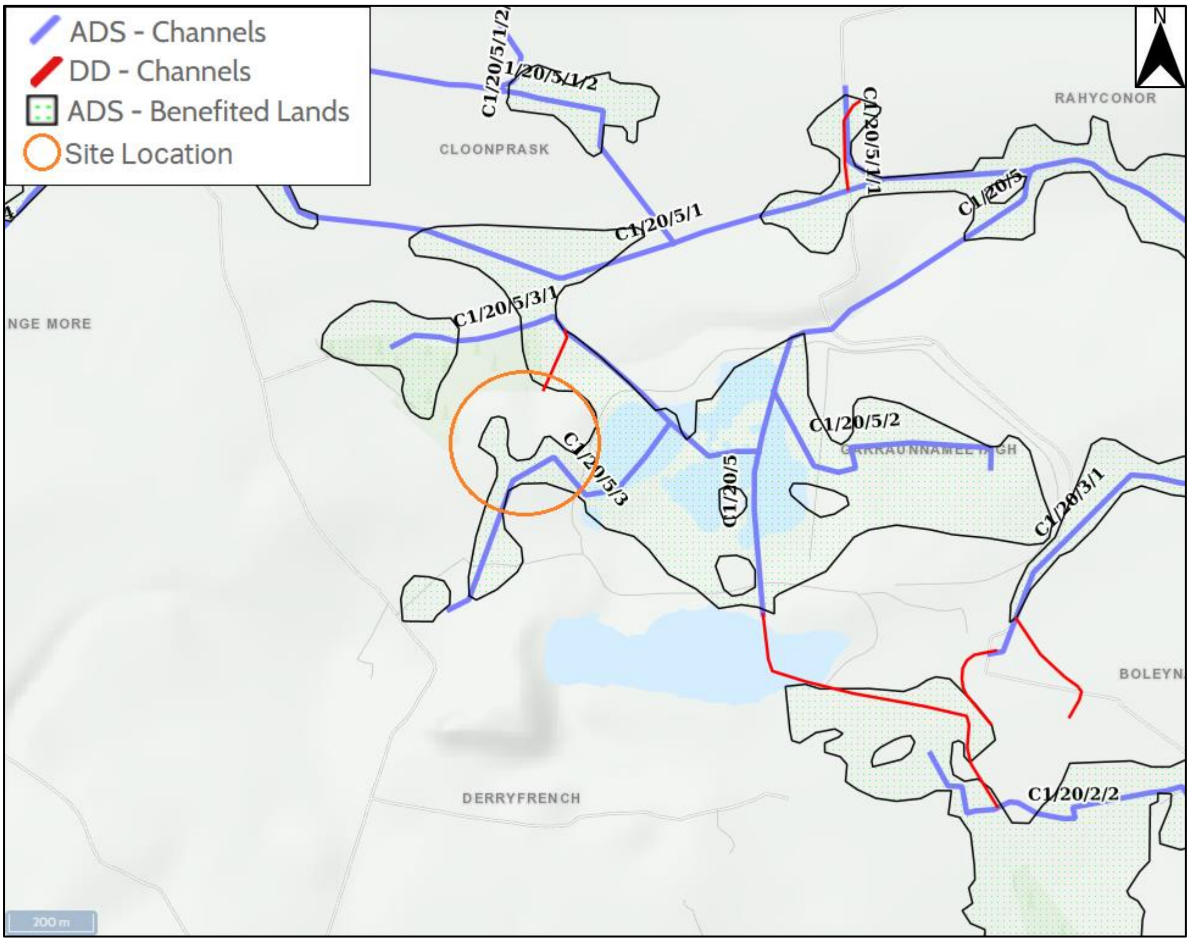


Figure 3-5 Groundwater Wells and Springs (Source: www.floodinfo.ie)

3.5 Flooding from Overland Flow

EP Energy Developments Limited have provided AECOM with information relating to minor historic flooding incidents on the western boundary of the Tynagh Power station (but not on the Proposed Development Site) relating to limited isolated incidents in November 2009 and December 2015. From the information provided and following discussions with the applicant and site inspection, AECOM have concluded that these incidents are caused by prolonged rainfall events leading to saturated ground conditions and higher than normal runoff from the surrounding areas.

It is considered that the topography of the wider area may result in overland flow being generated within the catchment upstream of the existing Tynagh Power Station which the flow then uses the LP4310 Gurtymaden (note- some public documents refer to this road as Gortymadden) to Tynagh Road as a flow path. The access road to the Tynagh Power Station site allows flow to escape from the LP4310 Gurtymaden to Tynagh Road. An existing hard area external to the Tynagh Power Station site entrance, which sits in a slight depression, has limited surface water drainage measures, which when combined with the overland flow, leads to a small ponding of water, to a depth of circa 300mm.

During the past flooding events the onsite teams have deployed precautionary sandbags and pumps to prevent the overland flows potentially reaching the existing Tynagh Power Station site. A land drain has also been constructed along the western boundary of the Site that takes flows in a northerly direction which is expected to have alleviated the situation. The topography of the area is such that flows would have originally travelled in a north-easterly direction and so displacement of flows was not occurring without the development of this land drain.

Additional pumping has also been deployed from the existing Tynagh Power Stationwater treatment facility to the adjacent lagoon due the volume of surface water being experienced overwhelming the storage available. Historic permission has been obtained from EPA prior to this pumping taking place and it should be noted that the Tynagh Power Station site, or the lands of the Proposed Development Site, has not been flooded or been encroached by ponded flood water and the Tynagh Power Station facility has never had to shut down due to flooding.

The existing Tynagh Power Station operational team has also developed a dedicated section of their “Off-Site Events with On-Site Impacts” emergency procedures relating to flooding which includes the following actions:

- Ensure all drains are clear of debris, including those off-site;
- Evacuation of areas of site which are at risk of flooding;
- Liaise with site neighbours for a co-ordinated response;
- Setup of flood water protection barrier;
- Setup of visible barriers to indicate the location of trenches and flood protection barriers;
- If necessary, contact EPA for permission to pump directly to discharge lake; and
- Monitor discharge pumps and regularly sample for water quality.

Given the above events that have occurred and the development of mitigation measures, AECOM are of the opinion that the risk of flooding from overland flow can be managed to a level that reduces the risk to low.

3.6 Galway County Development Plan

The Galway County Development Plan (GCDP) 2022 - 2028[1] outlines flooding policies and objectives to be applied in the preparation of future town development plans and in the assessment of planning applications, referring to the ‘Flood Directive’ (2007/60/EC) and ‘The Planning System and Flood Risk Management – Guidelines for Planning Authorities (DOEHLG 2009)’.

In regard to flooding, Policy DM Standard 67: Sustainable Drainage Systems (SuDS) states:

> “*All new developments (including amendments/ extensions to existing developments) will be required to incorporate ‘Sustainable Urban Drainage Systems’ (SuDS) as part of the development/design proposals. SuDS are effective technologies, which aim to reduce flood risk, improve water quality and enhance biodiversity and amenity. The systems should aim to mimic the natural drainage of the application site to minimise the effect of a development on flooding and pollution of existing waterways*”.

Policy DM Standard 68: Flooding states:

> “*The table below indicates the types of land uses that are appropriate in each of the Flood Zones identified within the Plan area, in accordance with the 2009 Flood Risk Management Guidelines for Planning Authorities and Departmental Circular PL2/2014 (or any updated/superseding legislation or policy guidance).*
>
> *Where developments/ land uses are proposed that are considered inappropriate to the Flood Zone, then a Development Management Justification Test and site-specific Flood Risk Assessment will be required in accordance with The Planning System and Flood Risk Management Guidelines 2009 (and as updated)”.*

The Flood Zones and their implications are assessed further in a Stage 2 - Initial Flood Risk Assessment in Section 4.

[1] Galway County Development Plan 2022-2028, Galway County Council, June 2022. Available at: https://consult.galway.ie/en/consultation/adopted-galway-county-development-plan-2022-2028. Last accessed: December 6th 2022.

Table 3-3 Flood Zones Planning Implications

Flood Zones	Overall probability	Planning implications for land uses			
		Highly Vulnerable Development	Less Vulnerable Development	Water Compatible Development	
Flood Zone A	Highest	Inappropriate – if proposed then Justification Test and detailed Flood Risk Assessment is required	Inappropriate – if proposed then Justification Test and detailed Flood Risk Assessment is required	Appropriate – screen for flood risk	
Flood zone B	Moderate	Inappropriate – if proposed then Justification Test and detailed Flood Risk Assessment is required	Inappropriate due to climate change – if proposed then Justification Test and detailed Flood Risk Assessment is required	Appropriate – screen for flood risk	
Flood Zone C	Lowest	Appropriate - detailed Flood Risk Assessment may be required	Appropriate - detailed Flood Risk Assessment may be required	Appropriate – screen for flood risk	

3.7 Screening Assessment Conclusion – Stage 1

The purpose of Scoping Stage 1 is to identify whether there may be any flooding or surface water management issues. It indicates that fluvial flooding of the Site from the Kilcrow River is unlikely. The topographical assessment indicates that existing topographic levels would allow excessive flow from the network of streams away from the Site.

Historic flood hazard map indicates one event, located greater than 2.5km away from the site. In the vicinity of the existing Tynagh Power Station site, there are groundwater sources that indicate temporary surface floods during prolonged periods of rain.

For the groundwater flooding mapping provided, it appears that this area is referring to the lagoon which is located outside and to the south of the Tynagh Power Station site boundary. Furthermore, the topography of the Proposed Development Site and the immediate surrounds shows that any flooding from this location would flow away from the Site.

Existing surface water drainage records (for Tynagh Power Station) attached as Appendix C indicate surface water runoff intercepted at the site is treated onsite and is then discharged to the existing lagoon to the south of the existing site during isolated incidents. Embankments around the lagoon are raised to prevent treated surface water runoff from overflowing onto the Site. Specific emergency procedures are in place by the Tynagh Power Station operator for flooding should a repeat event occur.

There are no springs and groundwater discharges recorded in the immediate vicinity of the Site. The Department of Communications, Climate Change and Environment (http://dcenr.maps.arcgis.com) identifies the area south of the existing site and areas to the north of the existing site to be possibly at risk of flooding from groundwater.

4 Stage 2 – Initial Flood Risk Assessment

In consideration of the flood risk identification, this assessment is required to proceed to 'Stage 2 – Flood Risk Assessment'. The screening assessment requires the groundwater levels to be discussed in detail. To undertake the initial flood assessment, the following determinations are required:

- Flood zone in which the Site is located,
- Vulnerability of the proposed works,
- Type of development and flood zone designation and
- EIA.

4.1 Determination of Vulnerability

The vulnerability of the proposed works is classified into three classes as given in Table 4-1.

Table 4-1 Classification of Vulnerability

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

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

Source: The Planning System and Flood Risk Management - Guidelines for Planning Authorities

The guidelines would indicate that the Proposed Development (Tynagh North), as an OCGT electricity generating power station, should be considered to be **highly vulnerable development**.

4.2 Determination of Flood Zone

In accordance with '*The Planning System and Flood Risk Management – Guidelines for Planning Authorities*' (DOEHLG, 2009), there are three flood zones designated in the consideration of flood risk to a particular site. The three flood zones are described in Table 4-2.

Table 4-2 Flood Zone Description

Flood Zone	Description
Flood Zone A	Where the probability of flooding from watercourses is the highest (greater than 1% or 1 in 100 year for watercourse flooding or 0.5% or 1 in 200 for coastal flooding).
Flood Zone B	Where the probability of flooding from watercourses is moderate (between 0.1% or 1 in 1000 year and 1% or 1 in 100 year for watercourse flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding).

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

Source: The Planning System and Flood Risk Management - Guidelines for Planning Authorities

The planning implications for each of the flood zones are:

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

Zone B - Moderate probability of flooding. Highly vulnerable development, such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses and primary strategic transport and utilities infrastructure, would generally be considered inappropriate in this zone, unless the requirements of the Justification Test can be met. Less vulnerable development, such as retail, commercial and industrial uses, sites used for short-let for caravans and camping and secondary strategic transport and utilities infrastructure, and water-compatible development might be considered appropriate in this zone. In general, however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone C and subject to an FRA to the appropriate level of detail to demonstrate that flood risk to and from the development can or will adequately be managed.

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

4.2.1 Coastal Flooding

The Site is not at risk of coastal flooding due to its geographic location and distance from coastal areas.

4.2.2 Fluvial Flooding

Figure 4-1 below indicates the extents of the present day predicted fluvial flood plain for a 10-year (high probability), 100-year (medium probability) and 1000-year (low probability) year return period, in proximity to the Proposed Development.

The modelled flood mapping indicates that the Overall Project Site is not in a 'Flood Risk Zone' (i.e., Flood Zone C). As described in the guidelines, development in Zone C is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but would need to meet the normal range of other proper planning and sustainable development considerations.

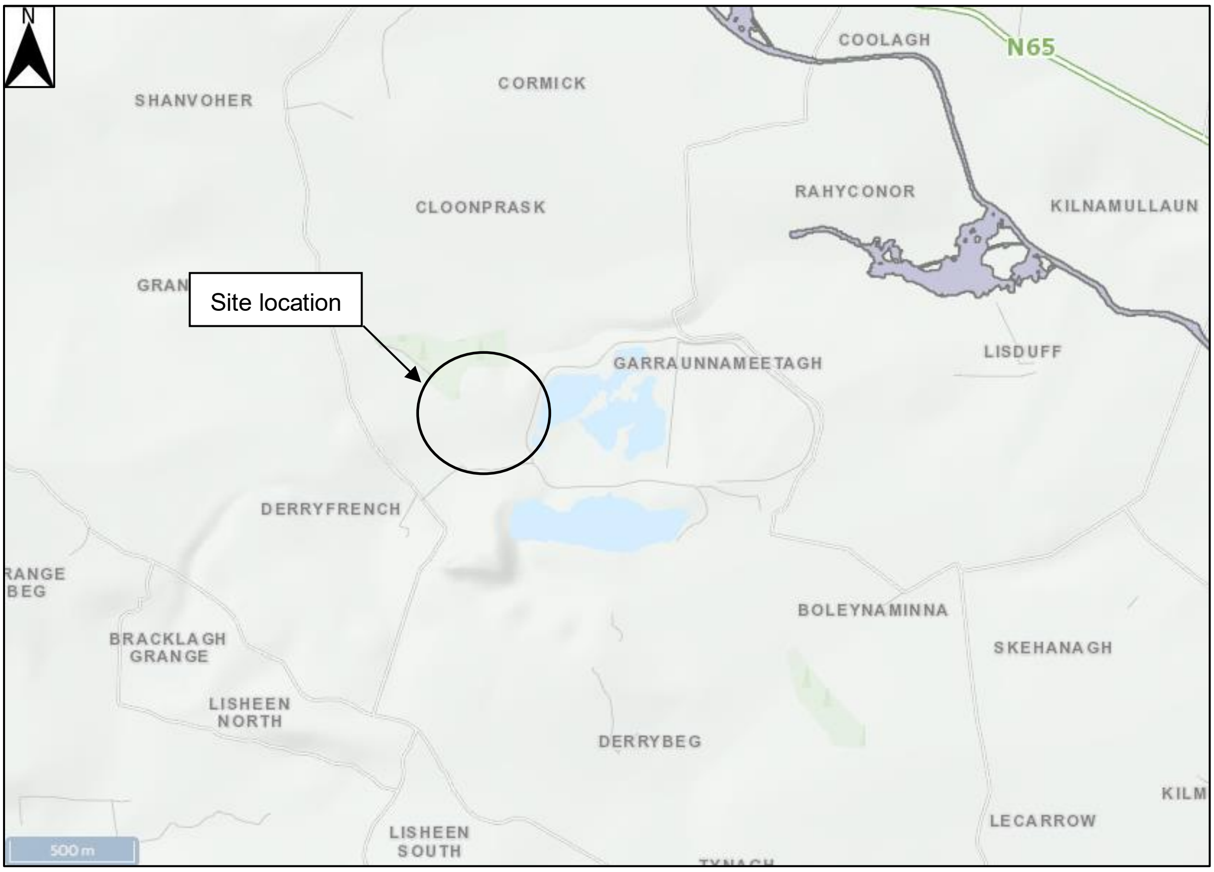


Figure 4-1 Flood Hazard Extents (Source: www.floodinfo.ie)

4.2.3 Pluvial Flooding

Sewer records for the existing development are provided in Appendix C of this report. The records and site inspection information indicate the existing Tynagh Power Station site is served by an on-site private surface water sewer network. The surface water drainage network intercepts surface water runoff from the road network and hardstanding areas at the buildings and conveys the surface water runoff to an onsite treatment plant within the Tynagh Power Station. Treated surface water is then discharged to the existing lagoon to the south of the existing site under the existing Tynagh Power Station site licence and discharge consent. Figure 2-1 indicates the embankments around the lagoon are raised to prevent treated surface water runoff from overflowing onto the site.

4.2.4 Groundwater Flooding

An assessment of low, medium, and high probability of groundwater flooding maps made available by the OPW concluded that the Site is not at risk of groundwater flooding. The closest area at risk is over 11km south-east of the Proposed Development.

4.3 Justification Test Requirement

The requirement for a justification test was reviewed for this study to determine whether the Proposed Development would be considered acceptable in terms of flood risk. The conclusion of 'Stage 1 – Flood Risk Identification' called for the vulnerability of the Proposed Development to be characterised in terms of defining its corresponding Flood Zone and the Sites appropriate use.

The requirement for a Justification Test is determined based on the type of development and flood zone designation as indicated in Table 4-3 below.

Table 4-3 Justification Test Matrix

	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable Development	Justification Test	Justification Test	Appropriate

Less Vulnerable Development	Justification Test	Appropriate	Appropriate
Water-Compatible Development	Appropriate	Appropriate	Appropriate

Source: The Planning System and Flood Risk Management - Guidelines for Planning Authorities

Given the determination of the Site is located in Flood Zone C and is characterised as a 'Highly Vulnerable Development', the application of the justification test **will not be required** as it is categorised as **Appropriate**.

4.4 Environmental Impact Assessment

At the project or development level, exceeding specified thresholds or development under threshold but with significant environmental effects and in an area at risk of flooding requires an EIAR.

The Proposed Development, which includes a 350MW open cycle gas turbine plant, falls within the descriptions of development in the Planning and Development Regulations, 2001, Schedule 5, Development for the purposes of Part 10. An EIA for the Proposed Development is therefore mandatory. A Pre-Application Strategic Infrastructure Development (SID) consultation was held with ABP on the 18 January 2023 and the scope and format of the EIAR was presented.

4.5 Stage 2 Flood Risk Assessment Conclusion

The purpose of the Scoping Stage is to identify possible flood risks and to implement the necessary level of detail required to assess these possible flood risks, and to ensure these can be adequately addressed in the FRA. The scoping exercise should also identify that sufficient quantitative information is already available to complete an FRA appropriate to the scale and nature of the development.

The evidence provided in the Stage 2 Assessment (underpinned by the Stage 1 Assessment and the topographic survey assessment) indicates the Site and Proposed Development would not be at fluvial risk from the network of streams flowing nearby. The GCC Strategic Flood Risk Assessment, which forms part of the GCDP 2022 – 2028, indicates the Site lies in Flood Zone C (i.e., at low risk of fluvial flooding). Additionally, the Stage 2 assessment revealed the Site is characterised as 'Highly Vulnerable', and therefore the application of the Justification Test would not be required.

5 Stage 3 - Detailed Flood Risk Assessment

Although the overall FRA could be concluded as Appropriate with the information presented in Stages 1 and 2, a detailed FRA of the Proposed Development was carried out.

5.1 Proposed Development

The Proposed Development consists of a 350MW gas turbine operating in open cycle gas turbine (OCGT) mode primarily fuelled by natural gas, acoustic barriers, secondary fuel storage and unloading area, water storage tanks, and all associated ancillary development, site works and services.

The Site is bordered to the east by the former Tynagh Mine complex and to the immediate south by the existing Tynagh Power Station. Sperrin Galvanisers Ltd., an Integrated Pollution Prevention Control (IPPC) licensed facility, is located adjacent to the south-western boundary of the Site. The Site on which the Proposed Development will be located is to the immediate north of the existing Tynagh Power Station. The Site comprises brownfield land (former mine site), an electricity pylon (and overhead power lines), a disused galvanised shed and woodland and grassland in the northern and north-eastern sections.

In November 2021, a planning application and EIAR were submitted to GCC for a separate development project, a 299MW OCGT plant on the western portion of the existing Tynagh Power Station site. Submitted Development Ref: 21/2192 proposes to demolish the existing Tynagh Power Station site workshop, administration building and car park, relocate these items to the brownfield lands to the immediate north of the Tynagh Power Station facility and develop a separate OCGT plant on the western part of the Power Station Site. Submitted Development Ref: 21/2192 is currently awaiting determination by An Bord Pleanála (PL 07.313538) following a Third-Party appeal against Galway County Council's decision to grant permission. Subject to planning approval being obtained for the Submitted Development Ref: 21/2192, the Applicant intends to build out and operate both Submitted Development Ref: 21/2192 and the Tynagh North OCGT.

A sufficient drainage system will be provided to connect to the existing power station's foul and surface water drainage systems. Refer to the proposed layout and site boundary drawings prepared by Architects and attached as Appendix C.

The total area of the proposed site is approximately 5.53 ha, which will require a comprehensive drainage strategy to accommodate the 1.53ha development.

The proposed formation level/floor level of the Proposed Development infrastructure and access roads will be 67.5 m AOD. Full details of the Proposed Development are presented in Chapter 5 of the EIAR.

5.2 Foul Drainage

5.2.1 Existing Foul Drainage

The existing site drainage system for Tynagh Power Station is a gravity fed system which conveys foul water from the Power Station building, the warehouse facility, administration building and gate house towards the eastern boundary of the site where the on-site wastewater treatment plant is located. The gravity system is collected via the existing pumping station which pumps the foul water towards the wastewater treatment system. The existing on-site wastewater treatment system is a Klargester BioDisc unit, sand filter and then onto a percolation drainage field located along the eastern boundary of the power station site.

Refer to Appendix D for details on the existing drainage layout.

5.2.2 Proposed Foul Drainage

The Proposed Development will not lead to an increase in staff and therefore there will be no additional foul water generated (either from sanitation or process water) and as a result there will be no requirement for increased foul water management at the site over and above existing facilities.

There is no additional proposed foul drainage associated with the Proposed Development.

5.3 Surface Water Drainage

5.3.1 Existing Surface Water Drainage

The existing Tynagh Power station site drains via runoff in line with the engineered falls of the site. The drainage drains from west to east. Refer to the Topographical Survey information attached in Appendix B. From a detailed review of survey and as-built information, the site infrastructure information indicates that the surface water sewer connects south into the wider drainage infrastructure for the existing power station. Ground penetrating radar (GPR) surveys and as-built information have identified the location of manhole chamber covers for all services (foul and surface) under the road layout and are included in Appendix D.

The site-wide drainage system drains towards the southeast of the site where the surface water discharges into the lagoon at an invert level of 60m AOD. It is assumed that the current drainage system discharges into the lagoon at an unrestricted discharge rate.

In the northern section of the power station site, the undeveloped gravelled land is presumed to rely on drainage from infiltration into the ground and the flow of overland water east into an open ditch bordering the site on the east. The information gathered indicates that the area of land to the west of the site and directly in front of the entrance to the power station historically has been susceptible to overland flooding from the southwest.

The total area of the Proposed Development site is a combination of brownfield and greenfield land. Presently, the site does not have surface water drainage infrastructure. Undeveloped brownfield land has a gravelled surface and is assumed to be drained from infiltration into the ground. Greenfield land is assumed to have natural infiltration into the ground.

5.3.2 Proposed Surface Water Drainage

The Proposed Development surface water drainage strategy considers the change in land use. The undeveloped land will now accommodate OCGT, stack, air intake, fin fan coolers, fuel oil storage, fuel treatment, service road etc. As this site will be changing from a greenfield site to an impermeable brownfield site, associated hydraulic design is required to mitigate the impact on the capacity of the existing site-wide sewer infrastructure of the power station. A suitable drainage network shall be provided to connect to the existing drainage infrastructure of Tynagh power station. Therefore, for the 1.53 ha of hardstanding area, a below-ground drainage strategy has been developed to show how surface water will be managed before it is connected to the current Tynagh Power Station drainage system.

The proposed surface water drainage strategy is based on keeping equivalent peak discharge rate from developed impermeable are to existing greenfield runoff conditions. The peak discharge rate will be based on 1 in 100-year storm event, with the inclusion of a climate change factor additional allowance of rainfall intensity. As a conservative approach, 30% climate change allowance has been considered at this stage.

The surface water drainage will be a positive system (gullies, pipes) and need to be attenuated through below ground storage at a restricted rate. To achieve this, a flow control device, a petrol interceptor for the treatment of contaminated water from cars shall be provided.

There is surface water network provision within the existing Tynagh Power Station site, as demonstrated in the record drawings and site surveys. The drainage proposals will ensure that the development site is suitably drained into the existing Tynagh Power Station site wide network via gravity. A suitable sized drainage network will be provided for the access & service road drainage with a final chamber to connect into the existing site-wide drainage system.

In November 2021, a planning application and EIAR were submitted to GCC for a separate development project, a 299MW OCGT plant on the western portion of the existing Tynagh Power Station site. Subject to planning approval being obtained for the Submitted Development Ref: 21/2192, the Applicant intends to build out and operate both Submitted Development Ref: 21/2192 and the Tynagh North OCGT. The Submitted Development proposes to demolish the existing Tynagh Power Station site workshop, administration building and car park, relocate these items to the brownfield lands to the immediate north of the Tynagh Power Station facility. A new surface water drainage system is proposed, and the Proposed Development Design will tie into the existing Tynagh Power Station site drainage system to the north of the site.

5.3.2.1 Preliminary Calculation

The sufficient attenuation area will be provided within the site for storms in excess up to and including the 1 in 100-year storm plus 30% climate change event to ensure there is no flooding of development area, on or off the site.

Overland flow routing exceeding the 1 in 100 years plus 30% climate change storm event should direct flows to a common area within the site having flood depth not exceeding 100mm to ensure access or egress is unrestricted at all times. Checks should also be made to ensure no flooding of properties occur within the site during this scenario.

For the purpose of this detailed drainage assessment, greenfield run-off rates, discharge rate and the attenuation volume required to store the 100-year storm (+ 30% climate change) were calculated using H.R. Wallingford online tool.

Greenfield run-off rate estimation

Greenfield Run-off rate calculations are based on H.R. Walllingford Greenfield runoff rate estimation online tool (UKSuDS.co.uk). Table 5-1 presents the final results of the run-off rates and shows 2.81L/s for 1 in 100-year time. For details, refer to Appendix E.

Table 5-1 Estimated greenfield run-off rates

Greenfield run-off rates (L/s)	Default	Edited
Q_{BAR}	1.44	1.44
1 in 1 year	1.23	1.23
1 in 30 years	2.38	2.38
1 in 100 years	2.81	2.81
1 in 200 years	3.1	3.1

Source: HR Wallingford Online tool

Surface water storage volume estimation

The HR Wallingford FEH Statistical tool was used to pre estimate the storage volume requirements. Table 5-2 and Table 5-3 summarise the results while details can be found in Appendix F.

The Proposed Development site will cover a total area of 5.53ha with impermeable area approximately 1.53ha including hardstanding and service roads (refer to Appendix A).

Best practice has shown that where flow rates are less than 5.0L/s consent for discharge is usually set at 5.0L/s if blockage from vegetation and other materials is possible.

The tool gives a total storage volume requirement for the proposed strategy of approximately 1465m^3. The storage can be provided by means of oversized pipework/manhole chambers and/or attenuation tank. Refer to Appendix D which illustrates how the 1468m^3 of below ground granular storage will be formed as part of the existing drainage network. This will provide the main storage requirements for the site along with source control and lever of water quality treatment prior to discharging offsite.

Table 5-2 Estimated site discharge rates

Site discharge rates (L/s)	Default	Edited
1 in 1 year	5	5
1 in 30 years	5	5
1 in 100 years	5	5

Source: HR Wallingford Online tool

Table 5-3 Estimated storage volumes

Greenfield run off rates (m^3)	Default	Edited
Attenuation storage 1/100 years	1468	1468
Long-term storage 1/100 years	0	0

Total storage 1/100 years	1468	1468

Source: HR Wallingford Online tool

5.4 Mitigation Measures

A total maximum storage volume of 1465m^3 and 5.0L/s discharge rates has been hydraulically modelled using H.R. Wallingford surface water storage volume estimation online tool. The calculated storage and discharge can be achieved by a combination of the following:

- Volume of traditional drainage system components i.e. pipes and manhole/catchpit chambers.
- Underground attenuation storage with volume control flow system to release storm water in safe manner to a suitable discharge location to the watercourse.
- Provision of attenuation measures to reduce the peak surface water discharge rates by proposing minimum 300mm free board within manhole network.
- Flow control device on storage volume outflow; orifice plate, Hydrobrake or Hydroslide to achieve 5.0 l/s controlled discharge rate into receiving drainage infrastructure.
- Robust maintenance management regime to ensure the performance of the below ground drainage system is sustained for its intended design life.
- The proposed building FFL shall be designed so that the ground falls away from the building. Consideration must be given where unavoidable adjacent ground which falls toward building shall be diverted away while drainage designing.

6 Conclusion

AECOM has prepared this document to support the planning submission and Environmental Statement and to assess the drainage adequacy of the Proposed Development.

From stage 1, the Flood Risk Identification concludes that:

- The Proposed Development Site is not in the fluvial flood zone of Kilcrow River or near the vicinity of any other river or watercourse;
- The existing Tynagh Power Station site has a positive drainage network system (foul + surface) and is connected to an on-site wastewater treatment plan. The final discharge is connected to the lagoon. The embankment surrounding the lagoon prevents overland flooding;
- Historical flood events at the Tynagh Power Station site indicate they were caused by a prolonged period of rainfall. Mitigation measures have been implemented since the flood occurred; and
- The topography of the Proposed Development Site indicates groundwater would flow away from the Proposed Site.

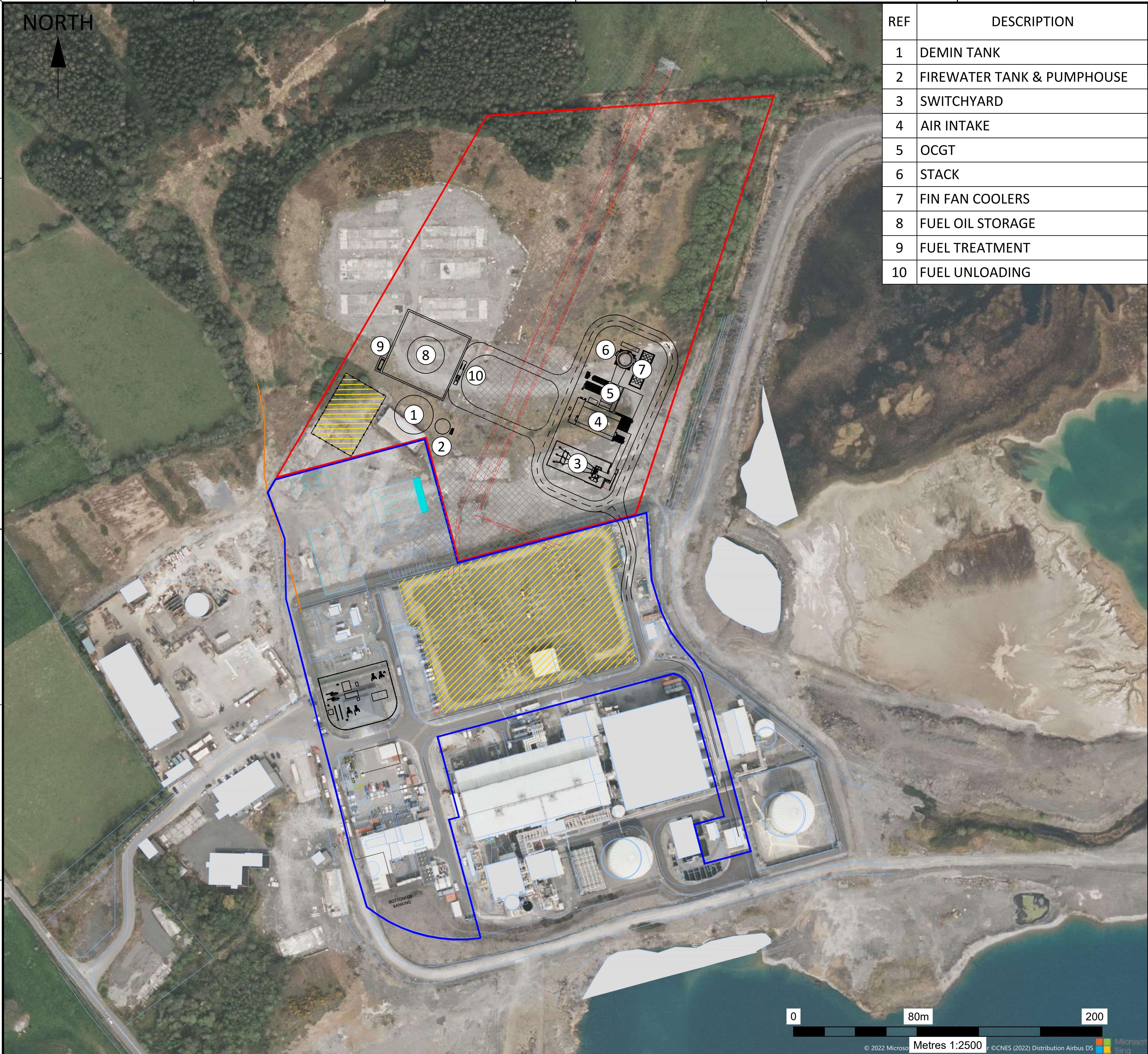
From stage 2, the Initial FRA concludes that:

- According to the Planning System and Flood Risk Management guidelines set for planning authorities, the proposed site falls under highly vulnerable development under determination of vulnerability class;
- Under determination of flood zone, it is classified as Flood Zone C, i.e., the probability of flooding from watercourses and the sea is low or negligible (less than 0.1% or 1 in 1000 year for both watercourse and coastal flooding); and
- According to the justification table provided in the guidelines, the proposed development is categorised as Appropriate.

From stage 3, the Detailed FRA concludes that:

- The surface water run-off from the ground-level hardstanding will be routed to the existing surface water drainage infrastructure of the Tynagh Power Station;
- The proposed surface water discharge rate will be equivalent to the greenfield run-off rate. However, in order to avoid blocking the network by vegetation, the flow rate is set at 5.0 l/s with a storage volume of approximately 1,465m^3; and
- The mitigation measures will be implemented in the form of underground geocellular storage and hydrobrakes or similar systems that control the flow rate.

Appendix A - Proposed Development Red Line Boundary and Site Layout



REF	DESCRIPTION
1	DEMIN TANK
2	FIREWATER TANK & PUMPHOUSE
3	SWITCHYARD
4	AIR INTAKE
5	OCGT
6	STACK
7	FIN FAN COOLERS
8	FUEL OIL STORAGE
9	FUEL TREATMENT
10	FUEL UNLOADING

ALL INFORMATION ON THIS DRAWING MAY BE SUBJECT TO FURTHER DESIGN DEVELOPMENT.

DO NOT SCALE

LEGEND

- AGI & SWITCHYARD SUBJECT TO DETAILED DESIGN BY OTHERS
- OVERHEAD LINES
- EXISTING GAS LINE
- REDLINE BOUNDARY
- REDLINE BOUNDARY FOR EXISTING OCGT APPLICATION
- INDICATIVE EASEMENT AROUND HV CABLES

REV.	DETAILS OF REVISION	DRAWN	CHKD	APR	DATE
R1.0	PRELIMINARY	DTW	AO1	LM2	09.11.22

FICHTNER
CONSULTING ENGINEERS LIMITED
92 George's Street Lower
Dun Laoghaire
Co Dublin, A96 VR66
Tel: +353 (1)506 0632
Website: www.fichtner.ie

CLIENT: EPED

SITE: TYNAGH NORTH

PROJECT:

TITLE: OCGT WITH AERIAL

DRAWING STATUS:	PRELIMINARY		
DRAWN BY:	DTW	DATE: 09.08.22	
CHECKED BY:	AO1	DATE: 09.08.22	
APPROVED BY:	LM2	DATE: 09.08.22	
FILENAME:			
OFFICE OF ISSUE:	DUBLIN		
SHEET SIZE:	A3	SCALE: 1:2500	
DRAWING No.:		Sheet 1 of 1	REVISION: R1.0

Appendix B - Existing Site Topography

LEGEND

Street furniture & Services

- Over Head Wires (LUAS) - Pylon ESB
- Flowerbed
- Pipe
- Lift
- Barrier
- Pump
- Trial Pit
- Bus/Tram Shelter
- Postbox
- Valve - General
- WV Water Valve
- GV Gas Valve
- SV Sluice Valve
- AV Air Valve
- SC Stop Cock
- CPP C P Post
- MK Marker Post
- TL Traffic light
- PM Parking Meter
- PAM Plane Aerial Mark
- SCV Smart Card Validator
- UV Unknown Valve
- Sign RS Road Sign
- BS Bus Stop
- BD Bollard
- BEA Beacon
- CH Coalhole Cover
- BH Bore Hole
- EP Electricity Pole
- TP Telegraph pole
- OCS OCS Pole
- CP CCTV Camera Pole
- LP Lamp Post
- FMH or Foul Manhole
- SMH or Surface Water MH
- MH or Manholes
- AC Air Conditioning Vents
- ICU Services Inspection Cover
- ICTC Traffic Inspection Cover
- ICTV Cable TV Inspection Cover
- ICES ESAT Inspection Cover
- ICNC NTL Inspection Cover
- ICEM Eircom Inspection Cover
- RE Rodding Eye
- PBOX Phone Box
- Bench Seat
- Duct
- Kiosk
- GAS Gas Cover
- GY Gully
- CPBox C P Box
- U/G Vent U/G Car Park Vent
- BIN Waste Bin
- HY Hydrant
- FH Fire Hydrant
- EBOX ESB Box
- ICE ESB Inspection Cover
- TFB Traffic Control Box
- LUAS LUAS Technical Cubicle
- Ticket Vending Machine
- WM Water Meter Cover
- ICT Telecom Inspection Cover
- Monument / Toilets
- Tank Storage
- Basement: MH, Cover & Pipe
- DAM Dished Aerial Mark
- STAY Stay for pole
- PP Pipe Protection
- WO Washout

Natural Features

- Surface Change
- Land Drain
- Bottom of Slope
- Top of Slope
- Ditch
- Water Edge / Lake / Pond
- Hedge / Trees Drip Line / Vegetation
- Tree Coniferous
- WLVL Water Level
- CRWN Crown Level
- IL Invert level
- BL Bed Level
- S Spotheight
- Tree Deciduous

Golf

- FWAY Fair Way
- GREE Green
- TBOX Tee Box

Other

- S1 E: 1000.000 N: 1000.000 H: 100.00 Survey Station
- Photo point
- TOT Top of Tree

Built Features
Roads & Road Markings

- Building
- Edge of Road
- Kerb Bottom
- Kerb Top
- Bridge Abutment
- Bridge Deck
- Bridge Parapet
- Building Façade
- Footpath / Platform Train & Tram
- Damp Proof Course / Verge
- Bridge Pier / Wall & Gate Pillar / LUAS Trackbed
- Cycleway / Private Landing Area
- Fence
- Gate Gate
- Road Centreline
- Top of Wall
- Hoarding
- Property Line
- Road Scar
- Top of Fence
- Wall / Retaining Wall
- Railway / Tram Rail / Grating / Ramp
- Building Canopy / Roof / Overhang
- FL 0.00 Floor Level
- APX 0.00 Apex Height
- EV 0.00 Eaves Height
- PAR 0.00 Parapet Height
- SOFF 0.00 Soffit Elevation
- STPL 5.12 Step Level
- CONC Concrete Pad
- Track

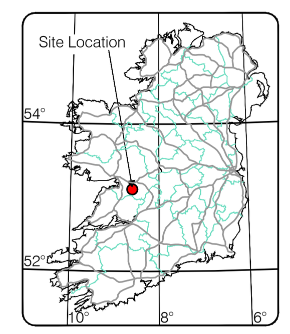
Murphy Surveys Ltd. Disclaimer

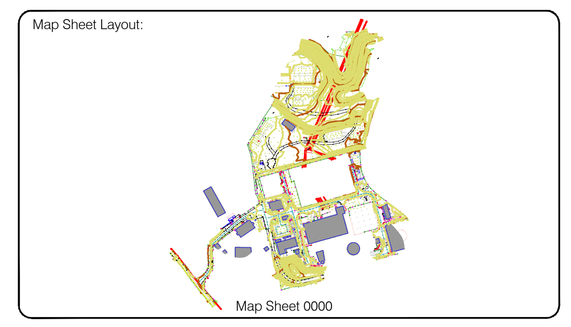
The user or recipient of this survey data understands and acknowledges this data may be inaccurate or contain errors or omissions and the user or recipient assumes full responsibility for any risks or damages resulting from, arising from, or in connection with any use of or reliance upon data displayed herein. Although significant care has been exercised to produce surveys that satisfy survey accuracy standards, these surveys are only as accurate as the source data from which they were compiled. Although all reasonable steps have been taken to locate all features visible at the time of the survey, there is no guarantee that all will be shown on the drawing, as some above ground features may have obstructed the survey. Wherever possible, areas unable to be surveyed will be labelled as “UTS”.

The Company shall not be liable for any inaccuracy of the data provided beyond the specified scale or accuracy, or for any matters resulting from their use for purposes other than that stated in the Contract. No liability shall attach to the Surveyor in respect of any consequential loss or damages suffered by the Client.

The Client must promptly notify the Company of any errors in mapping of which it becomes aware. If misleading, inaccurate or otherwise inappropriate information is brought to the Company's attention or the Company itself identifies any such imprecision or error in a survey, it shall use its reasonable endeavours to fix or remove it and if necessary in certain instances, the Company being on notice of any such misleading, inaccurate or otherwise inappropriate information, it will re-conduct the survey and reproduce the data to within the specified scale or accuracy.

North





Surveyed by : BT Date: JULY 2021 Datum : Malin Head
Drawn by : CD Date: JULY 2021 Grid System:
Checked by : PK Date: 23.07.2021 Irish National Grid ☐ ITM ■

Revisions

No.	Date	Description
0	23.07.2021	First Drawing

SOCIETY OF CHARTERED SURVEYORS IRELAND
RICS the mark of property professionalism worldwide
THE SURVEY ASSOCIATION FULL MEMBER
EUROPEAN GPR ASSOCIATION

Murphy GEOSPATIAL

Topographic surveys, Measured Building Surveys, Setting-Out, As-Built Surveys, Hydrographic Surveys, Legal Mapping, Pipeline Surveys, Services Location, Ground Penetrating Radar, Laser Scanning, Rectified Photography

Kildare Cork Dublin Belfast Glasgow Manchester London

Head Office
Global House
Kilcullen Business Campus
Kilcullen Co. Kildare, Ireland
Phone: (+353) 045 484040
Fax: (+353) 045 484004
Email: info@murphygs.ie

Client : AECOM

Project : Tynagh Power Station Topo

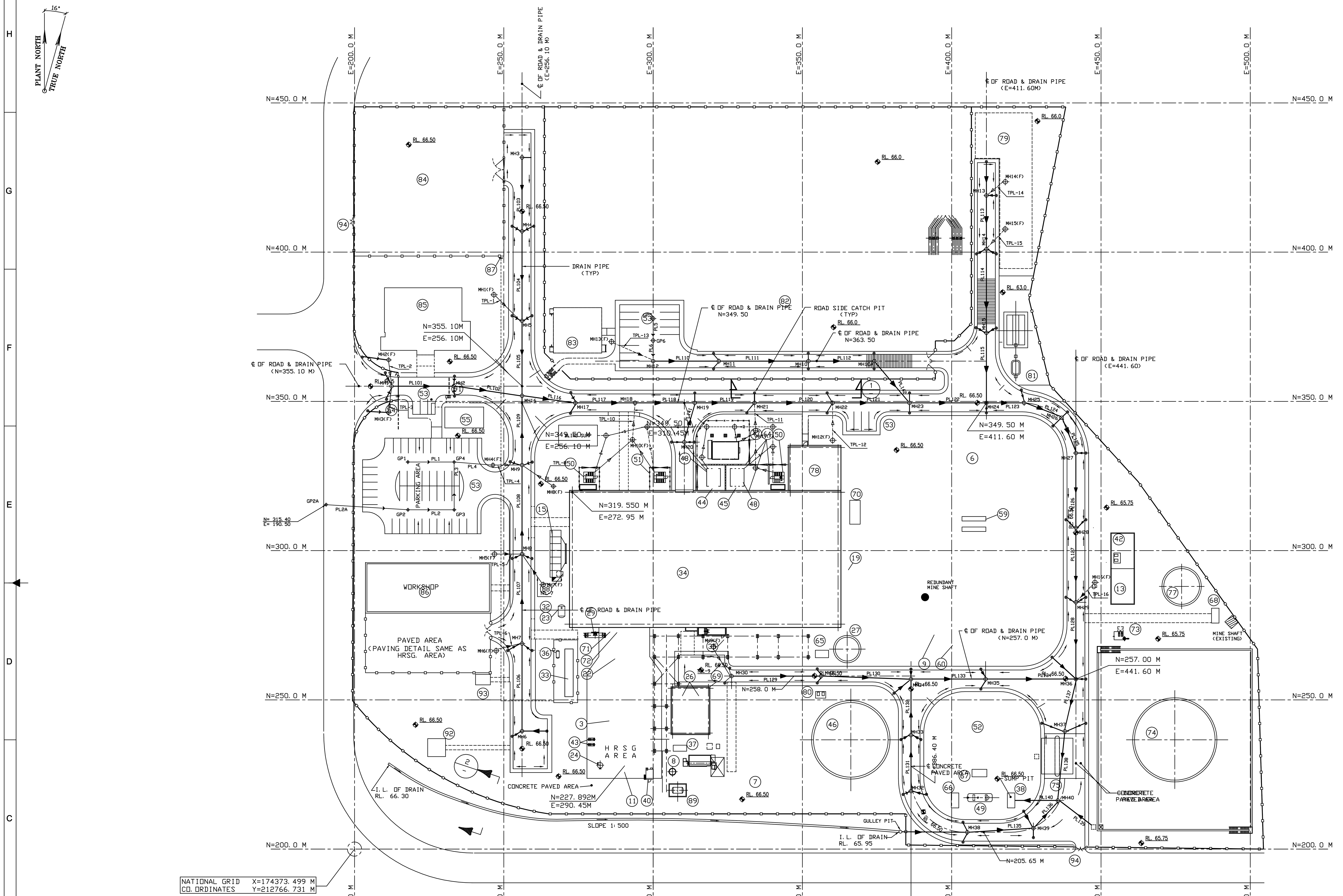
Date : 23.07.2021 **Scale :** NTS@A1

Description : Topographical Survey

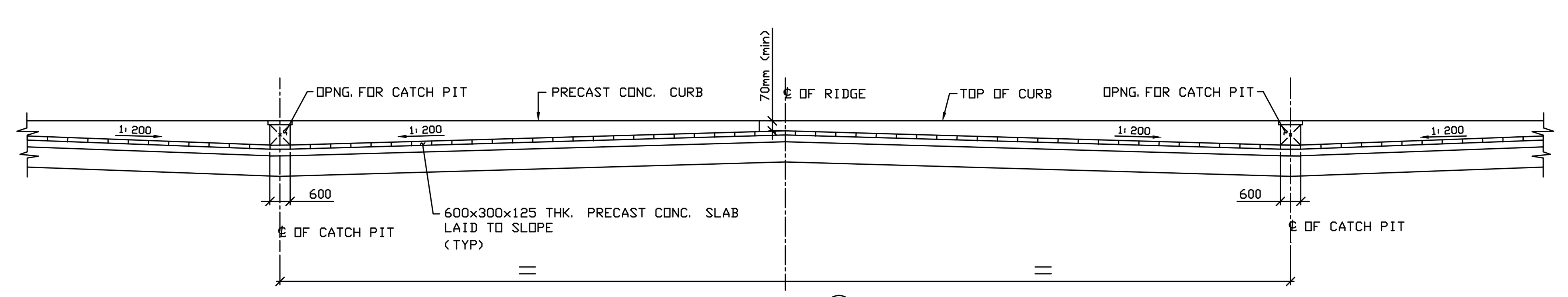
Drawing Number : MGL42168_T_ITM_Rev0-00

Appendix C - Existing Drainage Layout


NATURAL GAS LINE (indicative only)
POWER LINES (indicative only)
PROPOSED PALISADE FENCE TO BOUNDARY OF SITE.
GAS DEPOT
EXISTING STRUCTURE TO BE DEMOLISHED.
NOTE: OVERGROUND PIPEWORK WILL BE SUBJECT TO DESIGN BY AN BÓRD GÁIS, IRELAND.
UNDERGROUND GAS LINE TO TURBINE HALL.
EXISTING SEPTIC TANK & FOUL SEWER TO BE DEMOLISHED
ADMIN BUILDING
NEW M.H. ON EXISTING OUTFALL
EXISTING 12" CULVERT
240 MV SWITCHYARD
SERVICE ROAD
POST & WIRE FENCE
EXISTING DRAIN TO BE BACKFILLED WITH CLEAN STONE
EXISTING 12" CULVERT TO BE DECOMMISSIONED
OUTFALL HEADWALL
300mm Ø LAND DRAIN
POLISHING FILTER
PUMP SUMP
SEWAGE TREATMENT UNIT
SEWERAGE TREATMENT PLANT.
TRANSFORMERS
GAS TURBINE HALL
STEAM TURBINE HALL
AIR CONDENSER
WORKSHOP
STACKS
WATER TANK
DIESEL TANK
REDUNDANT MINE SHAFT
250mm Ø rising main
250mm Ø supply main
WATER TREATMENT EFFLUENT (DISCHARGE TO OPEN PIT)
150mm Ø CLASS C WATERMAIN
GRAVEL ACCESS ROAD TO EAST OF SITE.
STORM WATER TO DISCHARGE TO OPEN PIT (I.L. 60.00 APPROX.)
PROPOSED FOUL SEWER SHOWN (MAIN LINE)
PROPOSED SURFACE WATER SEWER SHOWN (MAIN LINE)
PROPOSED WATERMAIN SHOWN
PROPOSED HYDRANT SHOWN
PROPOSED SLUICE VALVE SHOWN
PROPOSED 300mm Ø LAND DRAIN SHOWN
PROPOSED U.G. GAS LINE TO TURBINE HALL SHOWN
EXISTING CULVERT TO BE DECOMMISSIONED SHOWN
Notes
A Development repositioned, sewer layout revised 3/4/03
Revision Revision Description Date
Client MOUNTSIDE PROPERTIES LTD.
Job title PROPOSED POWER STATION AT TYNAGH MINES, TYNAGH, CO. GALWAY
Drawing title SERVICES LAYOUT
Drawn By: S.H. Date: 14/03/03 Checked By: Date:
Approved By: Date: Status: PLANNING
Job No: 01072
Drawing No: C-P-01 Revision: A
Drawing Scale: 1/500
oconnor
Consulting Civil & Structural Engineers
HGL O'Connor + Company
Woodquay Court, Woodquay, Galway, Ireland
Tel (091) 563191 Fax (091) 568683
e-mail mail@hgloc.ie

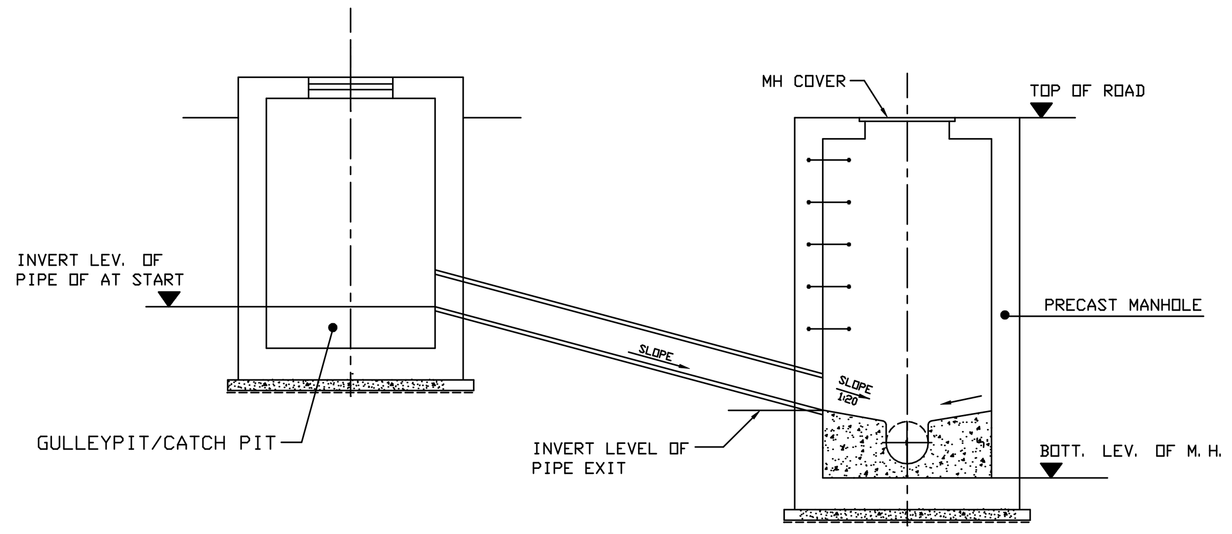


LAYOUT OF STORM WATER DRAIN

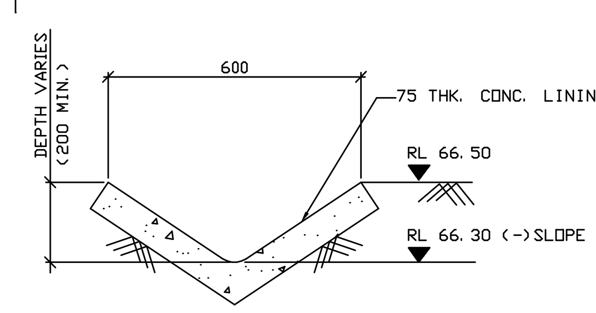


SECTION 1

(SHOWING TYPICAL ARRANGEMENT OF PRECAST CONC. SLAB AT EDGE OF ROAD)



TYP. SECTION SHOWING CONNECTION BETWEEN GULLEYPIT/CATCH PIT & MANHOLE



SECTION 2

(SCALE 1:10)

LEGEND

1. M. H. - MANHOLE MKD.
2. C. P. - ROAD SIDE CATCH PIT MKD.
3. DRAIN PIPES (PL101 ETC.) MKD.
4. MH(F) - MANHOLE TO BE CONSTRUCTED IN FUTURE
5. TPL - TEMPORARY PIPE LINE
6. EMERGENCY DISCHARGE PIPE LINE

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETER AND GRIDS AND LEVELS ARE IN METERS UNLESS NOTED OTHERWISE
2. ALL GRIDS ARE BASED ON PLANT GRID COORDINATES.
3. ALL LEVELS SHOWN AS R.L. ARE RELATIVE TO O.S. DATUM
4. FOR DETAILS OF MANHOLES REFER DWG NO C-1009
5. FOR SCHEDULE OF MANHOLE & DRAINAGE SYSTEM REFER DWG NO C-1008_(SHT.2)
6. LOCATIONS OF MANHOLE MKD. MH (F) ARE TENTATIVE. ACTUAL LOCATION SHALL BE DECIDED AFTER FINALISATION OF NEAR BY BUILDING STRUCTURE/ EQUIPT. FOUNDATIONS.

REFERENCE DRAWINGS:

1. PLOT PLAN DRAWING NO. P0001.
2. SLOPE STABILIZATION, EROSION AND SEDIMENTION CONTROL PLAN, SECTIONS & DETAILS DWG. NO. C 1003, SHEET 1 OF 2 & SHEET 2 OF 2.
3. SITE GRADING PLAN & SECTION DWG. NO. C 1002, SHEET 1 OF 2 & SHEET 2 OF 2.
4. PLANT FENCING DWG. NO. C 1006
5. PLANT ROAD DWG. NO. C 1005.
6. PLANT SEWERS, CULVERT DITCHES & MANHOLES DWG. NO. C 1009.

REV.	DESCRIPTION	DATE	APPV'D
-	PRILIMINARY	24.05.04	PD

PRILIMINARY

SIGNATURE		DATE
DRAWN	JD	21-05-04
CHK'D	ADG/SPM	22-05-04
PASSED	-	-
APPV'D	BB/DG	24-05-04

SCALE 1:500

OWNER: TYNAGH ENERGY LIMITED

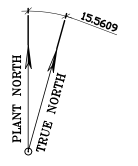
PROJECT: 400MW COMBINED CYCLE POWER STATION
TYNAGH, CO. GALWAY, IRELAND

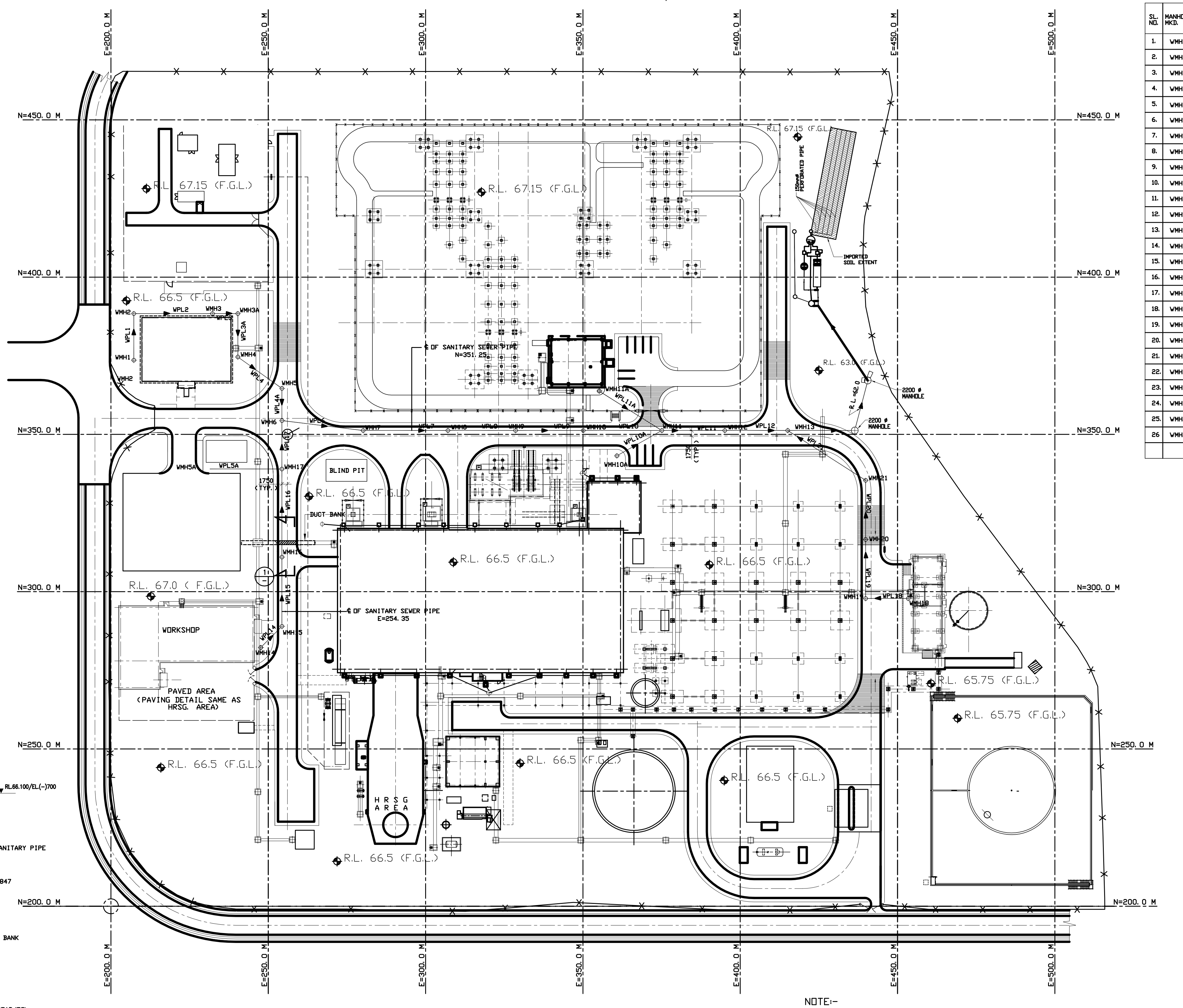
EPC CONTRACTOR: GE ENERGY, GENERAL ELECTRIC COMPANY, Schenectady, NY - USA; GAMA Power Systems Inc. Güç Sistemleri A.Ş. ANKARA, TURKEY

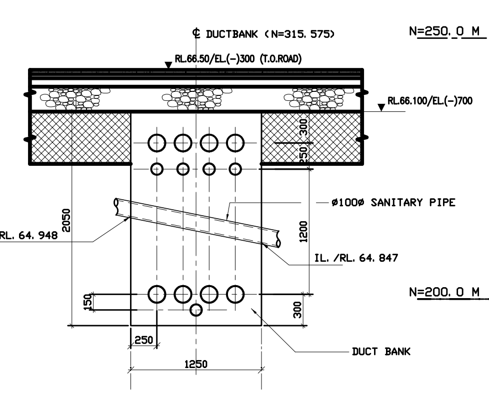
ARCHITECT ENGINEER: THE KULJIAN CORPORATION, ENGINEERS • ARCHITECTS • CONSULTANTS, PHILADELPHIA, PA., U.S.A.

TITLE: STORM WATER DRAINAGE

JOB NO. K-3953 | DRAWING NO. C1008 SHEET 1 | REV -

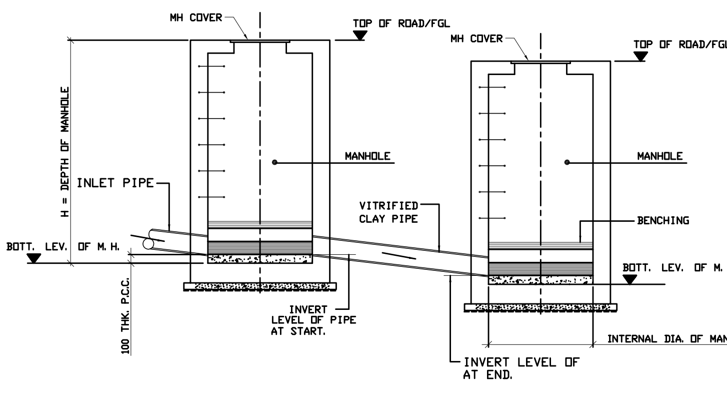




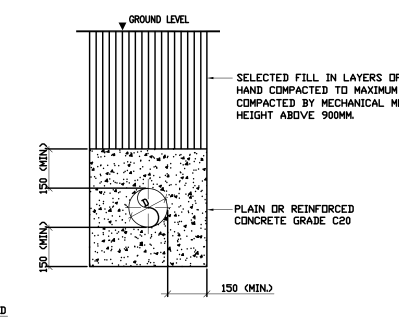


SECTION 1
(SCALE 1:20)

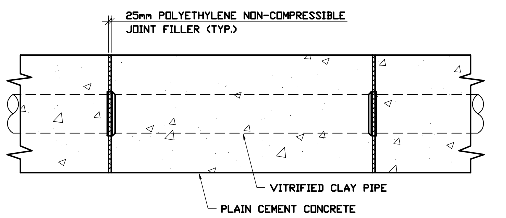
LAYOUT OF WASTE WATER DRAIN



TYP. SECTION SHOWING CONNECTION BETWEEN MANHOLE
SCALE 1: 30



TYPICAL DETAIL AT PIPE BEDDING AND BACKFILL



TYPICAL PLAN VIEW OF PIPE & ENCASING JOINT 4

SCHEDULE OF MANHOLE

SL. NO.	MANHOLE MKD.	LOCATION		INTERNAL DIA. OF MANHOLE (D) (MM)	DEPTH (H) FROM ROAD TOP/FGL(MM)	DIA. OF MANHOLE OPNG. (MM)	TOP OF MANHOLE RL.	REMARKS
		NORTH COORDINATE(M.)	EAST COORDINATE(M.)					
1.	WMH1	373.60	207.30	1200	1110	600	66.5	SEE NOTE 6
2.	WMH2	388.40	207.30	1200	1360	600	66.5	SEE NOTE 6
3.	WMH3	388.40	232.30	1200	1785	600	66.5	SEE NOTE 6
4.	WMH3A	388.40	240.36	1200	1925	600	66.5	SEE NOTE 6
5.	WMH4	374.60	240.36	1200	2160	600	66.5	SEE NOTE 6
6.	WMH5	364.60	254.35	1200	2415	600	66.465	
7.	WMH5A	339.00	230.85	1200	1890	600	66.5	SEE NOTE 5
8.	WMH5B	NOT	USED					
9.	WMH6	354.4	254.35	1200	2590	600	66.465	
10.	WMH7	351.25	280.10	1200	2860	600	66.465	
11.	WMH8	351.25	307.10	1200	3145	600	66.465	
12.	WMH9	351.25	328.60	1200	3375	600	66.465	
13.	WMH10	351.25	350.10	1200	3600	600	66.465	
14.	WMH11	351.25	375.10	1200	3865	600	66.465	
15.	WMH12	351.25	395.10	1200	4075	600	66.465	
16.	WMH13	351.25	415.10	1200	4290	600	66.465	
17.	WMH10A	343.200	360.800	1200	2400	600	66.5	SEE NOTE 6
18.	WMH11A	363.80	355.20	1200	1950	600	67.15	SEE NOTE 6
19.	WMH14	282.25	247.60	1200	1035	600	66.465	SEE NOTE 6
20.	WMH15	289.0	254.35	1200	1160	600	66.465	
21.	WMH16	311.0	254.35	1200	1640	600	66.465	
22.	WMH17	339.0	254.35	1200	2255	600	66.465	
23.	WMH18	297.845	453.400	1200	1585	600	65.75	
24.	WMH19	297.845	439.850	1200	1995	600	65.83	
25.	WMH20	316.595	439.850	1200	2592	600	65.962	
26	WMH21	335.400	439.850	1200	3560	600	66.465	

SCHEDULE OF SEWERAGE PIPES

SL. NO.	PIPE LINE MKD.	FROM	TO	INT. DIA (M.M.)	START INV. LEVEL (RL)	END INV. LEVEL (RL)	REMARKS
1	WPL1	WMH1	WMH2	100	65.490	65.265	SEE NOTE 6
2	WPL2	WMH2	WMH3	100	65.240	64.840	SEE NOTE 6
3	WPL3	WMH3	WMH3A	100	64.815	64.700	SEE NOTE 6
4	WPL3A	WMH3A	WMH4	100	64.675	64.465	SEE NOTE 6
5	WPL4	WMH4	WMH5	150	64.440	64.175	
6	WPL4A	WMH5	WMH6	150	64.150	64.000	
7	WPL6	WMH6	WMH7	225	63.975	63.730	
8	WPL7	WMH7	WMH8	225	63.705	63.445	
9	WPL8	WMH8	WMH9	225	63.420	63.215	
10	WPL9	WMH9	WMH10	225	63.190	62.990	
11	WPL10	WMH10	WMH11	225	62.965	62.725	
12	WPL11	WMH11	WMH12	225	62.700	62.515	
13	WPL12	WMH12	WMH13	225	62.490	62.300	
14	WPL13	WMH13	STP	225	62.275	62.195	
15	WPL5A	WMH5A	WMH17	100	64.710	64.335	
16	WPL5B	NOT	USED				
17	WPL10A	WMH10A	WMH11	100	64.200	63.800	SEE NOTE 6
18	WPL11A	WMH11A	WMH11	100	65.30	64.757	SEE NOTE 6
19	WPL14	WMH14	WMH15	100	65.570	65.430	
20	WPL15	WMH15	WMH16	100	65.405	64.950	
21	WPL16	WMH16	WMH17	100	64.925	64.335	
22	WPL17	WMH17	WMH6	150	64.310	64.000	
23	WPL18	WMH18	WMH19	100	64.265	63.960	
24	WPL19	WMH19	WMH20	100	63.935	63.495	
25	WPL20	WMH20	WMH21	100	63.470	63.030	
26	WPL21	WMH21	WMH13	100	63.005	62.300	

NOTES

1. ALL GRIDS AND LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL GRIDS ARE BASED ON PLANT GRID COORDINATES.
3. ALL LEVELS SHOWN AS R.L. ARE RELATIVE TO O.S. DATUM
4. MANHOLES MAY BE CAST-IN-SITU OR PRECAST CONFORMING TO BS 5911.
5. FOR DETAILS OF MANHOLES REFER DWG NO C1009 (SHT.1) & C1009 (SHT.3)
6. LOCATIONS OF MANHOLES & PIPE LINES CLOSE TO BUILDING ARE TENTATIVE. ACTUAL LOCATION SHALL BE DECIDED AFTER FINALISATION OF NEAR BY BUILDING STRUCTURE / EQUIPT.
7. GRADE OF CONCRETE SHALL BE C-35 AS PER BS 8110.
8. FOR GENERAL NOTES ON CONCRETE & REINFORCEMENT REFER DWG. NO. C2001 (SHT. 1 OF 2)
9. THE SEWERAGE PIPE SHALL BE VITRIFIED CLAY PIPES CONFORMING TO BS 65, BSEN 295, OR IS. 106
10. A MINIMUM OF 150 MM THICK AROUND PIPE SHALL BE ENCASED WITH CONCRETE OF GRADE C-20 WHENEVER DEPTH IS LESS THAN 1200 MM IN ROADS, 900 MM IN OTHER ARES FOR VITRIFIED CLAY PIPES.

NOTE:-

FOR TRENCH EXCAVATION IN SOLID ROCK, 100MM EXTRA DEPTH OF BEDDING REQUIRED TO ALL PIPES.

WHERE SERVICES ARE LOCATED IN NEW ROAD CONSTRUCTION THE CLAUSES 804 & 613 OF 'SPECIFICATION FOR ROAD WORK' OF THE NATIONAL ROADS AUTHORITY (NRI) SHALL BE EXTENDED DOWN TO THE TOP SIDE OF THE SERVICE SURROUND.

REFERENCE DRAWINGS:

1. PLOT PLAN DRAWING NO. P0001.
2. SLOPE STABILIZATION, EROSION AND SEDIMENTION CONTROL PLAN, SECTIONS & DETAILS DWG. NO. C 1003, SHEET 1 OF 2 & SHEET 2 OF 2.
3. SITE GRADING PLAN & SECTION DWG. NO. C 1002, SHEET 1 OF 2 & SHEET 2 OF 2.
4. PLANT FENCING DWG. NO. C 1006.
5. PLANT ROAD DWG. NO. C 1005.
6. STORM WATER DRAINAGE DWG. NO. C 1008.
7. LAYOUT & DETAILS OF DUCT BANK DWG. NO. C 1014.

LEGEND

1. W. M. H. - SANITARY SEWERS MANHOLE MKD.
2. SANITARY DRAIN PIPES (WPL1 ETC.) MKD.

AS BUILT

REV.	DESCRIPTION	DATE	APPV'D
5	REVISED AS PER GAMMA'S AS-BUILT INCORPORATION	14-08-06	PD
4	REVISED AS MKD. 4	13-12-04	PD
3	REVISED AS MKD.	06-12-04	PD
2	REVISED AS MKD.	16-10-04	PD
1	PIPE LINE ADDED FROM LABORATORY & REVISED AS MKD.	28-08-04	PD
0	FIRST ISSUE	26-07-04	PD

APPROVED FOR CONSTRUCTION

	SIGNATURE	DATE
DRAWN	SG	06-05-04
CHK'D	KR/ADG	06-05-04
PASSED	-	-
APPV'D	BB/DG	26-07-04

SCALE 1:500

OWNER: TYNAGH ENERGY LIMITED

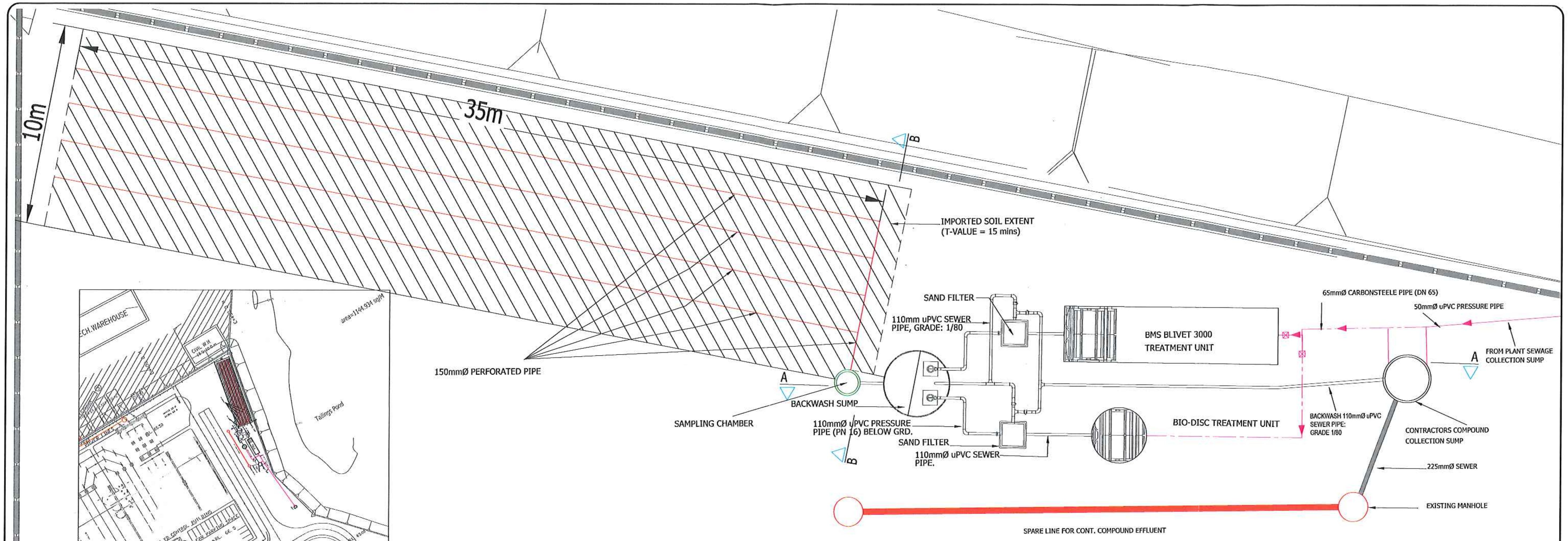
PROJECT: 400MW COMBINED CYCLE POWER STATION
TYNAGH, CO. GALWAY, IRELAND

EPC CONTRACTOR: GE ENERGY, GENERAL ELECTRIC COMPANY, Schenectady, NY - USA; GAMA Power Systems Inc. Güç Sistemleri A.Ş. ANKARA, TURKEY

ARCHITECT ENGINEER: THE KULJIAN CORPORATION, ENGINEERS · ARCHITECTS · CONSULTANTS, PHILADELPHIA, PA., U.S.A.

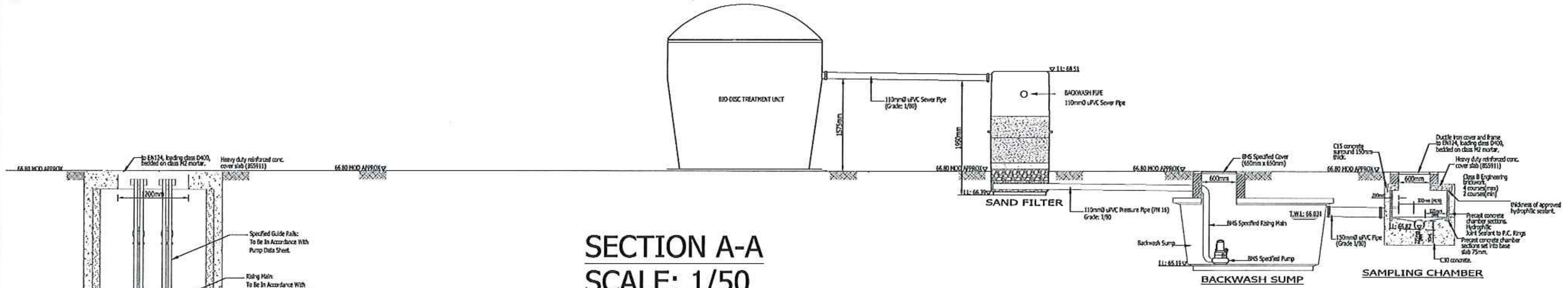
TITLE: SANITARY SEWERS & DRAINAGE
LAYOUT AND DETAILS

JOB NO. K-3953 | DRAWING NO. C1011 SHT. 1 | REV 5

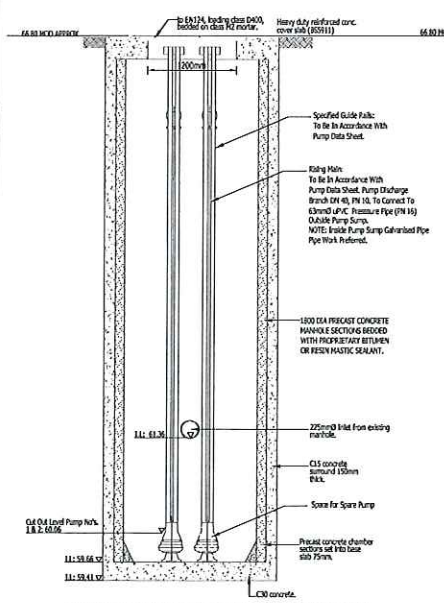


LAYOUT PLAN
SCALE: 1/50

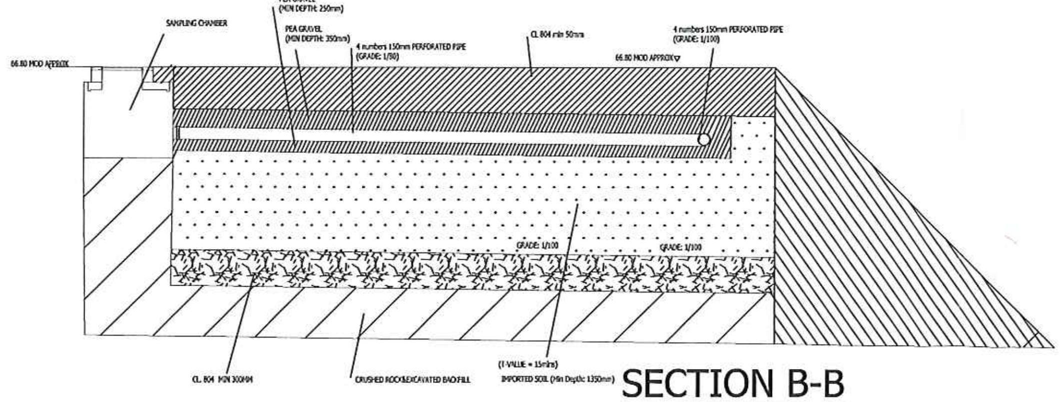
SITE LAYOUT PLAN
SCALE: 1/1000



SECTION A-A
SCALE: 1/50



CONTRACTOR COMPAUND SWITCH COLLECTION SUMP



SECTION B-B
SCALE: 1/50

OWNER
TYNAGH ENERGY LIMITED
DUNBOYNE, IRELAND

PROJECT
400MW COMBINED CYCLE POWER STATION
TYNAGH, CO. GALWAY, IRELAND

EPC CONTRACTOR
GE ENERGY
GENERAL ELECTRIC COMPANY
Schenectady, NY - USA

GAMA Power Systems Inc.
Güç Sistemleri A.Ş.
ANKARA, TURKEY

ARCHITECT ENGINEER
THE KULJIAN CORPORATION
ENGINEERS · ARCHITECTS · CONSULTANTS
PHILADELPHIA, PA., U.S.A.

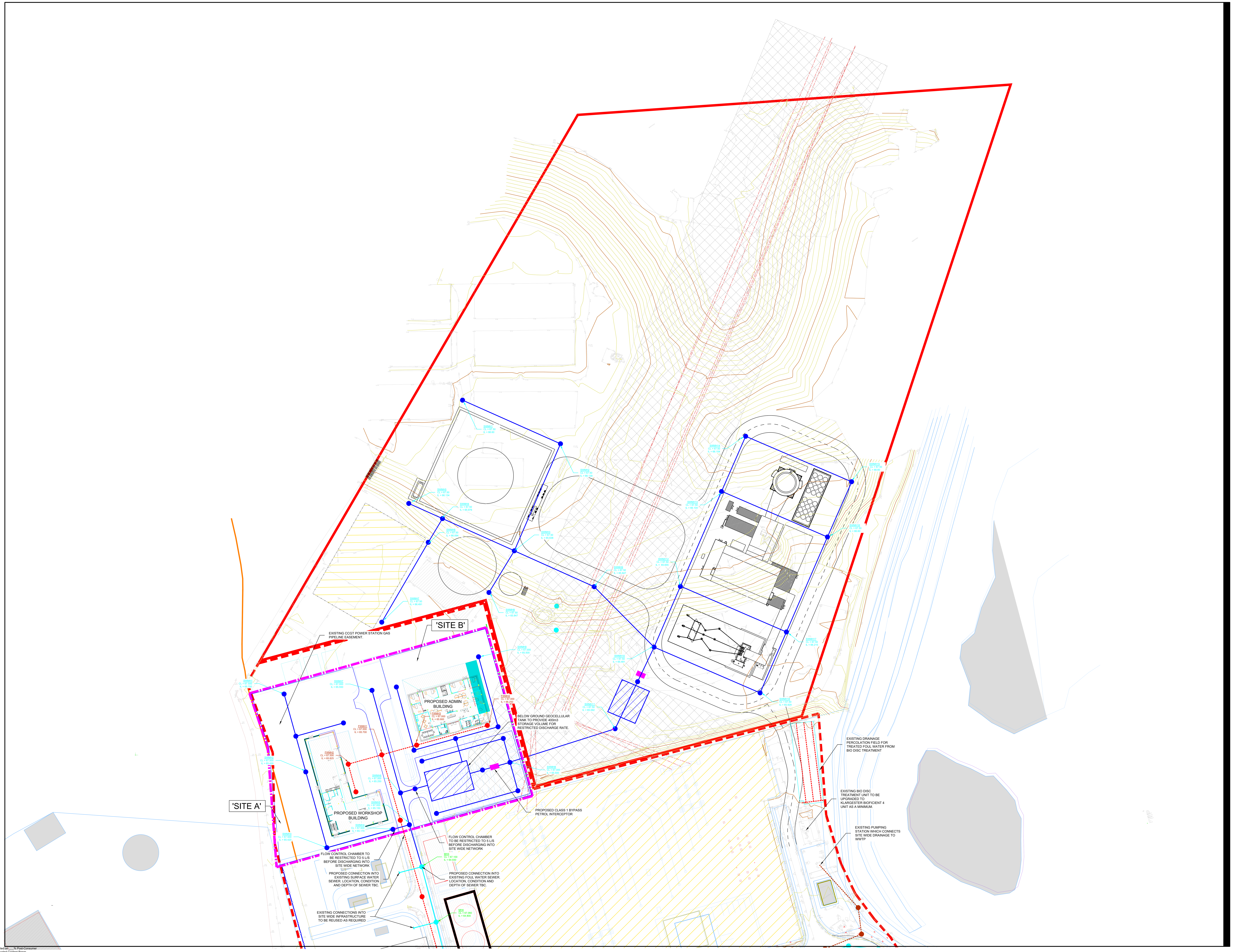
TITLE
SEWAGE TREATMENT PLANT LAYOUT PLAN

REV

JOB NO.

DRAWING NO.
AS-BUILT

Appendix D - Proposed Development Drainage Layout



Project Management Initials: ____ Designer: ____ Checked: ____ Approved: ____ ISO A0 841mm x 1189mm

Last saved by: APARNA.JAMGADE(2022-12-20) Last Plotted: 2022-12-21
Filename: L:\LEGACY\UKBLF1FP002\V1TP\PROPOSALS\2022 FOLDER\PROJECT TYNAGH POWER STATION\911_TRANSPORTATION\911_1_WIP\SHEET\60661667-SHT-CT-0-2000-DRAINAGE LAYOUT_OPTION 2.DWG

Printed on ___% Post-Consumer Recycled Content Paper

AECOM

PROJECT

Line #1
Line #2
Line #3
(FACILITY NAME)
Address Line 1
Address Line 2

CLIENT

OWNER/CLIENT
Address Line 1
Address Line 2
000.000.0000 tel 000.000.0000 fax
www.<website address>.com

CONSULTANT

AECOM Company Name
Address Line 1
Address Line 2
000.000.0000 tel 000.000.0000 fax
www.aecom.com

CONSULTANTS

DISCIPLINE
Consultant's Name
Address Line 1
Address Line 2
000.000.0000 tel 000.000.0000 fax
www.<website address>.com

DISCIPLINE
Consultant's Name
Address Line 1
Address Line 2
000.000.0000 tel 000.000.0000 fax
www.<website address>.com

DISCIPLINE
Consultant's Name
Address Line 1
Address Line 2
000.000.0000 tel 000.000.0000 fax
www.<website address>.com

REGISTRATION

ISSUE/REVISION

I/R	DATE	DESCRIPTION

KEY PLAN

PROJECT NUMBER

Project Number

SHEET TITLE

####
####
####

SHEET NUMBER

####

Appendix E - Greenfield run-off rate estimation

Print | Close Report

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Aparna Jamgade
Site name:	Tynagh OCGT North
Site location:	Tynagh, Co. Galway

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

Site Details

Latitude:	53.16860° N
Longitude:	8.38316° W
Reference:	507340686
Date:	Jan 13 2023 08:52

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 5.54

Methodology

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

Soil characteristics	Default	Edited
SOIL type:	1	1
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.1

Hydrological characteristics	Default	Edited
SAAR (mm):	1018	1018
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	1.44	1.44
1 in 1 year (l/s):	1.23	1.23
1 in 30 years (l/s):	2.38	2.38
1 in 100 year (l/s):	2.81	2.81
1 in 200 years (l/s):	3.1	3.1

Appendix F - Surface water storage requirements

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by: Aparna Jamgade

Site name: Tynagh OCGT North

Site location: Tynagh, Co. Galway

This is an estimation of the storage volume requirements that are needed 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). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude: 53.16839° N

Longitude: 8.3838° W

Reference: 2413090377

Date: Jan 13 2023 09:00

Site characteristics	
Total site area (ha):	1.53
Significant public open space (ha):	0
Area positively drained (ha):	1.53
Impermeable area (ha):	1.53
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	1.53
Net impermable area for storage volume design (ha):	1.53
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria	
Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	5

Methodology	
esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	1	1
SPR:	0.1	0.1

Hydrological characteristics	Default	Edited
Rainfall 100 yrs 6 hrs:	--	61
Rainfall 100 yrs 12 hrs:	--	73
FEH / FSR conversion factor:	1	1
SAAR (mm):	1018	1018
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.3	0.3
Hydological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.4	1.4
Growth curve factor 30 year:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Q_{BAR} for total site area (l/s):	0.4	0.4
Q_{BAR} for net site area (l/s):	0.4	0.4

Site discharge rates	Default	Edited
1 in 1 year (l/s):	5	5
1 in 30 years (l/s):	5	5
1 in 100 year (l/s):	5	5

Estimated storage volumes	Default	Edited
Attenuation storage 1/100 years (m^3):	1468	1468
Long term storage 1/100 years (m^3):	0	0
Total storage 1/100 years (m^3):	1468	1468

aecom.com

aecom.com