AECOM

Shannon Technology and Energy Park (STEP) Power Plant

Information to Cover the COMAH Regulations 2015

Shannon LNG Limited

Information to Cover the COMAH Regulations 2015

- Quantitative Risk Assessment (QRA) (Appendix A2.4).
- MATTE Assessment (Appendix A2.4).
- Oil and Hazardous and Noxious Substances (HNS) Spill Plan (Appendix A2.5).
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Vysus Group

Shannon Technology Energy Park (STEP) Power Plant Land Use Planning

Quantitative Risk Assessment (QRA) – Power Plant

Report Information

Shannon Technology Energy Park (STEP) Power Plant Land Use Planning: Quantitative Risk Assessment (QRA) – Power Plant		
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	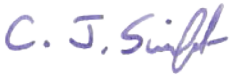	P.P. 
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List of Abbreviations

AGI	Above Ground Installation
BESS	Battery Energy Storage System
BLEVE	Boiling Liquid Expanding Vapour Explosion
CCA	Central Competent Authority
CCGT	Combined Cycle gas Turbine
CHP	Combined Heat and Power
COMAH	Control of Major Accident Hazards
cpm	Chances per million (years)
EV	Expectation Value
GNI	Gas Networks Ireland
HRSG	Heat Recovery Steam Generator
HSA	Health and Safety Authority
LFL	Lower Flammability Limit
LNG	Liquified Natural Gas
LOC	Loss Of Containment
LPG	Liquefied Petroleum Gas
LUP	Land Use Planning
QRA	Quantitative Risk Assessment
RNG	Renewable natural gas
SEP	Surface Emissive Power
SDS	Safety Data Sheet
STEP	Shannon Technology Energy Park
TLUP	Technical Land-Use Planning
UDM	Unified Dispersion Model
VCE	Vapour Cloud Explosion

Executive Summary

New Fortress Energy plans to construct a 600 MW power plant on Tarbert Ballylongford Landbank in the Kerry County Council Development Plant 2022-2028.

The STEP Power Plant consist of:

- A power plant, with different trains, with a total production capacity of 600 MW;
- Liquid fuel storage as power plant backup for production and the facilities needed to receive it; and,
- An above Ground Installation (AGI) accommodating valves and control equipment to receive the natural gas from pipeline.

The Irish Health and Safety Authority (HSA) is the statutory body providing technical land-use planning (TLUP) advice in Ireland, which it does at the request of a planning authority. Its policy on TLUP under the Seveso-III Directive [1] is presented in the document Guidance on technical land-use planning advice for planning authorities and COMAH establishment operators [2]. This document provides a clear guidance for the elaboration of a QRA for land use planning, defining scenario frequencies and modelling parameters, with emphasis in a risk-based approach. It identifies sector types and explains for each sector, the nature of accidents that will be considered, along with the scientific approach to estimate the likelihood of those accidents occurring. This enables lines of equal risk (isorisk contours) to be drawn on a map of the establishment and the surrounding area, defining three risk zones. Subsequently, based on the risk level, more or less intensive / extensive developments are allowed, with a decreasing likelihood of being advised against undertaking such developments as the risk decreases across the zones. The QRA conducted according to the HSA guidelines.

The QRA evaluates risk zones surrounding and due to the power plant and the diesel storage. With this aim, a comprehensive quantitative risk assessment (QRA) of the proposed Shannon Technology and Energy Park (STEP) 600 MW Power generation Combined Cycle Gas Turbine (CCGT) plant and the diesel storage unit has been conducted. The QRA has used the suite of models incorporated into the DNV SAFETI software (version 8.9). SAFETI is a comprehensive hazard and risk analysis software tool for all stages of design and operation.

The QRA evaluates risk to personnel associate with release from:

- The diesel storage unit;
- The AGI;
- The onsite piping; and,
- The power generation Combined Cycle gas Turbine (CCGT) Plant.

The following risks are evaluated:

- Individual risk of fatality contours;
- The individual risk at the nearest residential property;
- Societal risk FN curves for members of the public; and,
- The Societal risk Expectation Value (EV) for members of the public.

The conclusions drawn from the results are as follows:

- Comparing the QRA results against land use planning criteria shows there are no incompatible land uses in any of the three LUP zones;
- The individual risk at the nearest residential property is negligible;
- The societal risk has not been calculated as none of the populated areas are in the scope of the risk curves;
- The Expectation Value for members of the public is 0, as no lethality is expected in the populated areas near to the site.

1 Introduction

1.1 Project Background

New Fortress Energy plans to construct a 600 MW power plant on Tarbert Ballylongford Landbank in the Kerry County Council Development Plant 2022-2028.

The STEP Power Plant consist of:

- A power plant, with different trains, with a total production capacity of 600 MW;
- Liquid fuel storage as power plant backup for production and the facilities needed to receive it;
- An above Ground Installation (AGI) accommodating valves and control equipment to receive the natural gas from pipeline; and,

1.2 Objectives and Scope

This QRA evaluates risk to personnel (on-site and off-site) in relation to the power plant, the AGI and the diesel storage unit. The QRA was conducted in accordance with HSA guidelines, focusing solely on land-use considerations.

1.3 Location and Surroundings

As stated above, STEP is planned for the south bank of the Shannon estuary between Tarbert and Ballylongford in County Kerry, Ireland; this location is shown in Figure 1 (marked in red).

The STEP is to be located on a circa 603-acre site on the Shannon Estuary at Ralappane, between Tarbert and Ballylongford in Co. Kerry and accessed off the existing L-1010 (Coast Road).

The *Kerry County Development Plan 2022-2028* has zoned the site ‘Industry’ as part of the Tarbert/Ballylongford Land Bank, and more specifically for marine related industry and compatible industries requiring deep water access.

Figure 2 provides an overview of the site.

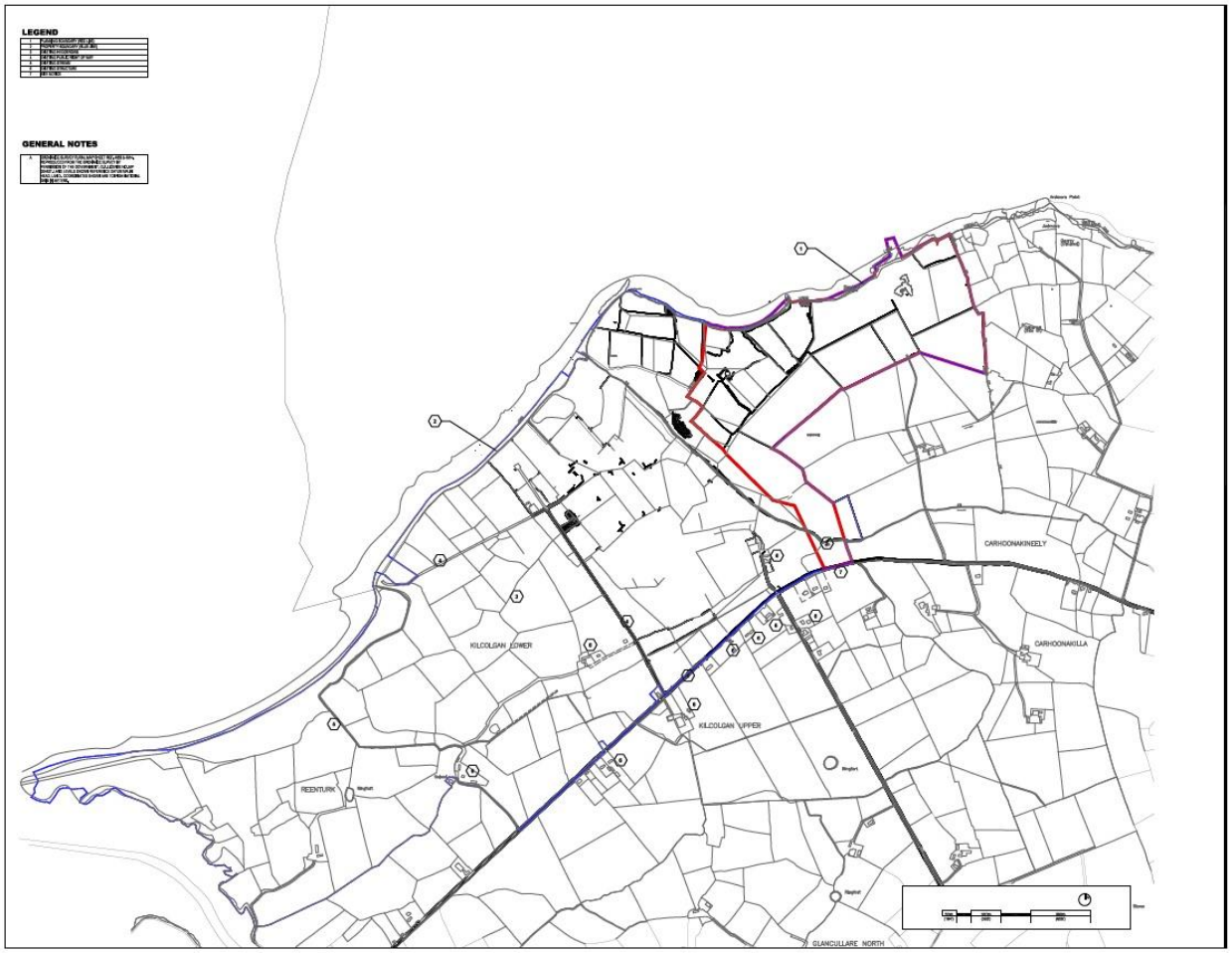

Figure 1 Site Location

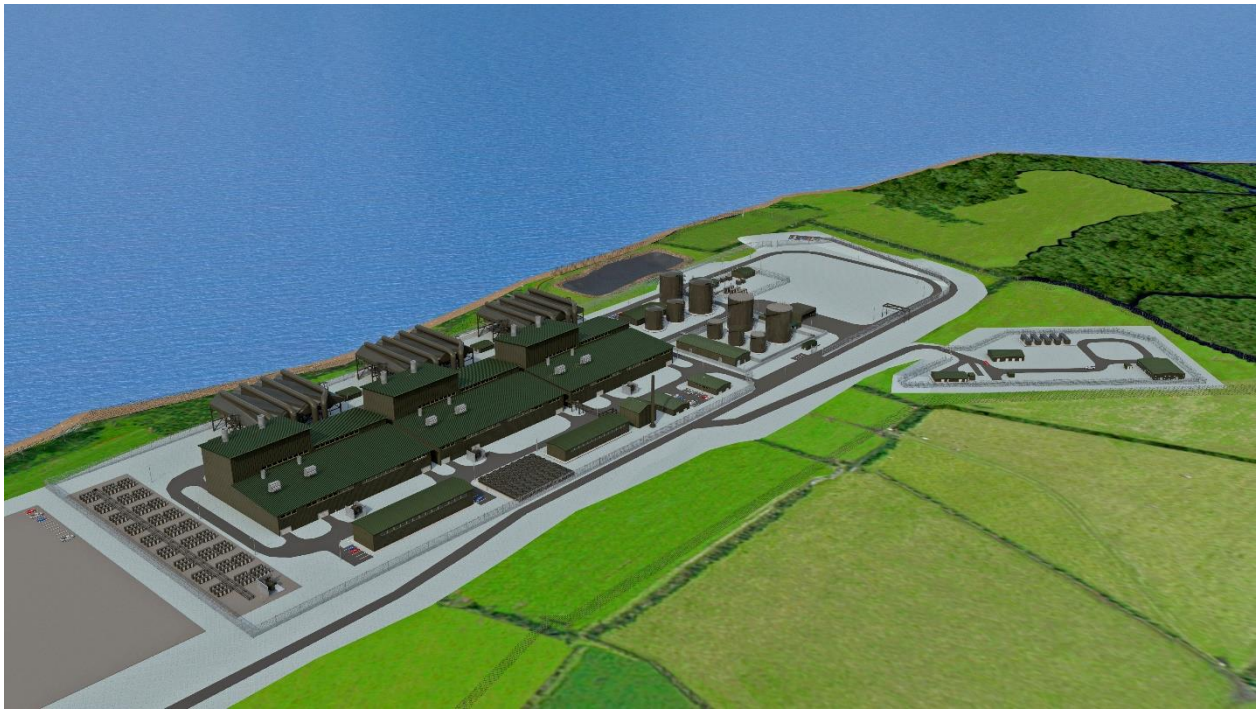

Figure 2 Proposed Site Overview

The location offers the following:

- A large unoccupied landbank on the coast which is zoned for industrial purposes adjacent to the foreshore;
- Access to high-capacity gas transmission system that can receive up to 800 mmscf/d;
- The ability to get a high voltage export grid connection offer within the generation capacity shortfall time window[1]; and
- Access to high-capacity electricity grid (220 kV or higher) that can export 600 MW without undue system constraint.

1.4 Site Summary

1.4.1 Power Plant

The proposed Power Plant will comprise of:

- A flexible modular power plant design with up to three (3) blocks of Combined Cycle Gas Turbines (CCGT), each block with a capacity of circa 200 MW for a total installed capacity of up to 600 MW. The multishaft arrangement of the power plant provides fast acting response with very low minimum stable generation and is ideally suited to support increased intermittent renewable generation. Each block shall comprise of two (2) gas turbine generators, two (2) heat recovery steam generator and one (1) steam turbine generator and an air-cooled condenser.
- A 120 MW for 1 hour (120 MWhr) Battery Energy Storage System (BESS). Due to its very fast response, the BESS supports intermittent renewable generation.
- High voltage 220 kV Substation;
- Auxiliary Boiler, powered by natural gas;
- Raw water treatment building;
- Firewater storage tanks and fire water pumps;
- Fuel storage consisting of five diesel tanks, two holding tanks and 3 day tanks, with a total capacity of 16000 m^3; and,
- Ancillary buildings.

1.4.2 AGI

The AGI will comprise of:

- Pig-trap (Bi-directional);
- Filtration;
- Fuel gas heaters/ heat exchangers and associated fuel gas skid;
- Metering equipment located in a Metering Building;
- Gas pressure regulation system located in a Regulator Building;

1 An application to connect to the national electrical transmission network via this 220 kV connection was submitted to EirGrid in September 2020. A Connection Agreement for a 600 MW Maximum Export Connection (MEC) was executed with EirGrid in 14th April 2023.

- Gas chromatographs/ Chromatograph Building;
- Generator Kiosk; and
- Control and Instrumentation building.

1.5 Hazardous Substances

Hazardous substances present in the power plant were identified during the MATTE preparation. Materials subject to control under COMAH regulations identified are presented in Table 1.

Table 1 Substances subject to control under COMAH regulations in the power plant

Substance
Natural gas
Diesel
Transformer oil
Cleaning materials, laboratory chemicals and paints

The QRA focuses only on accidents involving hazardous substances in quantities that are expected to lead to offsite impacts, which, in the power plant, are natural gas and diesel. Consequently, the scope of the study is limited to areas where these substances are present. The following sections presents the properties and the hazards related to natural gas and diesel.

1.5.1 Properties of Natural Gas

Natural gas is a mixture of low molecular weight (typically ≤ C4) hydrocarbons (predominantly methane), and in the present study it has been modelled as pure methane as only a very small fraction of the product stream will be heavier hydrocarbons. Physical properties for methane are provided in Table 2.

Table 2 Properties of methane [6]

Property	Value
Chemical Formula	CH_4
CAS Number	74-82-8
Appearance at 20°C	Colourless Gas
Atmospheric Boiling Point (°C)	-161.5
Melting Point (°C)	-182.5
Liquid Specific Gravity	0.422
Vapour Density (air = 1)	0.55
Lower Flammable Limit (vol %)	5
Upper Flammable Limit (vol %)	15
Flash Point (°C)	-188
Auto Ignition Temperature (°C)	595
Long Term Exposure Limit	N/A

Property	Value
LD_{50}	N/A
Eco-toxicity	Unlikely to cause adverse effects
Degradability	Disperses rapidly

1.5.2 Hazards of Natural Gas

The principal hazards of natural gas result from its:

- Flammability; and,
- vapour dispersion characteristics.

Natural gas is flammable when mixed in air at concentrations from 5 to 15% (volume basis).

The possible outcomes after a release of natural gas are a jet fire if an immediate ignition occurs and a flash fire or explosion if a delayed ignition occurs. These outcomes are shown in Figure 3.

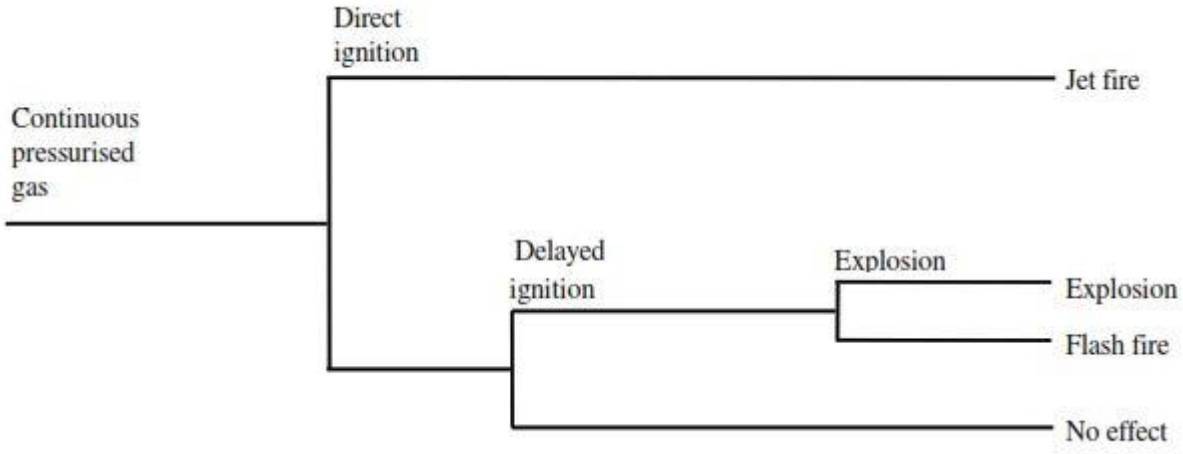

Figure 3 Event tree for a continuous release of a flammable gas (source: BEVI [3])

The description of the possible outcomes is presented below.

Jet fire

If natural gas is released from storage tanks, piping or pressurized equipment, it will form a gas jet that entrains and mixes with the ambient air. If the material encounters an ignition source while it is within the flammable range, it may result in a jet fire. Such fires have the potential to cause severe damage, but associated consequences are highly dependent on the direction of release (i.e. not omni-directional).

Flash Fire

When natural gas is released to the atmosphere, a vapour cloud forms and disperses (mixing with air as it does so). If the resultant vapour cloud is ignited before the cloud is diluted below its LFL, a flash fire may occur. The combustion normally occurs within only portions of the vapour cloud (where mixed with air in flammable concentrations), rather than the entire cloud. A flash fire may burn back to the release point, resulting in a jet fire but is unlikely to generate damaging overpressures (explode) when unconfined.

Explosions

If some confinement is present when a natural gas vapour cloud ignites, it can produce damaging overpressures. Areas congested with equipment and structures can facilitate damaging overpressures if a vapour cloud is ignited within such an area. For example, if a vapour cloud infiltrates a process plant area with various vessels, structures, and piping and the cloud ignites, the portion of the cloud within that congested area may generate damaging overpressures.

If no ignition point is present, the flammable cloud will ultimately disperse with no effects.

1.5.3 Properties of Diesel

Diesel is used as an alternative fuel for the power plant. While it won't be used regularly, two separate tests will be conducted annually. Diesel fuel is defined as any liquid fuel suitable for use in diesel engines. It is derived from crude oil and primarily composed of heavy hydrocarbons (C8+).

Table 3 presents diesel properties according to the SDS provided by the supplier.

Table 3 Properties of diesel

Property	Value
CAS Number	64742-79-6
Appearance at 20°C	Bright yellow liquid
Atmospheric Boiling Point (°C)	172 to 379ºC
Melting Point (°C)	-40 to 6ºC
Liquid Density	0.8 to 0.9 g/cm^3
Vapour Density (air = 1)	N/A
Lower Flammable Limit (vol %)	N/A
Upper Flammable Limit (vol %)	N/A
Flash Point (°C)	>56ºC
Auto Ignition Temperature (°C)	224ºC
LD_{50} oral rat	>5000 mg/kg
Eco-toxicity	Toxic to aquatic life with long lasting effects

1.5.4 Hazards of Diesel

The Globally Harmonised System for the Classification and Labelling of Chemicals (GHS) classifies all diesel liquids as "Flammable Liquid Category 3". According to the SDS provided, the diesel used in the power plant has a flash point greater than 56ºC.

Referring to the decision tree from the guide [2], (Figure 8.- Assignment of Ignition Category), diesel it categorized as an Ignition Category 3 substance, corresponding to an ignition probability of 0. However, for conservative considerations, a probability of ignition of 0.01 is assumed, a value aligned with Category 2 liquids.

The consequence following a loss of containment (LOC) of diesel will be a pool fire, confined or unconfined depending on the location of the release.

The guide provides a maximum surface emissive power (SEP) of heat radiated outwards per unit surface area of the flame from a pool fire of 130 kW/m^2.

2 Facility Description

The QRA has considered hazards from natural gas and diesel associated with operation of:

- The AGI;
- The power generation Combined Cycle gas Turbine (CCGT) Plant; and,
- The diesel storage unit.

2.1 Above Ground Installation (AGI)

The AGI will accommodate the valves and control equipment to facilitate the connection to the already consented 26 km Shannon pipeline. It will facilitate the transportation of gas from GNI and will include fiscal metering and pressure control of the gas flow. The AGI is located in a separate compound within the Proposed Development site covering an area of approximately 11,282 m^2.

The details provided on the AGI are based on information provided by Gas Networks Ireland (GNI) and will be typical of existing GNI AGIs on the national gas transmission network.

The AGI compound will be remotely operated and will normally be unmanned.

The proposed AGI general arrangement is shown in Appendix B.

2.2 Power Plant

The power plant will primarily operate using natural gas and will export generated power via the 220 kV connection to the national electricity grid. The usual fuel supply to the power plant will come from the gas grid through the Above Ground Installation (AGI). However, twice a year, the plant will conduct a diesel test utilizing the diesel stored in the tanks.

The proposed Power Plant general arrangement is shown in Appendix C.

2.3 Diesel Storage Unit

The Diesel will be used as an alternative fuel for the power plant. It will be stored in 6 tanks: two 5,000 m^3 fuel oil storage tanks (A and B) and three 2,000 m^3 fuel oil storage day tanks (A, B and C).

The layout of these tanks is shown in Appendix D.

3 Overview of the QRA Methodology

3.1 Introduction

The COMAH Regulation 24 refers to the siting and development of new establishments. In this context, new establishments are expected to provide sufficient information to enable the Central Competent Authority (CCA) to apply the method outlined in the guidance [2]. Specifically, the individual location-based risk contours depicted in Figure 4 must be plotted on a map.

Figure 4 Individual risk zones to be plotted on a map according to the guide [2]

Four development types are defined, and each one is permitted or forbidden based on the zone where it is located and the risk contours outlined. The acceptance criteria are shown in Figure 5:

Figure 5 Development types allowed in each risk zone according to the guide [2]

The definition of development types is presented in Appendix A.

Additionally, depending on the results, a societal risk evaluation may also be necessary.

3.2 Sectors

The guide [2] defines 13 different sectors, each of which with characteristic dangerous substances and types of major accidents. For each sector, a method of generating generic TLUP risk zones is elaborated. For complex sites, sector-specific approaches from the guide can be combined.

As the power plant is not specifically mentioned in the guide, a combination of scenarios from other sectors has been used (see Section 3.3).

3.3 Scenarios and Frequencies Definition

To define the scenarios to be calculated, all installations and equipment present in the power plant have been compared to those outlined in the guide. Subsequently, a selection based on their similarities has been made. All scenarios are defined to occur either in the power plant or in the storage unit.

3.3.1 Scenarios in the AGI

In the power plant, the only dangerous substance present is the natural gas.

Natural gas is fed to the power plant via a pipeline. Scenarios for natural gas aboveground pipelines are defined in table 40 of the guide [2] and are shown below in Table 4.

Table 4 Scenarios for aboveground natural pipelines with D > 150 mm (Table 40 of the guide [2])

LOC scenario	Frequency (m^{-1} yr^{-1})	Event #, [2]
Pipeline rupture	1E-07	087
Pipeline leak of 0.1D (max 50 mm)	5E-07	088

3.3.2 Scenarios in the Power Plant

In the power plant, the only dangerous substance present is the natural gas.

Natural gas is fed to the turbine via a pipeline. Scenarios for natural gas aboveground pipelines are defined in table 40 of the guide [2] and are shown in Table 4.

An additional scenario, specific to steam turbines, has been included, shown in Table 5.

Table 5 Additional scenario, specific for steam drums in the HRSG

Initiating event	Consequence
Failure of the containment of the high-pressure steam vessel	BLEVE

The BLEVE occurring in a steam drum results in a significant overpressure primarily concentrated close to the centre of the explosion and rapidly diminishing with distance. In addition, given the substance involved is water, there are no thermal effects (fireball). Considering these factors, coupled with the vessels' locations, it is anticipated that the lethality curves associated with this scenario will not extend beyond the site boundaries. As the focus of this QRA is on external risk only, this scenario has been excluded from consideration.

There is the potential for a major accident scenario which involves the application of firewater and subsequent release to the environment due to the presence of the BESS. Although there are secondary and tertiary containment systems which will be installed at the proposed development, these may be insufficient to cope with the potentially large volume of water which may be needed to actively contain a thermal runaway event associated with the BESS. Additional fire suppression systems such as gas purging systems linked to temperature / carbon monoxide sensors may minimise the extent of a thermal runaway event and reduce the requirement for fire water. Water used in managing a thermal runaway event may contain other heavy metal ions and toxic substances such as hydrogen fluoride, which have potential to cause harm to human health and the environment. This scenario has environmental consequences that can reach offsite, but the thermal radiation due to the fire will affect only the BESS building, not reaching offsite. Therefore, the scenario has not been calculated in the QRA.

3.3.3 Scenarios in the Storage Unit

For the liquid fuel storage, scenarios are extracted from the "Flammable liquid storage installations" on chapter 3.6 of the guide [2]. As mentioned previously, diesel is categorized as a category 3 substance, for which no scenarios need to be described. However, as a conservative approach, the QRA will treat Diesel as a Category 2 substance. The scenarios and their frequencies to be considered are shown in Table 6.

Table 6 Scenarios for diesel tanks (Table 48 of the guide [2])

LOC scenario	Leak Frequency (yr^{-1})	Ignition Probability	Consequence	Consequence Frequency (yr^{-1})	Event #, [2]
Instantaneous failure	5E-06	0.01	Pool Fire	5E-08	123
Failure over 10 minutes	5E-06	0.01	Pool Fire	5E-08	125
10 mm pipe leak over 30 minutes	1E-04	0.01	Pool Fire	1E-06	127
Overtop pool fire	-	-	Pool Fire	5E-08	--

The guide does not consider scenarios related to flammable liquid pipelines. Vysus recommends using the values from the BEVI [3]. The corresponding scenarios are shown below in Table 7:

Table 7 Scenarios for aboveground pipelines (according to BEVI [3])

LOC scenario	Frequency (m^{-1} yr^{-1})		
	D < 75 mm	75 mm ≤ D ≤ 150 mm	D > 150 mm
Pipeline rupture	1E-06	3E-07	1E-07
Pipeline leak of 0.1D (max 50 mm)	5E-06	2E-06	5E-07

The transport of diesel to the power plant via pipeline is expected to be carried out twice a year when the power plant is run on diesel as a test, lasting just a few hours. A total pipeline operation time of 24 h per year has been initially considered. However, there may be an incipient problem that is not revealed whilst the pipeline is not in operation, leading to a leak when the pipe is in use; and therefore, the enabling factor of use is not considered.

Table 8 Scenarios for aboveground pipelines (according to BEVI [3])

LOC scenario	Frequency (m^{-1} yr^{-1})	Ignition P	Length (m)	Pool fire freq. (yr^{-1})
Pipeline rupture	3E-07	0.01	350	1.05E-06
Pipeline leak of 0.1D (max 50 mm)	2E-06	0.01	350	7.00E-06

Diesel unloading operations are expected to be conducted very infrequently as the diesel is only maintained as a backup fuel and no consumption is foreseen. Considering the presence of trucks as once per year, with a total duration of the unloading operation of 12 h, frequencies for transport scenarios are presented in Table 9:

Table 9 Scenarios for aboveground pipelines (according to BEVI [3])

LOC scenario	Frequency (yr^{-1})	Trucks per year	Unloading duration (h)	Ignition P	Pool fire freq. (yr^{-1})
Instantaneous failure	1E-05	1	12	0.01	1.37E-10
Leak largest connection	5E-07	1	12	0.01	6.85E-12

Unloading operations from truck have not been considered in the QRA due to the fact that the risk is negligible compared to the minimum risk level to be considered from the guide [2] of 1E-07/y.

3.4 Consequence Analysis

The purpose of consequence analysis is to determine the potential outcome (or outcomes) of the various scenarios comprising the QRA. Consequence analysis may be broken down into the following steps:

- Source term modelling;
- Physical effects modelling; and,
- Impact modelling.

SAFETI performs these steps in a single model that automatically proceeds from one step to the next.

3.4.1 Source Term Modelling

Source term modelling determines the behaviour of the material upon leakage, in terms of:

- Release rate and / or quantity;
- The velocity of the material;
- The phase of the material (liquid, gas / vapour or two-phase); and,
- The conditions within the material upon release (temperature, density, etc.).

Where the material forms a pool of liquid, it will also be necessary to model the pool spreading and rate of vaporisation of material from the pool. Where a bund (i.e. secondary containment) is provided, the potential size of the pool is limited to the size of the bund.

3.4.2 Physical Effects Modelling

Modelling of physical effects predicts the behaviour of the material once it has been released, using the source term modelling results as inputs. The types of physical effects considered may include:

- Gas or vapour dispersion;
- Fire dimensions and heat output (for ignited releases of flammable material); and,
- Size and strength of explosions (for ignited flammable clouds in congested / confined regions).

Since some of the calculations performed can be quite complex, and the number of calculations required in a QRA study can be large, software packages are usually employed to perform the modelling.

3.4.3 Impact Modelling

Impact modelling evaluates the effect of different physical phenomena on receptors of interest (i.e. people, environmental features or assets, depending on the objectives of the study). In the present study, the parameters used for impact modelling are derived from the guide [2]. Specifically, the parameters related to flammable substances, given the absence of toxic substances in the STEP.

To estimate the fatal consequences of major accidents, established probit relationships for fatality are used; these are conservatively derived and help to ensure consistency in approach, resulting in a risk-based analysis that is robust and transparent. A range of consequences can be expected in a population exposed to an acute hazard (dose) which can be represented mathematically by a dose-response curve, with the number of people suffering fatal effects being the response.

Below are described the probit equations used in the QRA for estimating the consequences of specific types of major accident as detailed in the HSA guide [2].

3.4.3.1 Consequences for thermal radiation

Thermal radiation exposure arises from fire-type events, with accidents that give rise to a thermal (heat) effect having a different impact on indoor and outdoor populations.

The thermal effect on people outdoors (i.e. directly exposed to the thermal radiation) is determined by the following probit equation from the HSA guide [2]:

$$Probit = -14.9 + 2.56 \cdot \ln\left(I^{1.33} \cdot t\right) \qquad (1)$$

Where I is the incident heat flux in kW/m^2 and t is the exposure duration in seconds. The recommended value for t is 60 seconds. Using this value, equation ***(1)*** gives the following fatality percentages at the heat flux levels shown in Figure 6.

Figure 6 Heat flux and fatality levels, outdoor, for a 60s exposure

For flash fires, the HSA guide [2] stipulates that a fatality rate of 100% is assumed inside the lower flammability limit (LFL) envelope, with 0% fatalities outside that envelope.

People inside buildings will have some protection from the effects of incident thermal radiation. The guide [2] stipulates the following values in Figure 7 for relevant thermal radiation thresholds.

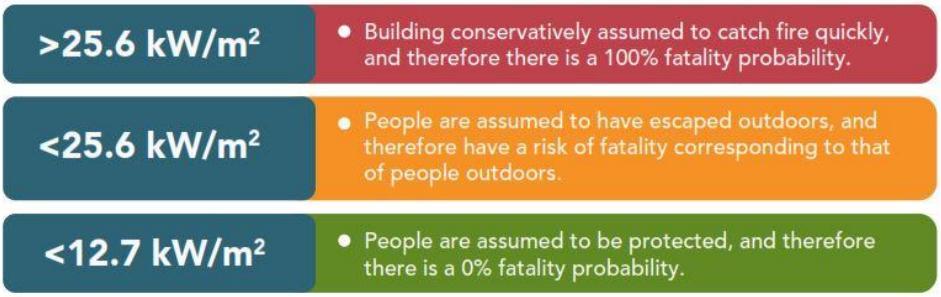

Figure 7 Heat flux levels relevant for people within buildings

For flash fire, within the flash fire envelope, indoor fatality levels are conservatively assumed to be 10% in the HSA guide [2].

3.4.3.2 Consequences for explosion overpressure

The probit equation used for determining consequences from blast overpressure for personnel outside presented in the guide [2] is:

$$Probit = 1.47 + 1.35 \cdot \ln(P) \qquad (2)$$

With P in psi.

This relationship applies only to people exposed to blast overpressure outdoors and gives the following in Figure 8 relationship between overpressure and fatality.

Figure 8 Overpressure fatality thresholds for people outdoors

As the plant constitutes an open and uncongested area, overpressure dissipates quickly and negligible effect at offsite buildings is expected, specially considering there are no buildings close to the site. Hence, overpressure over people indoors is not calculated.

3.5 Frequency Analysis

In general terms, frequency analysis is used to calculate:

- The likelihood of a given release of dangerous material occurring – this is usually expressed as a frequency (e.g. 1E-03 per year, or once in a thousand years);
- Given that a release has occurred, the probability that a given type of physical effect follows – for example, for releases of flammable material, the type of effect may depend on whether the material is ignited soon after the release begins, or at some time later; and,
- Given that a certain type of physical effects results, the probability of an undesired outcome – this may depend on the wind direction, the probability that a person is present within the hazard range, and the probability of successful emergency action.

Frequency analysis approaches fall into three categories:

- Use of relevant historical data;
- Use of analytical or simulation techniques (such as fault tree analysis or event tree analysis); and,
- Use of expert judgment.

In the present QRA, frequency values from the HSA guide [2] have been used in all scenarios for natural gas and diesel. Regarding the specific scenario, explosion in the steam vessel, has been considered equivalent to a rupture of a process vessel. A frequency of 5E-06/year has been obtained from the BEVI guideline [3].

3.6 Risk Analysis

In simple terms, risk is the chance of an undesired outcome with the chance usually expressed as a frequency; the undesired outcome may be fatality, environmental damage or financial loss. In terms of risks to people, there are different types of risk outputs that may be calculated using QRA:

- Risk indices (such as Fatal Accident Rate);
- Individual risk usually expressed as the risk of harming a hypothetical person with a defined set of characteristics. Individual risk results may be expressed as a point value (the individual risk to a hypothetical person at a given geographical location), as a graph of individual risk versus distance (a risk transect) or as risk isocontours overlaid on a map;
- Societal risk, which expresses the frequency with which different numbers of people could be affected by an accident. It is usually presented as an ‘FN curve’, where F is the frequency with which N or more people are affected.

3.7 Risk Assessment

Once the risk analysis results have been obtained, it is necessary to assess their significance. This usually involves comparison of the results with risk acceptance criteria. The risk acceptance criteria used in this study corresponds to the criteria shown in Figure 4 (see Section 3.1).

4 Identification of Scenarios

Scenarios for inclusion in the QRA have then been obtained from the guide.

The scenarios have been coded as follows: XX-YY-nn A/B… with:

- XX: the substance considered in the scenario, being NG for Natural Gas and DI for Diesel;
- YY: the location of the scenario, being AG the Aboveground Installation and PP the Power Plant (including the storage area);
- nn consecutive number to identify the scenario; and,
- A/B… to indicate that the scenario is repeated in identical equipment.

A complete list of the considered scenarios and their conditions is shown in Table 10.

Table 10 Scenario conditions

Scn. ID	Description	Substance	Pipe diameter (mm)	Pipe length (m)	Vessel / Tank diameter (m)	Height / Length (m)	Temperature (°C)	Pressure (barg)
NG-AG-01	Rupture of the natural gas pipeline	Natural gas	750	250 (1)	--	--	Ambient	
NG-AG-02	Leak in the natural gas pipeline	Natural gas	750	250 (1)	--	--	Ambient	
NG-AG-03	Rupture of the natural gas pipeline	Natural gas	250	100 (1)	--	--	Ambient	
NG-AG-04	Leak in the natural gas pipeline	Natural gas	250	100 (1)	--	--	Ambient	
NG-PP-01	Rupture of the natural gas pipeline	Natural gas	250	872	--	--	Ambient	45
NG-PP-02	Leak in the natural gas pipeline	Natural gas	250	872	--	--	Ambient	45
DI-PP-01A/B/C	Instantaneous release of the content of tanks A/B	Diesel	--	--	18	21	Ambient	Atmospheric
DI-PP-02A/B/C	Failure over 10 minutes of tanks A/B	Diesel	--	--	18	21	Ambient	Atmospheric
DI-PP-03A/B/C	10 mm pipe leak over 30 minutes from tanks A/B	Diesel	--	--	18	21	Ambient	Atmospheric
DI-PP-04A/B/C	Overtop fire on tanks A/B	Diesel	--	--	18	21	Ambient	Atmospheric
DI-PP-05A/B	Instantaneous release of the content of day tanks A/B/C	Diesel	--	--	13	15.5	Ambient	Atmospheric
DI-PP-06A/B	Failure over 10 minutes of day tanks A/B/C	Diesel	--	--	13	15.5	Ambient	Atmospheric
DI-PP-07A/B	10 mm pipe leak over 30 minutes from day tanks A/B/C	Diesel	--	--	13	15.5	Ambient	Atmospheric
DI-PP-08A/B	Overtop fire on day tanks A/B/C	Diesel	--	--	13	15.5	Ambient	Atmospheric
DI-PP-09	Pipeline rupture	Diesel	50	365	--	350	Ambient	10
DI-PP-10	Pipeline leak of 0.1D (max 50 mm)	Diesel	50	365	--	350	Ambient	10

(1) To account for possible pipe features such as bends or changes in direction, and to be more conservative (since the frequency is per meter) this estimated length has been multiplied by a factor of 2 in the final calculations.

5 Frequency Analysis

5.1 Piping and Equipment Release Frequencies

The frequency of releases from equipment used are those from the guide [2].

Table 11 shows the summary of piping and equipment scenarios and their frequencies and sources.

Table 11 Release frequencies used for piping and equipment

Substance	Scenario	Frequency	Source
Natural gas	Pipeline rupture	1E-07 ($m^{-1} \cdot yr^{-1}$)	Table 40 of the guide [2]
	Pipeline leak of 0.1D (max 50 mm)	5E-07 ($m^{-1} \cdot yr^{-1}$)	Table 40 of the guide [2]
Diesel	Instantaneous failure of the tank	5E-06 (yr^{-1})	Table 48 of the guide [2]
	Release of the content in 10 minutes	5E-06 (yr^{-1})	Table 48 of the guide [2]
	10mm pipe leak over 30 minutes	1E-04 (yr^{-1})	Table 48 of the guide [2]
	Pipeline rupture	1E-06 ($m^{-1} \cdot yr^{-1}$)	Table 40 of the guide [2]
	Pipeline leak of 0.1D (max 50 mm)	5E-06 ($m^{-1} \cdot yr^{-1}$)	Table 40 of the guide [2]

5.2 Specific Scenario

The specific scenario's frequency has been estimated using the BEVI [3] values for failures of process vessels. The explosion has been assimilated to the instantaneous release of the entire contents of the vessel.

Table 12 Frequencies for explosion in the steam drum

Substance	Scenario	Frequency	Source
Water	Explosion in the steam vessel due to a failure of the containment system	5E-06 (yr^{-1})	Table 31 of the BEVI [3]

5.3 Release Outcome Frequency

A given release of flammable material may ultimately result in a variety of outcomes, depending on a number of factors, including whether automatic isolation is successful, whether ignition of the release occurs immediately or whether it is delayed.

For diesel releases, the only possible consequence is the formation of a pool (i.e. if ignition takes place, it results in a pool fire).

For releases of natural gas, the possible outcomes are jet fire, flash fire or explosion, as presented in Section 1.5 and in Figure 3.

The probability of successful leak detection and automatic isolation of the pipe has been taken as 0.99, with a detection time of 30s.

6 Ignition

Ignition probabilities to be used, according to the guide [2] are shown in Table 13.

Table 13 Ignition Probability

Substance	Immediate Ignition Probability	Delayed Ignition Probability	Source
Natural gas	0.09	0.91	Table 20 of the guide [2]
Diesel	0.01	0	

7 Consequence Modelling

7.1 Modelling Software

The Shannon Power Plant QRA has used the suite of models incorporated into the DNV SAFETI software (version 8.9). SAFETI is a comprehensive hazard and risk analysis software tool for all stages of design and operation.

SAFETI evaluates the progress of a potential incident from the initial release to far-field dispersion including modelling of pool spreading and evaporation, and flammable and toxic effects.

SAFETI contains models tailored for hazard analysis of offshore and onshore industrial installations. These include:

- Discharge and dispersion models, including a Unified Dispersion Model (UDM).
- Flammable models, including resulting radiation effects, for jet fires, pool fires and boiling liquid expanding vapour explosions (BLEVEs).
- Explosion models, to calculate overpressure and impulse effects.

7.2 Fluid Composition

As discussed in Section 1.5.1, releases from the natural gas pipeline are modelled as methane releases. Diesel releases are modelled as dodecane releases.

7.3 Operating Conditions

Operating conditions for each release scenario are provided in Section 4.

7.4 Effect of Bunding

Releases of diesel are assumed to be confined within the dimensions of the bunded area containing the tanks, estimated at 3,900 m^2.

For the scenario of overtop fire, the pool is confined on the top of the tank, so the pool area is the area of each tank: 254 m^2 for the two 5,000 m^3 fuel oil storage tanks (A and B) and 133 m^2 for the three 2,000 m^3 fuel oil storage day tanks (A, B and C).

7.5 Effect of Topography

At the proposed location, when moving south from the riverbank, the terrain elevates to an approximate height of 30 metres before gradually descending. The Shannon facility will be constructed on ‘plateaux’ carved into the hillside descending toward the river.

It has been assumed that topography has minimal effect on dispersion of natural gas.

7.6 Releases onto Land and Water

The only liquid release evaluated in this QRA is a release of diesel from the diesel tanks. The diesel tanks are in a triple containment system, with 2 bunded areas. This contains the diesel within the bunds and prevents the diesel from spreading onto the water.

7.7 Dispersion Modelling

Dispersion of methane is dependent on several parameters, including: surface roughness, averaging time, material properties, wind speed and weather conditions. The weather data used in the study are discussed in Section 7.10.

Diesel releases will be contained within the bund around the tanks, with minmal gas flashing off.

7.8 Surface Roughness Parameter

Surface (terrain) roughness affects how quickly and how far a release may spread. The guide [2] gives the roughness lengths in Figure 9 for typical types of terrain. As recommended in [2] for general terrain without defining features, a surface roughness parameter of 0.1 has been used in this study for dispersion as recommended in the guide [2].

#	Short description of the terrain	Roughness length (m)
1	Open water (at least 5 km)	0.0002
2	Mud flats, snow; no vegetation, no obstacles	0.005
3	Open, flat terrain; grass, a few isolated objects	0.03
4	Low vegetation; large obstacles here and there, x/h > 20	0.10
5	High vegetation; distributed large obstacles, 15 < x/h < 20	0.25
6	Park, bushes; many obstacles, x/h < 15	0.5
7	Strewn with large obstacles (suburb, wood)	1.0
8	Town centre with high-rise and low-rise buildings	3.0

Figure 9 Roughness lengths for given types of terrain

7.9 Averaging Time

When using gas dispersion models the ‘averaging time’ is a description of the time over which a gas concentration is averaged. At a particular point in space the concentration of a plume at equilibrium will vary for two reasons. Firstly, as the wind direction is not perfectly constant the plume will meander about a mean value. Secondly there are ‘in-cloud’ fluctuations due to the turbulence inherent in the atmosphere. As dispersion models aim to show a ‘time averaged’ concentration at a particular point, this average will depend on the length of time over which the concentration was ‘sampled’. The situation is made more complicated because the different types of dispersion model assume different definitions of ‘averaging time’.

The use of a short averaging time will maximise the recorded concentration at a given point, whereas a longer averaging time will give a lower value. This is because the use of a short averaging time captures the concentration ‘peaks’ at a location.

In this study an averaging time of 18.75 s has been used (this is the SAFETI default value for flammable gases).

7.10 Weather Data

Within a risk assessment, weather conditions are usually described as a combination of a letter with a number, such as ‘F2’. The letter denotes the Pasquill stability class and the number gives the wind speed in metres per second.

The Pasquill stability classes describe the amount of turbulence present in the atmosphere and range from A to F. Stability class A corresponds to ‘unstable’ weather, with a high degree of atmospheric turbulence, as would be found on a bright sunny day. Stability class D describes ‘neutral’ conditions, corresponding to an overcast sky with moderate wind. A clear night with little wind would be considered to represent ‘stable’ conditions, denoted by stability class F.

Wind speeds range from light (1-2 m/s) through moderate (around 5 m/s) to strong (10 m/s or more). The probability of the wind blowing from a particular direction is commonly displayed graphically as a ‘wind rose’.

According to the guide [2], dispersion should be modelled in D5 and F2 conditions, with a temperature of 15ºC used in D5 conditions and 10ºC for F2 conditions.

However, the wind directionality distribution is not given in the guide [2]. Therefore, nearest weather data is used to derive the directionality distribution probabilities. Shannon Airport is the nearest weather station, located 35 km away from the site, near Ballylongford, and is therefore the most representative data source to be used in the QRA.

A detailed analysis of the weather data during day and night has been performed for this study.

The fraction of time considered to be ‘day’ was calculated by assigning day and night hours to different months of the year, then calculating the number of daytime hours. Note that ‘day’ and ‘night’ were defined according to hypothetical resident behaviour (i.e. on when people may typically get up and go to bed, and not sunrise and sunset). Within the weather calculation, this has been defined as a 14 hour period during summer (defined as the period from April to the end of October, when daylight saving time operates) from 07:00 GMT (06:00 DST) until 21:00 GMT (20:00 DST); and a 12 hour period during winter (all months not defined as summer) from 06:00 GMT to 18:00 GMT.

The data were then processed to obtain wind direction probabilities (i.e. ‘wind rose’ data) and the proportion of time for which D5 and F2 weather conditions occurred. As part of this analysis combinations of stability and wind speed that are not F2 or D5 are grouped together and included in the F2 and D5 distribution. i.e. Stability Classes A, B, C and D are grouped together as D5, Stability classes E, F and G are grouped together as F2.

The guide [2] established that D5 conditions are assumed to occur 80% of the time and F2 conditions occurring for the remaining 20%. In the QRA this relation is maintained.

The results are shown in Table 14 and Table 15.

Table 14 Wind Rose for Day

Stability Class	Wind Sector															
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	WSW	WNW	NW	NNW
D5	0.037859	0.03706	0.02175	0.04749	0.11664	0.11708	0.06808	0.09121	0.19493	0.11961	0.06769	0.05836	0.03786	0.03706	0.02175	0.04749
F2	0.000843	0.00142	0.00062	0.00053	0.00155	0.00160	0.00089	0.00102	0.00355	0.00453	0.00311	0.00257	0.00084	0.00142	0.00062	0.00053

Table 15 Wind Rose for Night

Stability Class	Wind Sector															
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	WSW	WNW	NW	NNW
D5	0.01189	0.02006	0.01574	0.03758	0.08888	0.10377	0.05797	0.06342	0.11833	0.06567	0.02781	0.02335	0.01189	0.02006	0.01574	0.03758
F2	0.02598	0.02509	0.01682	0.01978	0.03782	0.02659	0.02034	0.02335	0.04148	0.04186	0.04214	0.04434	0.02598	0.02509	0.01682	0.01978

8 Populations

Onsite personnel and off site population numbers used in the assessment are described below.

8.1 Offsite Populations

In the event of a major accident, the likelihood of harm to a person indoors differs from that for a person outdoors (see section 3.4). Therefore, it is common practice for QRA studies to consider the proportion of time individuals may spend indoors and outdoors.

To account for time spent indoors and outdoors, the previous QRA study [7] employed the concept of a 'hypothetical house resident' originally developed by the UK HSE [8]. The hypothetical house resident is present all of the time at their dwelling, spending 90% of their time indoors during the day and 99% of their time indoors at night.

In accordance with the guide [2], it is assumed that people are indoors 90% of the time. While this value is considered very conservative, it has been utilized as indicated in the guide. However, an exception is the population in the Money Point Power Station, as this is an industrial site and therefore a higher proportion of time spent outdoors (i.e. more exposed to risk) is assumed. In this case, the estimation from the previous QRA is applied.

The offsite populations used are sourced from various references. Data in **bold** is acquired from reports from The Central statistics Office [10] and correspond with data from the 2022 census. Data for individual residences and the Money Point Power Station are taken from the QRA for the site undertaken in 2013 [9].

Table 16 Offsite Populations

Area / Location	No. People	Fraction indoor Day	Fraction Indoor Night
Individual residences within 2 km	4 per residence	0.9	0.9
Ballylongford	**415**	0.9	0.9
Tarbert	**546**	0.9	0.9
Kilrush	**2649**	0.9	0.9
Money Point Power Station	313	0.5	0.7

8.2 Onsite Personnel

The objective of the methodology described in the guidelines [2] relates to TLUP advice, wich is external to the establishment and is future oriented: the assessment methods presented are not sufficiently detailed to address risk to on-site populations and should not be used for that purpose.

9 Risk Criteria

9.1 Individual Risk

The current HSA criteria [2] are stated in terms of risk of fatality. Use of probit equations is prescribed for calculation of the probability of fatality given exposure to a dose of a harmful agent (such as thermal radiation, overpressure or toxic gas).

The land use planning zone boundaries in the HSA guidance [2] are presented in Figure 4 (see Section 3.1) and defined as:

- Zone 1 (inner): within the 1E-05/y individual risk of fatality contour;
- Zone 2 (middle): between the 1E-05/y and 1E-06/y individual risk of fatality contours; and,
- Zone 3 (outer): between the 1E-06/y and 1E-07/y individual risk of fatality contours.

The criteria for new establishments found in the HSA guidance [2] are:

- The maximum trolerable risk to a member of the public should not exceed 1E-06/y; and,
- The maximum tolerable risk to a person at an off-site work location should not exceed 5E-06/y.

Land uses are assigned to one of four 'Sensitivity Levels' as summarised in Appendix A.

9.2 Expectation Value (EV)

The EV is the calculated number of fatalities per year, multiplying the number of expected fatalities by the frequency in chance in a million years (cpm). For example, a major accident that could result in 120 fatalities with a frequency of occurrence of 1 cpm would have an EV of:

$$EV = 120 * 1 = 120 \qquad (3)$$

According to the HSA guidance, the total off-site EV should not exceed the criterion upper limit of 10.000. Between EVs of 100 and 10,000, it should be demonstrated that all practicable efforts have been made to reduce the risk to a level that is as low as reasonably practicable. Above a developmental EV level of 450, an FN curve will be required as part of the demonstration. Where the EV exceeds 10,000, the TLUP advice to the planning authority will always be 'Advice against'.

9.3 Societal Risk – FN Curve

When the risk of multiple fatalities from an accident should be taken into account more explicitly, the societal risk must be determined. Societal risk results are commonly presented as an 'FN' curve, which shows the cumulative frequency with which N or more fatalities are experienced.

HSE2001 [11] provides an upper limit value for an intolerable societal risk criterion: for a predicted accident occurring no more frequently than once in 5,000 years, there should be no more than 50 fatalities. This has gained international acceptance as an anchor point for a line (of slope -1) to create an intolerable societal risk criterion for single accidents. The HSA document [5] recommended using points at (200 cpm / 50 fatalities) and (1,000 cpm/10 fatalities) to create that line. An acceptable societal risk single risk criterion line can then be drawn at frequencies that are two orders of magnitude below the intolerable line (so a frequency of 1E-04 on the intolerable line becomes 1E-06 on the acceptable line). The risk criterion lines are shown in Figure 10.

Between the two lines, operators and potential operators will be required to demonstrate that, in relation to proposed changes, all reasonable efforts have been made to reduce the risk to a level that is as low as reasonably practicable.

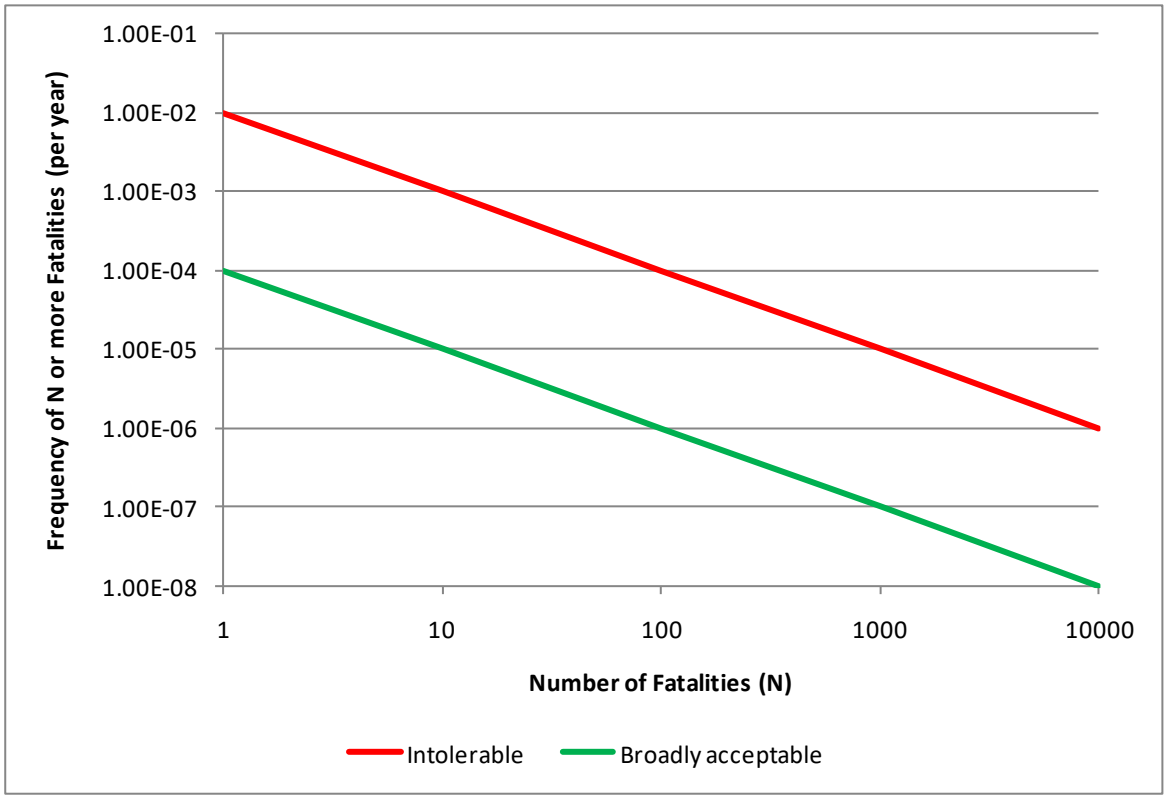

Figure 10 HSA Upper and lower societal risk criterion (log scale)

10 Risk Calculation Results

Individual risk of fatality and societal risk have been calculated using the DNV Safeti software (version 8.9).

10.1 Individual Risk

The individual risk contours for people outdoors in the area are presented in Figure 11 and Figure 12, contours for people indoors are presented in Figure 13 and Figure 14.

Figure 11 Outdoors Individual Risk Contours

Figure 12 Outdoors Individual Risk Contours with plot plant

Figure 13 Indoors Individual Risk Contours

Figure 14 Indoors Individual Risk Contours with plot plant

In both cases, indoors and outdoors, the risk curve corresponding to 1E-07/y slightly extends beyond the site limits, not affecting any installation or vulnerable element.

10.2 Expectation Value and Societal Risk

To determine the expectation value (EV) and societal risk, the population potentially affected by the risk from the plant has to be evaluated. For this purpose, the risk curve corresponding to 1E-09/y has been selected which serves as a conservative measure to define the affected population. It's worth noting that the guide [2]

does not impose any limitations beyond 1E-07/y. Figure 15 shows the 1E-09/y curve overlaid over a map with residential properties identified in purple.

Figure 15 Affected population

From Figure 15 it can be seen that there is no population that is within the 10-9/y per year risk level. Therefore the EV is 0, and hence an FN curve is not required.

11 Conclusions

A comprehensive quantitative risk assessment (QRA) of the proposed STEP has been performed. The analysis has been conducted in accordance with the current HSA guidance [2] and it does not constitute a full QRA of the risks to onsite personnel. It is intended for land use and permitting purposes only.

The following results have been obtained:

- Individual risk of fatality contours;
- The individual risk at the nearest residential property;
- Societal risk FN curves; and,
- Societal risk Expectation Values (EVs).

The results for the STEP project presented above have been compared with the HSA's risk criteria presented in Section 9.1.

The conclusions drawn from the results are as follows:

- Comparing the QRA results against land use planning criteria shows there are no incompatible land uses in any of the three LUP zones;
- The individual risk at the nearest residential property is negligible;
- The Expectation Value for members of the public is 0, as no lethality is expected in the populated areas near to the site. And hence no societal risk FN curve is required.

12 References

[1] Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC, Official Journal of the European Union, 24 July 2012.

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[3] RIVM (2009). Reference Manual BEVI Risk Assessments. Version 3.2.

[4] Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015. SI No. 209 of 2015.

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[6] Hazardous Chemicals Data Book, Second Edition1986. G. Weiss

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[9] Land -Use Planning QRA of Alterations to Shannon LNG Terminal and addition of a CHP Plant. Scandpower Risk Management. Lloyd's Register. Report No 50102216 R01 Rev 03. 6/3/2013.

[10] An Phiromh Staidrimh; Census - CSO - Central Statistics Office

[11] Reducing risks, protecting people: HSE's decision-making process, HSE Books, 2001.

Appendix A. Description of Development Types According to the Guide [2]

In the guidance [2], four levels of development are defined as presented in Figure 16:

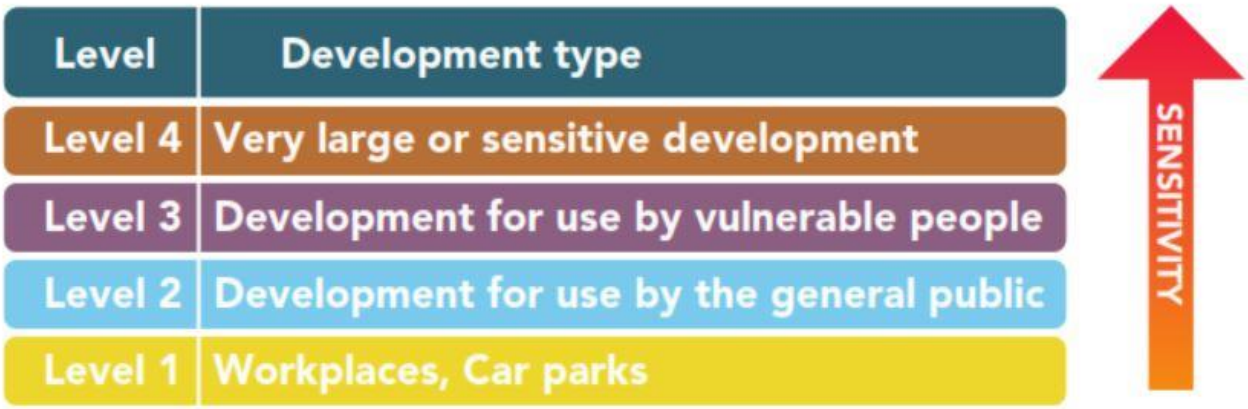


Figure 16 Levels of development according to the guide [2]

The more detailed description of these development levels is presented in the Appendix 2 of the guide [2] and shown next.

SENSITIVITY LEVEL 1: People at work, Car Parks

Level 1

DT1.1 – Workplaces

DT1.2 – Parking areas

DEVELOPMENT TYPE	EXAMPLES	DEVELOPMENT DETAIL AND SIZE	JUSTIFICATION
WORKPLACES (DT 1.1)	Offices, factories, warehouses, haulage depots, farm buildings, non-retail markets, builder's yards.	Workplaces (predominantly non-retail), providing for fewer than 100 occupants in each building **and** fewer than three occupied storeys – **Level 1**	Places where the occupants will be fit and healthy, and could be organised easily for emergency action. Members of the public will not be present or will be present in very small numbers and for a short time.
	EXCLUSIONS		
		Workplaces (predominantly non-retail) providing for 100 or more occupants in any building **or** 3 or more occupied storeys in height **(DT 1.1.1)** **Level 2** (except where the development is at the major hazard site itself, where it remains Level 1).	Substantial increase in numbers at risk with no direct benefit from exposure to the risk.
	Rehabilitation and training services for people with disabilities.	Workplaces (predominantly non-retail) specifically for people with disabilities – **(DT 1.1.2)** **Level 3**	Those at risk may be especially vulnerable to injury from hazardous events and/or they may not be able to be organised easily for emergency action.
PARKING AREAS	Car parks, truck parks, lock-up garages.	Parking areas with no other associated facilities (other than toilets) – **Level 1**	
	EXCLUSIONS		
	Car parks with picnic areas, or at a retail or leisure development, or serving a park and ride facility.	Where parking areas are associated with other facilities and developments the sensitivity level and the decision will be based on the facility or development. **(DT 1.2.1)**	

Appendix 2

Development sensitivity levels

SENSITIVITY LEVEL 2: Developments for use by the general public

Level 2

DT2.1 – Housing

DT2.2 – Hotel/Hostel/Holiday accommodation

DT2.3 – Transport links

DT2.4 – Indoor use by public

DT2.5 – Outdoor use by public

DEVELOPMENT TYPE	EXAMPLES	DEVELOPMENT DETAIL AND SIZE	JUSTIFICATION
HOUSING (DT 2.1)	Houses, apartments, retirement flats/ bungalows, residential caravans, mobile homes.	Developments up to and including 30 dwelling units **and** at a density of no more than 40 per hectare – **Level 2.**	Development where people live or are temporarily resident. It may be difficult to organise people in the event of an emergency.
	EXCLUSIONS		
	Infill, backland development (development of land at rear of existing property).	Developments of one or two dwelling units **(DT 2.1.1)** – **Level 1**	Minimal increase in numbers at risk.
	Larger housing developments	Larger developments for more than 30 dwelling units **(DT 2.1.2)** – **Level 3**	Substantial increase in numbers at risk
	Developments at high density.	Any developments (for more than two dwelling units) at a density of more than 40 dwelling units per hectare – **(DT 2.1.3)** **Level 3**	High-density developments.
HOTEL/HOSTEL/ HOLIDAY ACCOMMODATION (DT 2.2)	Hotels, motels, guesthouses, hostels, youth hostels, holiday camps, holiday homes, student accommodation, accommodation centres, holiday caravan sites, camping sites.	Accommodation of up to 100 beds or 33 caravan/tent pitches – **Level 2.**	Development where people are temporarily resident. It may be difficult to organise people in the event of an emergency.

SENSITIVITY LEVEL 2: Developments for use by the general public *Continued*

Level 2

DEVELOPMENT TYPE	EXAMPLES	DEVELOPMENT DETAIL AND SIZE	JUSTIFICATION
		EXCLUSIONS	
HOTEL/HOSTEL/ HOLIDAY ACCOMMODATION **(DT 2.2)**	Smaller guesthouses, hostels, youth hostels, holiday homes, student accommodation, holiday caravan sites, camping sites.	Accommodation of fewer than 10 beds or three caravan/tent pitches – **Level 1**	Minimal increase in numbers at risk.
	Larger hotels, motels, hostels, youth hostels, holiday camps, holiday homes, halls of residence, dormitories, holiday caravan sites, camping sites.	Accommodation of more than 100 beds or 33 caravan/tent pitches – **(DT 2.2.2)** **Level 3**	Substantial increase in numbers at risk.
TRANSPORT LINKS **(DT 2.3)**	Motorway, dual carriageway.	Major transport links in their own right, i.e. not as an integral part of other developments – **Level 2.**	Prime purpose is as a transport link. Potentially large numbers exposed to risk, but exposure of an individual is only for a short period.
		EXCLUSIONS	
	Estate roads, access roads.	Single-carriageway roads – **(DT 2.3.1)** **Level 1**	Minimal numbers present and exposed to risk for a short time period (predominantly). Associated with other development.
	Any rail or tram track.	Railways – **(DT 2.3 × 2)** **Level 1**	Transient population, exposed to risk for short time periods. Times with no population present.

Appendix 2

Development sensitivity levels

SENSITIVITY LEVEL 2: Developments for use by the general public *Continued*

Level 2

DEVELOPMENT TYPE	EXAMPLES	DEVELOPMENT DETAIL AND SIZE	JUSTIFICATION
INDOOR USE BY PUBLIC **(DT 2.4)**	**Food and drink:** Restaurants, cafés, drive-through fast food, pubs. **Retail:** Shops; petrol filling stations (total floor space based on shop area, not forecourt); vehicle dealers (total floor space based on showroom/sales building not outside display areas); retail warehouses; super-stores; small shopping centres; markets; financial and professional services to the public. **Community and adult education:** Libraries, art galleries, museums, exhibition halls, day surgeries, health centres, religious buildings, community centres. Adult education, second-level education colleges, colleges of further education. **Assembly and leisure:** Coach/bus/railway stations, ferry terminals, airports. Cinemas, concert/bingo/dance halls. Conference centres. Sports/ leisure centres, sports halls. Facilities associated with golf courses, flying clubs (e.g. changing rooms, club house), indoor go-kart tracks.	Developments for use by the general public where total floor space is from 250m² up to 5000m² - **Level 2.**	Developments where members of the public will be present (but not resident). Emergency action may be difficult to coordinate.
	EXCLUSIONS		
		Development with less than 250 m² total floor space – **(DT 2.4.1)** **Level 1**	Minimal increase in numbers at risk.

SENSITIVITY LEVEL 2: Developments for use by the general public *Continued*

Level 2

DEVELOPMENT TYPE	EXAMPLES	DEVELOPMENT DETAIL AND SIZE	JUSTIFICATION
INDOOR USE BY PUBLIC **(DT 2.4)**		Development with more than 5000 m² total floor space – (DT 2.4.2) **Level 3**	Substantial increase in numbers at risk.
OUTDOOR USE BY PUBLIC **(DT 2.5)**	**Food and drink:** Food festivals, picnic area. **Retail:** Outdoor markets, car boot sales, funfairs. **Community and adult education:** Open-air theatres and exhibitions. **Assembly and leisure:** Coach/bus/railway stations, park and ride facilities, ferry terminals. Sports stadia, sports fields/pitches, funfairs, theme parks, viewing stands. Marinas, playing fields, children's play areas, BMX/go-kart tracks. Country parks, nature reserves, picnic sites, marquees.	Principally an outdoor development for use by the general public, i.e. developments where people will predominantly be outdoors and not more than 100 people will gather at the facility at any one time – **Level 2.**	Developments where members of the public will be present (but not resident) either indoors or outdoors. Emergency action may be difficult to coordinate.
	EXCLUSIONS		
	Outdoor markets, car boot sales, funfairs. Picnic area, park and ride facilities, viewing stands, marquees.	Predominantly open-air developments likely to attract the general public in numbers greater than 100 people, but up to 1,000 people at any one time – **(DT 2.5.1)** **Level 3**	Substantial increase in numbers at risk and more vulnerable due to being outside.
	Theme parks, funfairs, large sports stadia and events, open-air markets, outdoor concerts, pop festivals.	Predominantly open-air developments likely to attract the general public in numbers greater than 1,000 people at any one time – **(DT 2.5.2)** **Level 4**	Very substantial increase in numbers at risk, more vulnerable due to being outside and emergency action may be difficult to coordinate.

Appendix 2

Development sensitivity levels

SENSITIVITY LEVEL 3: Developments for use by vulnerable people

Level 3

DT3.1 – Institutional accommodation and education

DT3.2 – Prisons

DEVELOPMENT TYPE	EXAMPLES	DEVELOPMENT DETAIL AND SIZE	JUSTIFICATION
INSTITUTIONAL ACCOMMODATION AND EDUCATION **(DT3.1)**	Hospitals, convalescent homes, nursing homes. Housing for elderly with warden on-site or 'on call', sheltered housing. Nurseries, crèches. Schools and academies for children up to school-leaving age.	Institutional, educational and special accommodation for vulnerable people, or that provides a protective environment – **Level 3.**	Places providing an element of care or protection. Due to age, infirmity or state of health, the occupants may be especially vulnerable to injury from hazardous events. Emergency action and evacuation may be very difficult.
	EXCLUSIONS		
	Hospitals, convalescent homes, nursing homes, sheltered housing.	24-hour care where the site on the planning application being developed is greater than 0.25 hectare **(DT3.1.1)** **Level 4**	Substantial increase in numbers of vulnerable people at risk.
	Schools, nurseries, crèches.	Day care where the site on the planning application being developed is greater than 1.4 hectares **(DT3.1.2)** – **Level 4**	Substantial increase in numbers of vulnerable people at risk.
Places of detention **(DT3.2)**	Prisons, detention facilities, remand centres.	Secure accommodation for those sentenced by court, or awaiting trial, etc. – **Level 3.**	Places providing detention. Emergency action and evacuation may be very difficult.

SENSITIVITY LEVEL 4: Very large and sensitive developments

Level 4

DT4.1 - Institutional accommodation

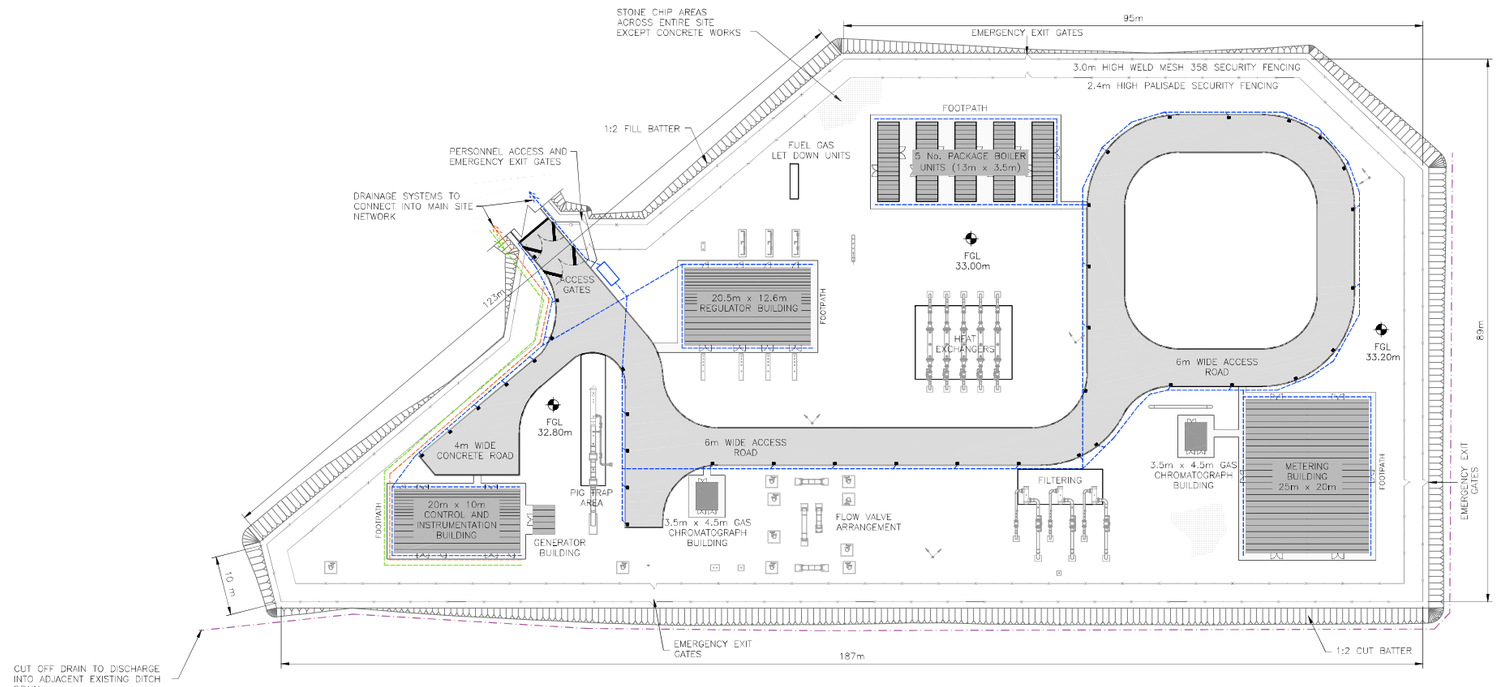
DT4.2 - very large outdoor use by public

DEVELOPMENT TYPE	EXAMPLES	DEVELOPMENT DETAIL AND SIZE	JUSTIFICATION
		EXCLUSIONS	
INSTITUTIONAL ACCOMMODATION (DT4.1)	Hospitals, convalescent homes, nursing homes, sheltered housing.	Large developments of institutional and special accommodation for vulnerable people (or that provide a protective environment) where 24-hour care is provided. And where the site on the planning application being developed is greater than 0.25 hectare: **Level 4.**	Places providing an element of care or protection. Due to age or state of health, the occupants may be especially vulnerable to injury from hazardous events. Emergency action and evacuation may be very difficult. The risk to an individual may be small, but there is a larger societal concern.
	Nurseries, crèches. Schools for children up to school-leaving age.	Large developments of institutional and special accommodation for vulnerable people (or that provide a protective environment) where day care (not 24-hour care) is provided. And where the site on the planning application being developed is greater than 1.4 hectares: **Level 4.**	Places providing an element of care or protection. Due to their age, the occupants may be especially vulnerable to injury from hazardous events. Emergency action and evacuation may be very difficult. The risk to an individual may be small, but there is a larger societal concern.
VERY LARGE OUTDOOR USE BY PUBLIC (DT4.2)	Theme parks, large sports stadia and events, open-air markets, outdoor concerts, and pop festivals.	Predominantly open-air developments where there could be more than 1,000 people present **Level 4.**	People in the open air may be more exposed to toxic fumes and thermal radiation than if they were in buildings. Large numbers make emergency action and evacuation difficult. The risk to an individual may be small, but there is a larger societal concern.

Notes

1. Where a development straddles zones, the development will be considered to belong to the zone that gives rise to the greatest expectation value (EV) – a societal risk assessment may be necessary if there is significant expectation contribution from the other zone(s). For developments consisting of multiple development types, a societal risk evaluation will likely be necessary.

Appendix B. Above Ground Installation General Arrangement



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SITE LAYOUT
SCALE 1:500

NOTES

LEGEND

DENOTES U/G SURFACE WATER DRAIN

DENOTES OPEN CUT-OFF DRAIN

DENOTES U/G FOUL WATER DRAIN

DENOTES U/G POTABLE WATER MAIN

DENOTES U/G KLARGESTER SEPERATOR OR SIMILAR

DENOTES ROAD GULLY

TWO 200W LED LIGHTS ON A 8.5 METER ROUND GALVANIZED STEEL POLE WITH TOP TENON

ISSUE FOR PLANNING

Applicant

Shannon LNG Limited

REV.	DATE	REVISION	BY	CHKD.	APPR.
2	29/05/23	ISSUE FOR PLANNING	JD	VOH	BF
1	24/03/21	ISSUE FOR PLANNING	MAH	MC	BF
0	02/10/20	CONCEPTUAL ISSUE	MAH	MC	BF

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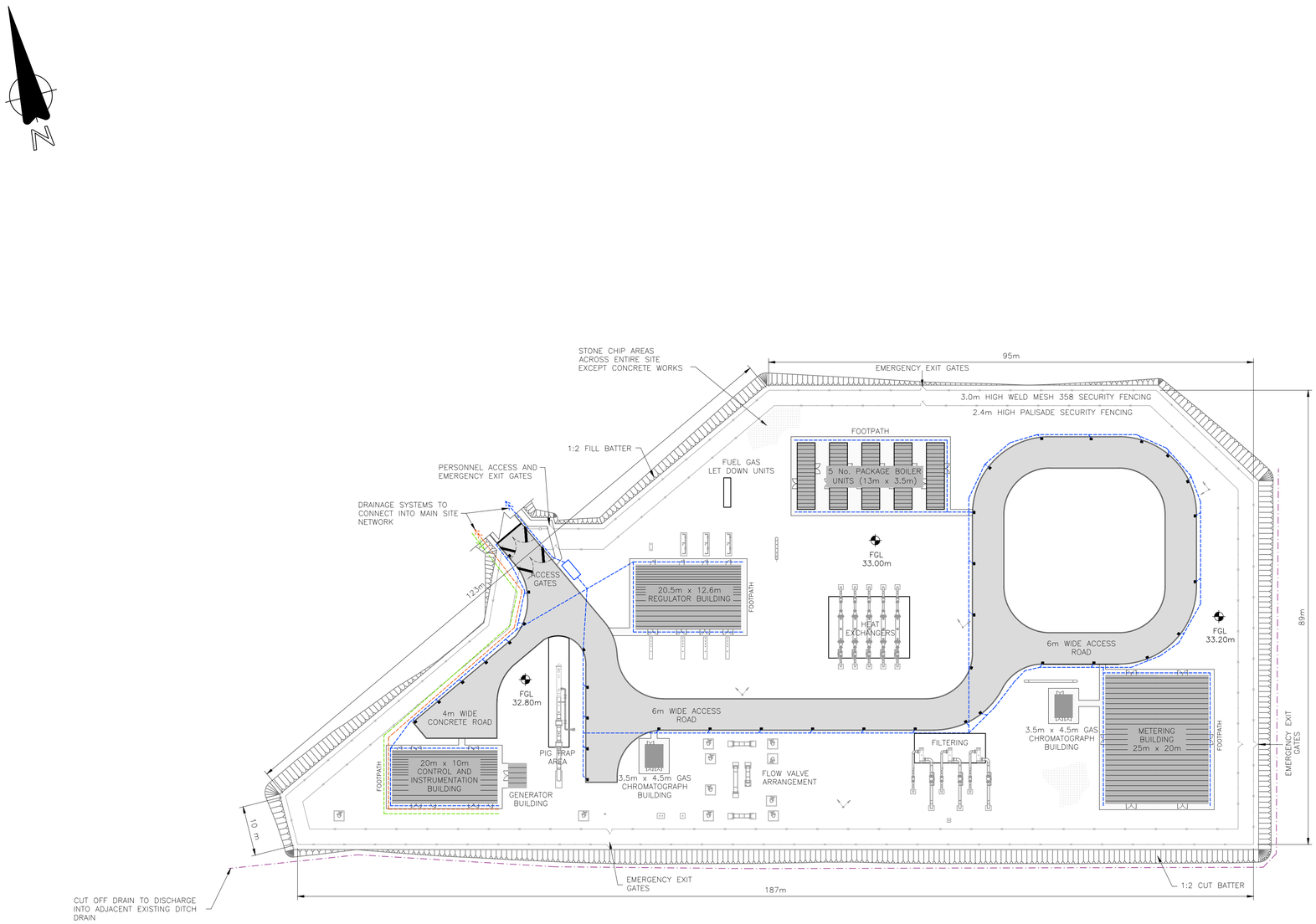
Project

SHANNON TECHNOLOGY AND ENERGY PARK (STEP)

Title

RALAPPANE AGI - SITE LAYOUT

Drawn	Scale	Drawing Number	Rev.
J.DELANEY	1:500/A1	1227-02-DG-0001	2
Chkd. V.O'HARA	Date 19/06/2023		
Apprd. B.FINGLETON	Status ISSUED		



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SITE LAYOUT
SCALE 1:500

NOTES

LEGEND

DENOTES U/G SURFACE WATER DRAIN

DENOTES OPEN CUT-OFF DRAIN

DENOTES U/G FOUL WATER DRAIN

DENOTES U/G POTABLE WATER MAIN

DENOTES U/G KLARGESTER SEPERATOR OR SIMILAR

DENOTES ROAD GULLY

TWO 200W LED LIGHTS ON A 8.5 METER ROUND GALVANIZED STEEL POLE WITH TOP TENON

ISSUE FOR PLANNING

Applicant

Shannon LNG Limited

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Project

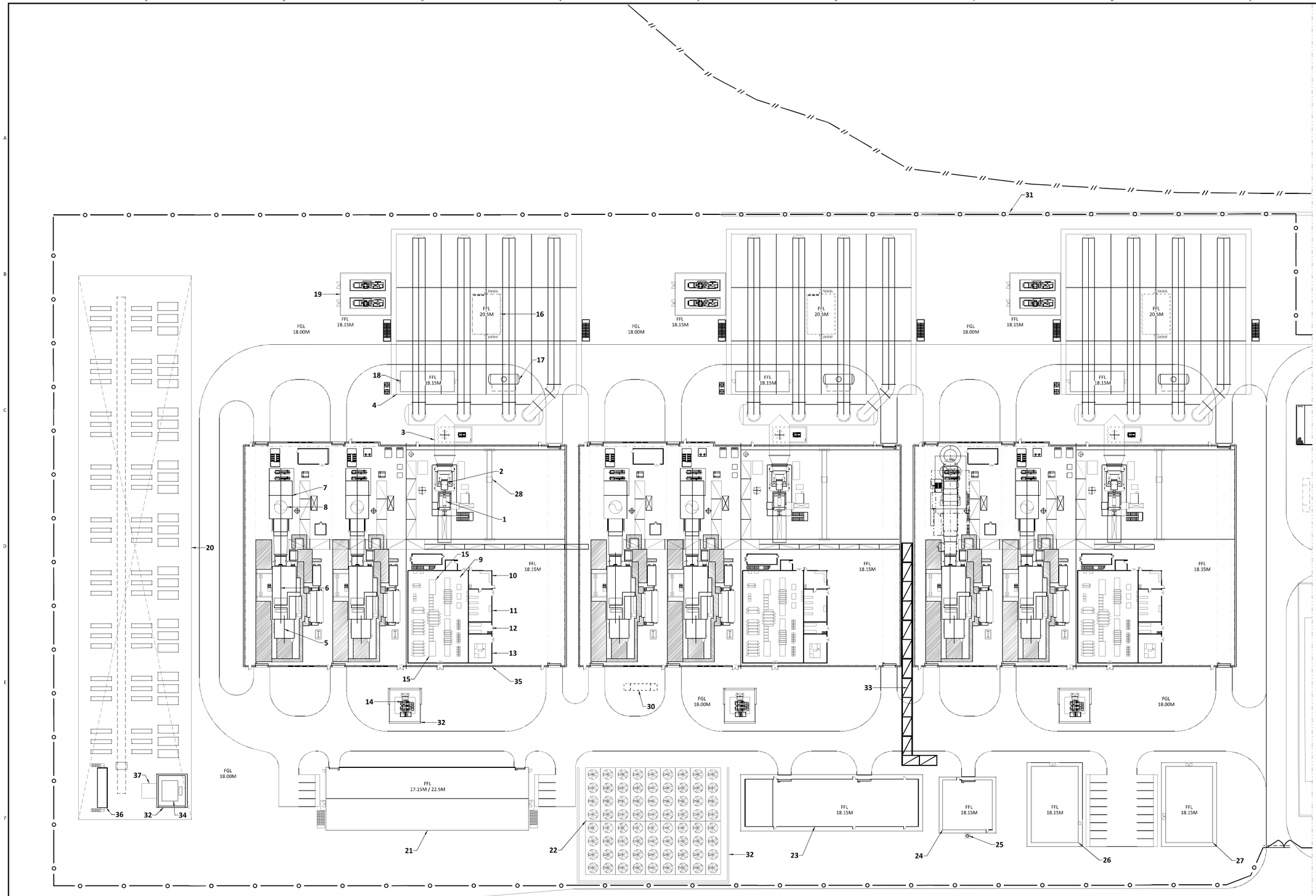
SHANNON TECHNOLOGY AND ENERGY PARK (STEP)

Title

RALAPPANE AGI - SITE LAYOUT

Drawn.	Scale	Drawing Number	Rev.
J.DELANEY	1:500/A1	1227-02-DG-0001	2
Chkd. V.O'HARA	Date 19/06/2023		
Apprd. B.FINGLETON	Status ISSUED		

Appendix C. Power Plant General Arrangement



ITEM NO.	EQUIPMENT IDENTICATION
1	STEAM TURBINE GENERATOR
2	STEAM TURBINE
3	STEAM TURBINE EXHAUST DUCT
4	AIR COOLED CONDENSER
5	COMBUSTION TURBINE GENERATOR
6	COMBUSTION TURBINE
7	HEAT RECOVERY STEAM GENERATOR
8	HRSG EXHAUST STACK
9	ELECTRICAL EQUIPMENT ROOM
10	AUXILIARY CONTROL ROOM
11	DCS ROOM
12	BATTERIES ROOM
13	STANDBY DIESEL GENERATOR ROOM
14	GENERATOR STEP-UP TRANSFORMER
15	AUXILIARY TRANSFORMER
16	ACC ELECTRICAL EQUIPMENT POWER DISTRIBUTION CENTER
17	CONDENSATE COLLECTION TANK
18	CONDENSATE POLISHING EQUIPMENT ENCLOSURE
19	ACC AIR EXTRACTION EQUIPMENT ENCLOSURE
20	BATTERY ENERGY STORAGE SYSTEM (BESS) EQUIPMENT AREA
21	ELECTRICAL (GIS) SUBSTATION BUILDING
22	AIR COOLED HEAT EXCHANGERS
23	WORKSHOP/STORES/CANTEEN
24	AUXILIARY BOILER BUILDING
25	AUXILIARY BOILER EXHAUST STACK
26	CENTRAL CONTROL/OPERATIONS BUILDING
27	ADMINISTRATION BUILDING
28	OVERHEAD CRANE
29	INDICATIVE ELECTRICAL GRID INTERFACE BUILDING
30	OIL/WATER SEPARATOR
31	RETAINING WALL
32	SOUND RETENTION WALL
33	UTILITY RACK
34	BESS STEP-UP TRANSFORMER
35	TURBINE HALL (TYP OF 3)
36	BESS POWER DISTRIBUTION CENTER
37	BESS AUXILIARY POWER TRANSFORMER

NOTES.

1. THE FINISHED SURFACE LEVEL (FSL) OR PLATFORM FOR THE POWER PLANT, IS +18M ABOVE ORDINANCE DATUM (AOD).
2. THE PROPOSED FINISHED GRADE LEVEL (FGL) ARE IDENTIFIED THRU OUT THE PERIMETER OF THE POWER BLOCK AREA.
3. THE PROPOSED FINISHED FLOOR LEVEL (FFL) ARE IDENTIFIED WITHIN THE BUILDING STRUCTURES.
4. SEE DRAWING 198291-1GSU-G1003 FOR SITE ARRANREMENT.

NOT TO BE USED FOR CONSTRUCTION

PLANT TRUE 31.6°

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SCALE IN MILLIMETERS

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1	18/JUN/2021	ISSUED FOR PLANNING	TMC	DJL		DAC	
0	30/APR/2021	ISSUED FOR PLANNING	TMC	DJL		DAC	

BLACK & VEATCH CORP HEADQUARTERS:
11401 LAMAR AVENUE, OVERLAND PARK,
KANSAS, USA

BLACK & VEATCH

DESIGNER	DRAWN DJL
CHECKED	DATE

SHANNON LNG LIMITED
SHANNON TECHNOLOGY AND ENERGY PARK (STEP)

GENERAL ARRANGEMENT
COMBINED CYCLE POWER PLANT
MAIN POWER BLOCK AREA

PROJECT	DRAWING NUMBER	REV
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AREA		

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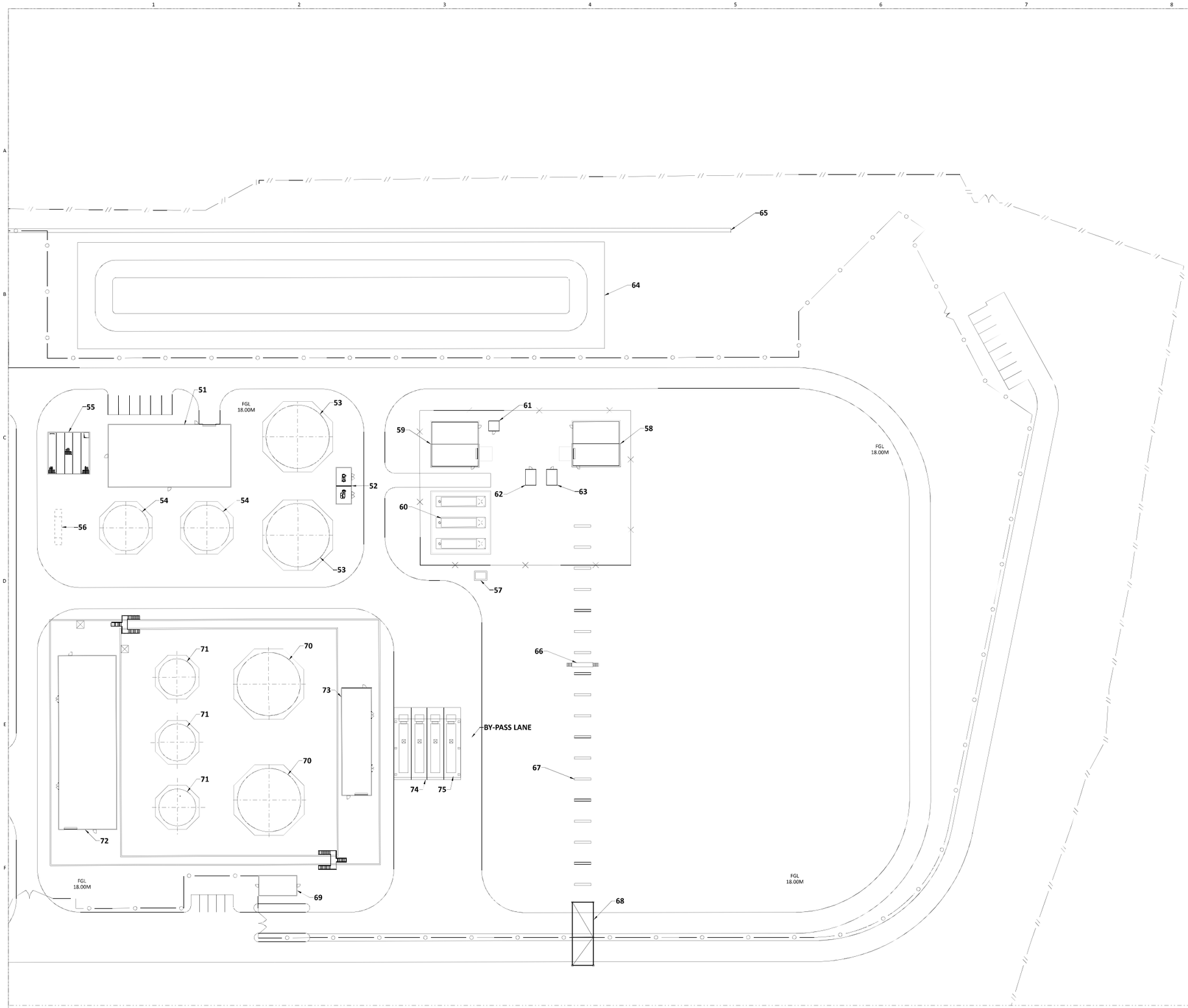

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51	WATER TREATMENT BUILDING
52	FIRE WATER PUMPS ENCLOSURE
53	RAW/SERVICE/FIRE WATER STORAGE TANK
54	DEMINERALIZED WATER STORAGE TANK (TYP OF 2)
55	EFFLUENT SUMP
56	OIL/WATER SEPARATOR
57	WASTEWATER TREATMENT EQUIPMENT PACKAGE
58	FUEL GAS METERING ENCLOSURE
59	FUEL GAS REGULATING ENCLOSURE
60	FUEL GAS HEATER - WATER BATH TYPE (TYP OF 3)
61	KIOSK ENCLOSURE - METERING AND REGULATING AREA
62	ANALYZER ENCLOSURE - METERING AND REGULATING AREA
63	INSTRUMENT ENCLOSURE - METERING AND REGULATING AREA
64	FIRE WATER RETENTION POND
65	RETAINING WALL
66	CROSSOVER PLATFORM
67	UTILITY SLEEPER
68	UTILITY RACK
69	SECURITY BUILDING
70	FUEL OIL STORAGE TANK (TYP OF 2)
71	FUEL OIL STORAGE DAY TANK (TYP OF 3)
72	FORWARDING PUMP BUILDING
73	CENTRIFUGE AND FUEL OIL UNLOADING PUMP BUILDING
74	FUEL OIL TRUCK UNLOADING AREA
75	FUEL OIL TRUCK UNLOADING SHELTER

NOTES.
1.THE FINISHED SURFACE LEVEL (FSL) OR PLATFORM FOR THE POWER PLANT, IS +18M ABOVE ORDINANCE DATUM (AOD).

NOT TO BE USED FOR CONSTRUCTION

PLANT TRUE 31.6°

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2	28/APR/2023	ISSUED FOR PLANNING	PSS	KAR		DAC	
1	18/JUN/2021	ISSUED FOR PLANNING	TMC	DJL		DAC	
0	30/APR/2021	ISSUED FOR PLANNING	TMC	DJL		DAC	

BLACK & WEATCH CORP HEADQUARTERS:
11401 LAMAR AVENUE, OVERLAND PARK,
KANSAS, USA

BLACK & VEATCH

SHANNON LNG LIMITED
SHANNON TECHNOLOGY AND ENERGY PARK (STEP)

GENERAL ARRANGEMENT
COMBINED CYCLE POWER PLANT
BALANCE OF PLANT AREA

DESIGNER	DRAWN	DJL
CHECKED	DATE	

PROJECT 198291-1GSU-G2002
DRAWING NUMBER
REV 3
CODE
AREA

Microstation v10.15.0.74
Rev. 1.4
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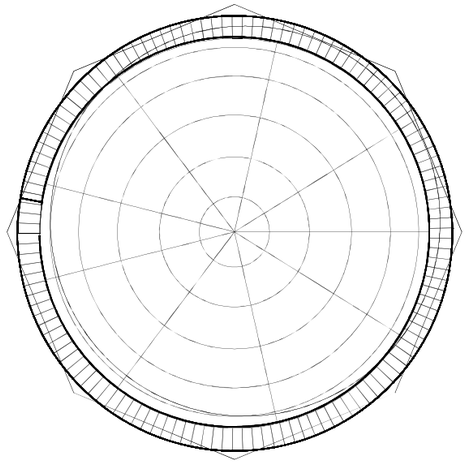
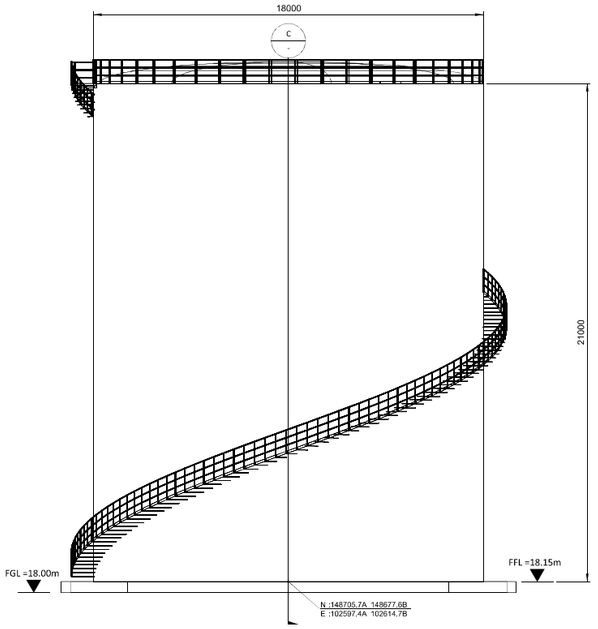
Appendix D. Tanks Layout

NOTES:

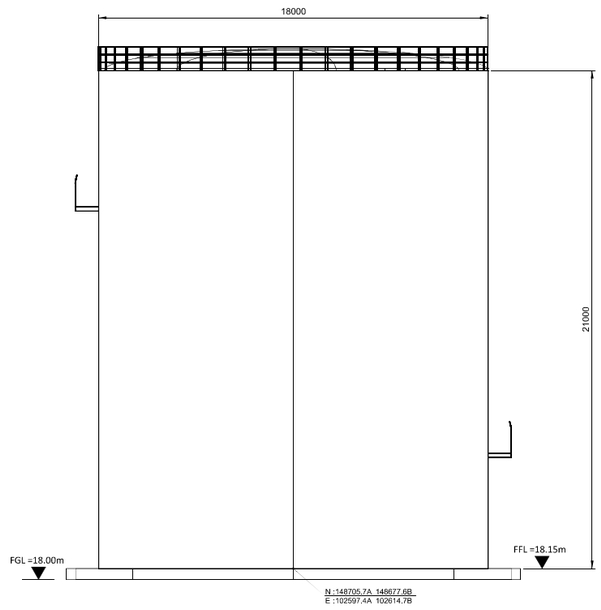
1. THE TANK IS FOR PLANNING PURPOSES ONLY AND NOT FOR CONSTRUCTION. EQUIPMENT LOCATIONS ARE INDICATIVE ONLY AND ARE SUBJECT TO CHANGE WITHIN BUILDING.
2. TANKS TO BE CONSTRUCTED FROM PAINTED CARBON STEEL. COLOUR GREY-OLIVE, RAL 6006.



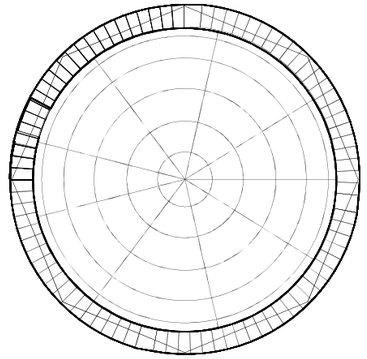
PLAN VIEW
FUEL OIL STORAGE
TANK A, B



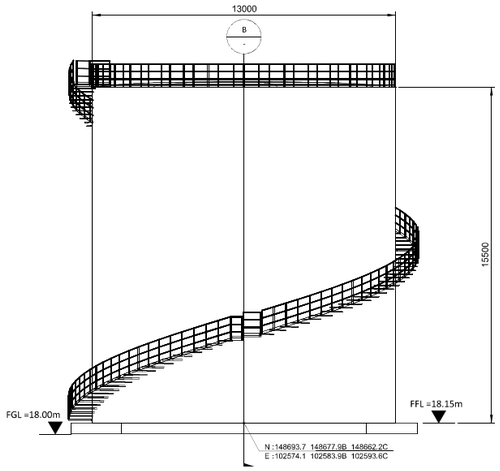
ELEVATION
FUEL OIL STORAGE
TANK A, B



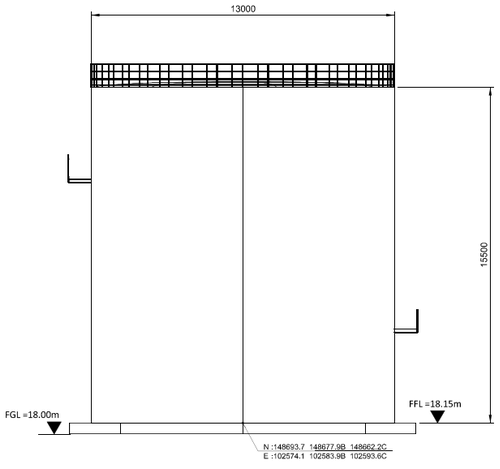
SECTION C
FUEL OIL STORAGE
TANK A, B



PLAN VIEW
FUEL OIL STORAGE
DAY TANK A, B & C



ELEVATION
FUEL OIL STORAGE
DAY TANK A, B & C



SECTION B
FUEL OIL STORAGE
DAY TANK A, B & C

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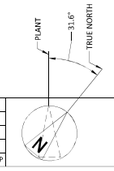

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0	28/APR/2023	ISSUED FOR PLANNING	SRB	HK		DAC	

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SCALE IN MILLIMETERS
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BLACK & VEATCH CORP HEADQUARTERS:
11401 LAMAR AVENUE, OVERLAND PARK, KANSAS, USA

BLACK & VEATCH

DU	DRAWN	TMC
CHECKED	DATE	

SHANNON LNG LIMITED
SHANNON TECHNOLOGY AND ENERGY PARK (STEP)
CCGT FUEL OIL STORAGE TANKS
PLAN AND ELEVATIONS

PROJECT	DRAWING NUMBER	REV
198291	SS-A4112	1
CODE		
AREA		

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Report for:	Shannon LNG Limited
Report reference:	RMC0500653.1.4
Date:	10 April 2024
Revision:	02

Vysus Group

MATTE assessment for Shannon Technology Energy Park Power Plant

Report prepared for Shannon LNG Limited

Report Information

MATTE assessment for Shannon Technology Energy Park Power Plant		
Report reference: RMC0500653.1.4	**Date:** 10 April 2024	**Revision:** 02
Prepared by: Ian Thomas Senior Principal Consultant	**Reviewed by:** Chris Swift Lead Risk Specialist Lloyd's Register	**Approved by:** Adam Baxter Department Manager, UK & Spain
		
Client contact: Kieran O'Connor Permit, Regulatory and Environmental Lead T/M: +353 87 1464 794 koconnor@newfortressenergy.com	**Client entity and address:** Shannon LNG Limited 27 Market Street, Listowel Co. Kerry, V31 Y436 Ireland	
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Document control (Vysus Group internal use):

Revision	Prepared by	Reviewed by	Approved by	Date	Comments
00	DIT	CJS	AB	20 Mar 2024	Issued to client
01	DIT	CJS	AB	09 Apr 2024	Revised accounting for client comments
02	DIT	CJS	AB	10 Apr 2024	Revised accounting for client comments

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List of Abbreviations

ABP	An Bord Pleanala (Planning Authority)
AGI	Above Ground Installation (Operated by Gas Networks Ireland)
AONB	Areas of outstanding natural beauty
ALARP	As Low As Reasonably Practicable
CA	Competent Authority
CCGT	Combined Cycle Gas Turbine
CDOIF	Chemical and Downstream Oil Industries Forum
COMAH	Control of Major Accident Hazards
CRU	Commission for Regulation of Utilities
DAU	Development Applications Unit
DEFRA	Department for Environment, Food and Rural Affairs
EPA	Environmental Protection Agency
ESA	Environmentally Sensitive Area
HSA	Health and Safety Authority
kV	Kilo Volt
LNR	Local Nature Reserves
LUP	Land use planning
MAPP	Major Accident Prevention Policy
MATTE	Major Accident to the Environment
MW	Mega Watt
NHA	Natural Heritage Area
NSA	Nitrate Sensitive Areas
QRA	Quantitative risk assessment
SAC	Special Area of Conservation
SPA	Special Protection Area
SPR	Source, Pathway, Receptor
SSSI	Site of Special Scientific Interest
STEP	Shannon Technology Enterprise Park

Executive Summary

This report has been prepared for Shannon LNG Limited by Vysus Group. The report documents the findings of a MATTE (Major Accidents to the Environment) study for the proposed Shannon Technology Enterprise Park (STEP) power plant.

Purpose

The purpose of the MATTE study is to identify potential scenarios associated with Major Accidents for the proposed STEP power plant involving dangerous substances which can pose a credible threat of damage to the environment, as defined and governed by COMAH Regulations.

Scope

The scope for this MATTE study is the Power Plant Only development (ABP-311233-21*).*

The report does not address Major accident scenarios which can give rise to serious injury to people; routine environmental emissions associated with the operation of the installation, and connection to gas supply via pipeline.

Methodology

The MATTE study was conducted as a desk study using the HSA Guidance on technical land-use planning advice for planning authorities and COMAH establishment operators, also taking into account HSA Guidance to Inspectors on the Assessment of Safety Reports under the COMAH Regulations 2015, DEFRA Guidelines for Environmental Risk Management, the COMAH regulations and the Chemical and Downstream Oil Industries Forum (CDOIF).

As per the HSA Guidance, the basic approach was to apply the Source, Pathway, Receptor methodology to identify hazards and assess any residual environmental risk (MATTE) associated with a major accident.

Findings

The findings of the MATTE assessment are summarised in the table below.

Material	Potential MATTE?	Evaluation	MATTE Risk
Diesel	Yes	The proposed 11,500 m^3 diesel stored on site falls within the Qualifying quantity (>2,500 tonnes) of dangerous substances as referred to in the COMAH Regulations, but the low likelihood of a release occurring combined with the triple containment system means that it is very unlikely for a release to occur resulting in the material entering the estuary (pathway).	Low
Transformer oil	Yes	Transformer oil may be hazardous to the environment depending on its chemical composition and a significant release to the estuary could result in a MATTE. Measures on site would prevent the material entering the estuary (pathway)	Very low
Firefighting Water	Yes	Firefighting the water may be contaminated with materials that are toxic to the environment and, as such, a release of a large quantity of firefighting water into the Shannon estuary may lead to a MATTE. Measures on site would prevent the material entering the estuary (pathway)	Very low

Material	Potential MATTE?	Evaluation	MATTE Risk
Natural Gas	No	There is no MATTE associated with the natural gas used on the facility as it does not have any liquid constituents.	N/A Not a MATTE
Ammonia Hydroxide	No	Small quantities of material that is not significantly ecotoxic with low possibility of entering the marine environment.	N/A Not a MATTE
Tri-Sodium Phosphate	No	Small quantities of material that is not significantly ecotoxic with low possibility of entering the marine environment.	N/A Not a MATTE
Sodium Bisulphite	No	Small quantities of material that is not significantly ecotoxic with low possibility of entering the marine environment.	N/A Not a MATTE
Sulphuric acid	No	Small quantities of material that is not significantly ecotoxic with low possibility of entering the marine environment.	N/A Not a MATTE
Cleaning materials, laboratory chemicals and paints	No	Materials may be harmful to the environment but only present in small quantities with low possibility of entering the marine environment.	N/A Not a MATTE

All of the identified MATTE events are described as low or very low risk, as the likelihood of a release occurring is low and measures for prevention of discharge to the estuary are present within the plant design and operating philosophy.

It is noted that the risks associated with the facility are in accordance with HSA criteria.

1 Introduction

This report has been prepared for Shannon LNG Limited by Vysus Group. The report documents the findings of a MATTE (Major Accidents to the Environment) study for the proposed Shannon Technology Enterprise Park (STEP) power plant.

This study has been performed in accordance with HSA Guidance on technical land-use planning advice for planning authorities and COMAH establishment operators [1] and HSA Guidance to Inspectors on the Assessment of Safety Reports under the COMAH Regulations 2015 [2].

1.1 Location of proposed development

The Proposed Development site is located approximately 4.5 km and 3.5 km from Tarbert and Ballylongford in Co. Kerry, respectively.

The Proposed Development site is located within the boundary of two townlands: Kilcolgan Lower and Ralappane, Co. Kerry.

- 450 acres of land zoned for marine and industrial development by local and regional development plans (600 total acres)
- Proximity to high-capacity gas and electricity networks
- 220 kV electrical connection at substation 5 km to East
- Successful in recent ECP 2.1 electrical grid connection process

Figure 1. Site location

Within the wider area, energy infrastructure is a significant feature of the landscape. Moneypoint power station lies approx. 2.5 km north of the site in Co. Clare, while Tarbert power station lies approx. 4 km east of the site. Kilpaddoge 220 kV substation lies approx. 3 km to the east of the site, to which a number of high voltage overhead lines are connected. Wind energy projects within both Co. Clare and Co. Kerry form part of the background to views in this area. There are a number of designated conservation sites located in the vicinity including:

- Lower Shannon candidate Special Area of Conservation (SAC), 002165.
- Shannon-Fergus Estuary Special Protection Area (SPA), 00407
- Ballylongford Bay proposed Natural Heritage Area (pNHA), 1332.

1.2 Key features of the proposed development

The key features of the Power Plant only development comprise:

- Three (3) blocks of CCGT facilitating a flexible multi-shaft power plant. Each block up to 200 MW for a total capacity of up to 600 MW.
- Each block comprises of two (2) gas turbine generators, two (2) heat recovery steam generator and a steam turbine generator.

- Cooled by means of air-cooled steam condensers.
- A 120 MW for 1-hour (120 MWh) battery storage facility
- High voltage 220 kV Substation
- Raw water treatment building
- Firewater storage tanks and fire water pumps
- Under the CRU's Decision Paper CER/09/001 5 days continuous Secondary Fuel storage will be stored on site, equating to approximately 11,000 cubic metres.
- The 220 kV cable(s) will run 5 km east under the L-1010 road to the Eirgrid Killpaddogue 220 kV substation.

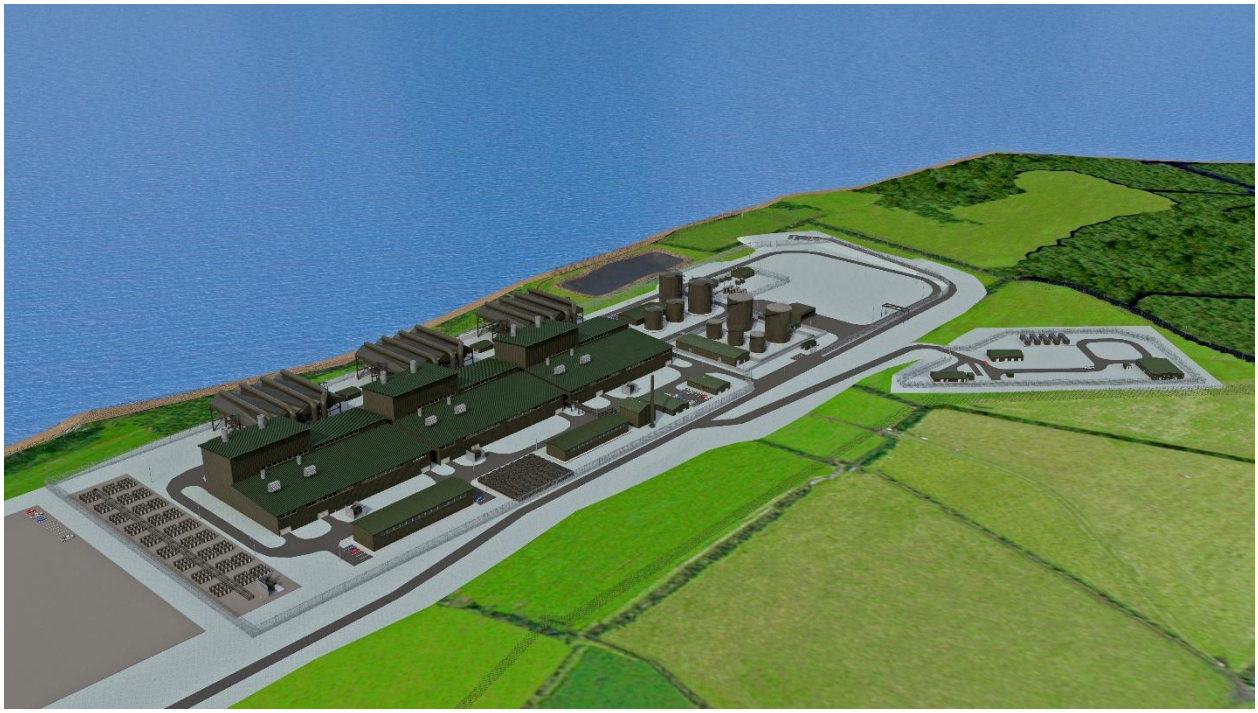

Figure 2. Impression of proposed Power Plant only development and 120MW – 1 hr Battery Storage System.

2 Purpose

The purpose of the MATTE study is to identify potential scenarios associated with Major Accidents for the proposed STEP power plant involving dangerous substances which can pose a credible threat of damage to the environment, as defined and governed by COMAH Regulations.

3 Scope

This MATTE study is concerned with credible MATTE Scenarios associated with a Major Accident, as defined by COMAH regulations [3] and industry guidance [1], [2], [4], [5], for the Power Plant Only development (ABP-311233-21*).*

The scope of the proposed Power Plant considered in this MATTE study includes:

- Site access point and main administration building
- Process building, Electrical substations, security building, Maintenance / warehouse and equipment building
- Power plant
- Secondary diesel fuel storage for the power plant (11,500 m^3, equivalent to approximately 10,000 tonnes)
- AGI
- Construction laydown
- Battery storage facility
- Drainage outfall pipe
- Fire water retention pond

3.1 Exclusions to the scope

Major accidents scenarios which can give rise to serious injury to people are addressed separately in a dedicated QRA report.

Routine environmental emissions associated with the operation of an establishment are a matter for the local authority or the Environmental Protection Agency (EPA), as relevant, and are subject to separate permitting/licensing requirements. Routine emissions are not considered within the scope of this report.

4 Governing regulations and definitions

HSA Guidance on technical land-use planning advice for planning authorities and COMAH establishment operators [1] considers that in addition to assessment of risk to human health, there is also a requirement to assess risks to the environment by applying the source-pathway-receptor model.

[1] interprets Health and Safety Authority (HSA) policy on technical land-use planning (TLUP) advice under the Seveso-III Directive (Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC), as implemented by the COMAH Regulations 2015 (Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015, S.I. No. 209 of 2015, the "COMAH Regulations" [3]).

The COMAH Regulations implement the Seveso III Directive (2012/18/EU) [6].

4.1 MATTE definitions and thresholds

As neither the regulations nor the Directive define the term MATTE. The Competent Body refer to the HSA Guidance on technical land-use planning advice for planning authorities and COMAH establishment operators and the Guidance to Inspectors on the Assessment of Safety Reports under the COMAH Regulations 2015 Rev 4 Jan 2017, which specify the CDOIF guidance [4] which defines the term.

The term MATTE is used by industry and the Competent Authorities (CAs) to indicate when a major accident has caused serious harm to the environment (or when it has potential to do so):

- a Major Accident which could cause serious harm to the environment (i.e. lead to serious danger) is a potential MATTE (i.e. a Major Accident with MATTE potential);
- a Major Accident which has caused serious harm to the environment is a MATTE.

In accordance with the definitions for of a MATTE and a Major Accident, a MATTE would be taken to require harm or damage to the environment above defined thresholds when considering key environmental receptors in relation to a designated area.

MATTE thresholds defined in the CDOIF guidance concern [4]:

- Extent and Severity; and
- Duration of harm

Designated areas and potential receptors considered within the CDOIF definitions concern [4]:

- Nationally important: SSSI and National Nature Reserves
- Internationally important: SACs, SPAs & Ramsar sites
- Other designated land (ESA's, AONB's LNRs, NSA's etc.)
- Scarce habitat
- Widespread habitat (land/water)
- Groundwater
- Soil or sediment (land/water)
- Built environment (land, man-made)
- Particular species (land, water, air)
- Marine (water)
- Freshwater and estuarine habitats (water)

4.2 MATTE Scenarios

MATTEs are most frequently due to liquid releases (including firewater) impacting on land and water. The prevention measures of most relevance to environmental protection are those which reduce the risk of accidental liquid releases or enable their retention on site [1].

MATTE incidents caused by aerial dispersion are less frequent, but aerial pathways should not be overlooked. Where the potential for such a MATTE has been identified, efforts should be focused on measures for prevention and mitigation [1].

4.3 Compliance requirements

4.3.1 COMAH

COMAH requires all Upper Tier and Lower Tier establishment operators to submit a safety report to the Competent Authority (CA) that demonstrates the environmental risk for the whole COMAH establishment has been reduced to a tolerable level.

4.3.2 Land use planning

In the context of land use planning (LUP), the prevention of MATTEs will be the primary objective and it is expected that accident pathways will be prevented. Where this is not practicable, or in the context of significant modifications at existing COMAH establishments, the assessment of major accidents to the environment focuses on the specific risks to sensitive receptors within the local environment, the extent of consequences to such receptors and the ability of such receptors to recover: environmental damage may be relatively long-lasting but is not necessarily irreversible. Recovery of habitats within a reasonable period of time is possible, depending on the dangerous substance involved.

Emphasis is initially placed on the prevention phase, the control of potential pollution routes and available response measures, rather than on the development of a quantitative risk assessment approach and use of risk based criteria [1].

4.3.3 Assessment expectations

Assessment is based on a Source-Pathway-Receptor model. For new establishments, the CA will focus on the removal of accident pathways to receptors (through the use of additional technical measures: appropriate containment, within the confines of current good practice and ALARP, for example).

Irrespective of whether the approach is qualitative or quantitative, the HSA expect the following items to be considered when assessing a MATTE:

- environmentally sensitive areas in the vicinity,
- presence of endangered species,
- protected water resources/biospheres,
- types of accident that can cause environmental damage (firewater run-off, for example),
- contamination routes (watercourses, for example),
- measures in place to protect the environment and their reliability,
- hard/reliable measures in place to contain run-off in the context of internal and external emergency plans,
- recovery periods with and without intervention,
- clean-up and remediation plans and resources, and
- if necessary, tolerability of assessed risk.

Under COMAH, operators are required to use best practicable means, specifically:

- to prevent a major emission of dangerous substances resulting from uncontrolled developments in an establishment into the environment, and
- for rendering harmless and inoffensive the substances emitted.

5 MATTE assessment methodology overview

The general approach to environmental risk assessment followed by Vysus, applies industry guidelines such as the DEFRA Guidelines for Environmental Risk Management [5] whilst considering COMAH Regulations and CDOIF guidance. The basic outline for the DEFRA approach to environmental risk assessment is summarized in the model below.

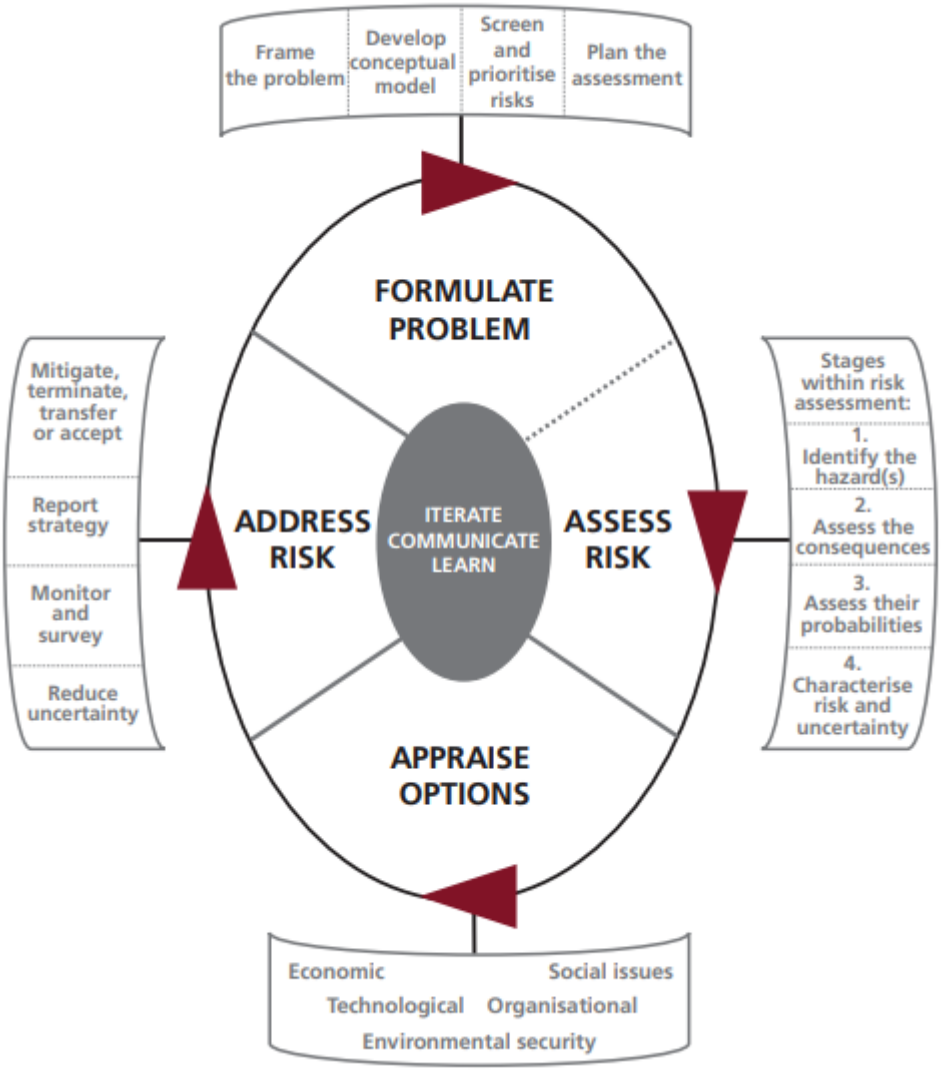

Figure 3. A framework for environmental risk assessment and management.

The DEFRA risk assessment model allows the re-appraisal of the proposed design in a systematic manner, whereby:

- the conceptual model and problem formulation is informed by the revised design features.
- the approach to hazard identification and risk assessment is progressed by applying the source, pathway, receptor concept.
- residual risk identified by confirmation of the Source, Pathway, Receptor linkage can be assessed, eliminated, mitigate and / or managed to ALARP. Environmental risk assessment follows the source-pathway-receptor method, which requires that a linkage (pathway) must exist between the source and receptor in order for an accident to occur. Therefore any assessment of potential MATTE events will require the presence of a material that could harm the environment, a scenario for the release of the material, some pathway through which the material could pass to the environment, and some feature of the environment that could be significantly harmed.

The source, pathway concept methodology considers the features of a conceptual model to identify:

- sources of environmental impact from a major accident e.g. fire water or diesel spill
- pathway for pollutant to reach a receptor e.g. surface drain
- receptor e.g. groundwater aquifer, habitat.

An example of identifying and representing the S-P-R linkages regarding leakage from an underground gasoline storage tank that contains benzene.

Table 1. Example, source, pathway, receptor linkage concept [5]

Hazard	Source	Pathway	Receptor	S-P-R Linkage
Benzene	Underground fuel storage tank	Leaching Groundwater supply	Groundwater supply	Yes
			Public water supply	Yes

5.1 Sources

Sources are inventories of materials within the facility that are major environmental hazards (i.e. that have the potential to result in significant impact on the environment if released and reach an environmental receptor). The evaluation of sources includes quantity, location and properties of environmentally hazardous materials present on the site.

5.2 Pathways

Pathways may have a number of features; including the initial release of material, secondary failures and local factors.

Possible sources of release of materials that may be hazardous to the environment are primarily due to failure of containment. A range of possible causes of loss of containment exist and are typically due to:

- Impact by vehicle, machinery or dropped object;
- Dropped or punctured container;
- Corrosion, erosion or chemical attack;
- Overpressurisation or vacuum;
- Overfilling of equipment;
- Internal explosion (where flammable materials are present);
- Runaway chemical reaction or mixing of incompatible chemicals;
- Overheating or overcooling of equipment;
- On site events such as fires or explosions; or,
- Offsite events that may affect the area, such as earthquakes, landslip, flooding or extreme weather;

Secondary factors are those where some barrier or safeguard fails. For releases of liquids a secondary failure may be a damaged drain or bund, or the failure to treat a material if discharged into an effluent treatment system.

Pathways will also depend upon the type of surface onto which a material is released and drainage systems.

Local factors that influence pathways are often related to environmental conditions. For example, where releases could enter rivers, the hydraulic state of the river may be a factor. For releases to air, the

atmospheric conditions (wind speed, stability and direction) and rainfall could influence the consequences of a release. Releases to air may also include vapours generated by pools of spilt liquid.

5.3 Receptors

The assessment of major accidents to the environment focuses on the specific risks to sensitive receptors within the local environment, the extent of consequences to such receptors and the ability of such receptors to recover, noting that environmental damage may be long-lasting but not necessarily permanent.

Consideration of local environmental receptors and their sensitivity is required in order to allow an assessment of the consequences of a release from an establishment and whether it would be classified as a MATTE.

6 Environmental setting, sensitivities and impact assessment

The information presented in this section has been sourced from the original AECOM EIA report to enable the Vysus team to apply a Source, Pathway, Receptor approach to the review of the potential for a MATTE associated with the Power Plant only ABP Application.

Note: The potential impact of operations, abnormal events and accidents on the local environment not covered by COMAH regulations are outside the scope of this review and are not addressed here.

6.1 Site setting and operation

The area to be developed within the Proposed Development site is characterised by predominantly improved grassland in an agricultural setting. Field boundaries predominantly comprise hedgerows with small drainage ditches. A small section of the Ralappane Stream is located in the southernmost part of the Proposed Development site.

The Shannon Estuary comprises 500 square kilometres (km^2) of navigable water extending from Loop Head, in Co. Clare, and Kerry Head, in Co. Kerry, eastwards to the city of Limerick, a distance of approximately 100 km. The naturally occurring deep and sheltered waters of the estuary are connected to the Atlantic Ocean and are accessible to large ocean-going vessels of varying types and sizes [7].

The location of the Proposed Development is within the protected area of the Shannon Estuary (the Lower River Shannon SAC, the River Shannon and River Fergus Estuaries SPA and the Ballylongford Bay pNHA). Therefore, the highest standards of environmental protection will be incorporated into the design of the Proposed Development [7].

6.2 Major accidents and disasters

The risk of a major accident occurring, is considered to be very low, however a detailed pollution response plan, emergency equipment and procedures will be in place prior to construction and throughout the lifetime of the Proposed Development.

The Proposed Development site location has been carefully chosen and there is a very low risk of natural disasters occurring such as flooding and earthquakes.

There is a very low risk of a major accident or disaster occurring at the Proposed Development. The facility will be regulated as a Lower Tier COMAH Installation and the highest levels of safety and environmental protection will be in place for the lifecycle of the facility, from prior to construction and throughout the operational lifetime. Detailed risk analyses for the Proposed Development such as Quantitative Risk Assessment (QRA) and Environmental Risk Assessment (ERA) will be carried to analyse the potential for further risk reduction.

The facilities associated with the Proposed Development will be designed, constructed and operated by specialist, experienced organisations who will adhere to all applicable national regulations and internationally recognised best practice in the design and operation of the facility, controlling the risks and delivering essential gas supplies to the national network [7].

6.3 Major accident scenarios

The Power Plant will contain process equipment such as natural gas compressors, turbine generators and electrical transformers, containing flammable and combustible substances. Consequently, a fire has been identified in this assessment as the most significant potential major accident in this area of the Proposed Development.

A number of fire prevention and protection measures are included in the design of the Proposed Development, which are as follows:

Layout of the Proposed Development to minimise the potential for an incident in one area affecting other areas;

Passive fire protection systems will be installed in appropriate areas, which allows certain systems to withstand a fire for a defined period of time to enable the emergency response plan to be initiated [7]:

- A network of fire and gas detectors, audible and visual fire alarms will be installed throughout the Proposed Development to alert operations personnel who will initiate the emergency response; and
- Active fire protection systems will be installed onsite, supplied by large firewater storage tanks and activated on demand from the fire and gas system or manually initiated from the central control room.

7 MATTE assessment

The MATTE study for the proposed power plant only development has been conducted as a desk study using the DEFRA Guidelines for Environmental Risk Management whilst taking account of the COMAH regulations and CDOIF.

The basic approach to the study was to apply the Source, Pathway, Receptor methodology to identify hazards and assess any residual environmental risk (MATTE) associated with a major accident.

7.1 Sources

Materials that have been identified as present at the STEP are shown in the table below.

Table 2. Materials and Inventory

Material	CAS Number	Inventory	Annual Use	Form	Containment	Use
Natural Gas	74-82-8	Natural Gas: <50 tonnes	Unknown	Gas	Piping and equipment containing gas	Process material (gas supply)
Ammonia hydroxide (19%)	1336-21-6	1,500 litres	13,140 litres	Liquid	Tote 1,500 litres	pH control
Tri-Sodium Phosphate	7601-54-9	1,500 litres	13,140 litres	Liquid	Tote 1,500 litres	pH buffer and harness/scale treatment
Sodium Bisulphite (30% - 50%)	7631-90-5	1,500 litres	3,500 litres	Liquid	Tote 1,500 litres	Dechlorination agent
Sulphuric Acid (77-100%)	7664-93-9	3,000 litres	Unknown	Liquid	Storage tank and Batteries	pH Control
Diesel	68476-34-6	11,500 m^3	Unknown	Liquid	Diesel Tanks	Fuel
Transformer oil (Mineral oil, petroleum distillates)	Varies depending on supplier	110 m^3	Unknown	Liquid	Within transformers	Electrical system cooling

Additional materials including antiscalants, biocides, corrosion inhibitors, antifreeze, cleaning chemicals, paints, hydraulic oil, grease and lubricating oils are expected to be present on site in small quantities. These materials, whilst present at the site, are not anticipated to be present in sufficient quantities to materially affect the outcome of this assessment.

A review of the Material Safety Data Sheets (MSDS) [9][10][11][12][13], the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) [8] and the COMAH Regulations [3] has provided details of the classification and ecotoxicity of the materials listed in the table above. The findings from this review are summarised in the table below. Where the material classification is not directly available from GHS relevant data then date from the Material Safety Data Sheets (MSDS) has been used.

Any materials that are identified as ‘Dangerous Substances’ under the COMAH Regulations or have Hazard Classifications indicating the potential for significant environmental damage on release have been identified.

Table 3. Material Classification and Ecotoxicity

Chemical [CAS No.]	GHC Classification	Hazard Statement	Environmental Effects			COMAH Classification
			Toxicity	Biodegradability	Bioaccumulation	
Natural Gas	Flam. Gas 1 Press. Gas	H220	No environmental toxicity identified.	No data available	No data available	**Flammable gases**
Ammonia Hydroxide	Harmful if swallowed. Causes severe skin burns and eye damage. May cause respiratory irritation. Very toxic to aquatic life.	H302 H314 H335 **H400**	LD50 Oral – Rat – 350 mg/kg (Ammonium hydroxide) LC50 – Fish – 0.44 mg/l – 96 h (Ammonium hydroxide) LC50 – Daphnia magna (Water flea) – 25.4 mg/l – 48 h (Ammonium hydroxide)	No data available	Does not bioaccumulate	**Hazardous to the Aquatic Environment**
Tri-Sodium Phosphate	Causes skin irritation Causes serious eye irritation May cause respiratory irritation	H315 H319 H335	LD50 Oral – Rat – female - > 2,000 mg/kg LC50 Inhalation – Rat – male and female – 4 h - > 0.83 mg/l LD50 Dermal – Rat – male and female - > 2,000 mg/kg LC50 – Oncorhynchus mykiss (rainbow trout) - > 100 mg/l – 96 h EC50 – Daphnia magna (Water flea) - > 100 mg/l – 48 h ErC50 – Desmodesmus subspicatus (green algae) - > 100 mg/l – 72 h Toxicity to bacteria static test EC50 – activated sludge - > 1,000 mg/l – 3 h	Not applicable to inorganic materials	No data available	None
Sodium Bisulphite	Exempt from Regulation (EC) No 1272/2008.	-	No data available	No data available	Not bioaccumulitive	None

Chemical [CAS No.]	GHC Classification	Hazard Statement	Environmental Effects			COMAH Classification
			Toxicity	Biodegradability	Bioaccumulation	
Diesel	Flam. Liquid Skin Corrosion/Irritation Aspiration Hazard STOT SE Carcinogenicity Aquatic Chronic Eye Damage/ Irritation	H226 H315 H304 H336 H350 **H411** H319	Inhalation LC50 Rat >6 mg/l/4h Acute Toxicity LD50 Dermal Rabbit >5000 mg/kg Acute Toxicity LD50 Oral Rabbit >5000 mg/kg Toxic to aquatic organisms based on an acute basis LC50/EC50 >1 but < 10 mg/L in the most sensitive species. Material is a long-term aquatic hazard based on a chronic basis (C50/EC50 >1 but < 10 mg/L in the most sensitive species.	No data available	No data available	**Named: Petroleum products (gas oils)**
Transformer Oil (1)	May be fatal if swallowed and enters airways. Harmful to aquatic life with long lasting effects.	H304 **H412**	LD50 (Rat): > 2,860 mg/kg LC50 (Rat): > 5.2 mg/l, 4 h	No Data available.	No data available.	**Hazardous to the Aquatic Environment**

Notes:

(1) Transformer oil classification based on review of a range of oil MSDS, the H412 categorisation may not be applicable to some transformer oils.

Of the materials listed in Table 2 those classified with the following categories are the most hazardous to the environment. Specifically:

- H400 – Very toxic to aquatic life (Ammonia hydroxide);
- H411 – Long-term (chronic) aquatic hazard (Category 2) (Diesel); and,
- H412 – Harmful to aquatic life with long lasting effects (Transformer Oil).

7.2 Pathways

A review of the processes undertaken and measures provided on the site has identified the following possible onsite pathways (refer to the following subsections), which have been considered, where appropriate, for the assessment of MATTE scenarios.

7.2.1 Drainage systems on site

The Environmental Impact Assessment Report (EIAR) [7] describes the details of the drainage systems on the site, which is summarised in this subsection.

A surface water drainage network consisting of piped drainage and swales/ catch basins will be constructed to collect, convey, and attenuate the surface water runoff generated.

The access road levels will be profiled to drain road runoff to an engineered swale adjacent to the road, the majority of which will drain to the engineered storm drainage system at the Power Plant site and discharge to the shared constructed outfall to the Shannon Estuary.

There will also be a stormwater discharge point at the Ralappane D1 stream crossing located 50m from the site entrance (Drawing Ref: 198291-1STF-S3001), and a second stormwater discharge point will be located at the D2 stream crossing located 20m from the construction laydown area (Drawing Ref: 198291-1STF-S3002). Both will be fitted with Class 1 hydrocarbon interceptors.

Stormwater collected from roof drains and permeable areas will discharge directly to the estuary via the final discharge monitoring station. All bunded areas within the Proposed Development site will have valved discharge points as part of their connection to the drainage network (see Figure Appendix A).

Groundwater seepages from springs or at the toe of cut slopes will be collected via a groundwater drainage network which will then discharge directly to the Shannon Estuary via the same discharge outfall pipe as the surface water.

Silt traps will be incorporated in all groundwater drainage points prior to discharge.

During the operational phase, all drainage from the Proposed Development site will be controlled and monitored in compliance with the terms of the IE licence.

A firewater retention pond is included in the Proposed Development and sized according to EPA Guidance on Retention Requirements for Firewater Runoff, as the most effective and suitable measure for retaining firewater. The retention pond will be rendered impermeable by use of an appropriate liner, and integrity-tested in line with the requirements of the site's licence. All process area site drainage will pass through the retention pond. An automatic shut-off valve linked to the site's fire detection system will be installed on the drainage outlet point.

7.2.2 Releases into Bunded Areas

Bunds are designed to contain liquid releases from bulk storage tanks. Where bunds are correctly designed, operated and maintained, the only release to the environment will be due to evaporation from liquid that is contained in the bund. All bunds will be sized to contain the full storage tank inventory plus

an additional allowance for safety where appropriate. These bunds will have valved discharge points as part of their connection to the drainage network. Prior to draining of rainwater from bunded areas, checks will be carried out to ensure that the material discharged is not contaminated.

Possible failure of bunds may be due to poor design, substandard construction, damage, overtopping, overfilling and the failure of systems for rainwater removal. Depending upon the failure type and location, possible outcomes of bund failure could be a release to unmade ground below the bund, release onto plant areas that are covered in broken stone, or release into the surface water drains. Bund failures that are coincident with a release of dangerous substance from the primary containment, while discussed in this assessment, are considered to be very low probability events.

7.2.3 Releases in the Power Plant Area

All stormwater collected from paved and impermeable areas within the Power Plant will pass through a class 1 hydrocarbon interceptor prior to discharge to the Shannon Estuary.

At the end of the system there is a valve which is normally open to allow rainwater to discharge to the estuary but can be closed in an emergency to prevent discharge.

Stormwater collected from roof drains and permeable areas within the power plant will discharge directly to the estuary via the final discharge monitoring station.

7.2.4 Releases to the Storm Water Drain System

The access road levels will be profiled to drain road runoff to an engineered swale adjacent to the road, the majority of which will drain to the engineered storm drainage system at the Power Plant site and discharge to the shared constructed outfall to the Shannon Estuary.

There will also be a stormwater discharge point at the Ralappane D1 stream crossing located 50m from the site entrance (Drawing Ref: 198291-1STF-S3001), and a second stormwater discharge point will be located at the D2 stream crossing located 20m from the construction laydown area (Drawing Ref: 198291-1STF-S3002). Both will be fitted with Class 1 hydrocarbon interceptors.

Releases to the Shannon Estuary are only possible of there is a failure to control discharge from the sumps or through the drains.

7.2.5 Releases to Ground/Ground Water from permeable areas

Ground water from permeable areas will be collected by means of a ground water drainage network that will collect the ground water and discharge where possible into either the existing stream/drainage ditches within the site or directly to the estuary via same discharge outfall pipe as the storm water. Silt traps will be incorporated onto all groundwater drainage points prior to discharge.

As the site groundwater drains are only located along the outside perimeter of the developed site, away from process equipment, roadways and buildings it is thought that a release into these drains is not possible.

7.2.6 Releases into Storage Buildings/Warehouses

Building areas used for chemical or hydrocarbon storage on the site, Power Station and AGI will have impermeable floors with no drains. Therefore, any spillage in these building areas should be contained.

7.2.7 Releases at the AGI Area

Water collected on the paved and impermeable areas of the AGI will be collected and discharged to the storm water drain system after passing through an inceptor located at the AGI. The drainage route from the AGI Interceptor through the storm water drains pass through a second interceptor located near the

instrument air package prior to discharge into the fire water retention pond. The fire water retention pond discharges to the estuary.

7.2.8 Fires

Any fires on site will release combustion products, and in some cases may release unburned material to atmosphere. Systems will be installed on site for preventing and mitigating fires (e.g. inerting systems, minimisation of ignition sources and water or firefighting systems).

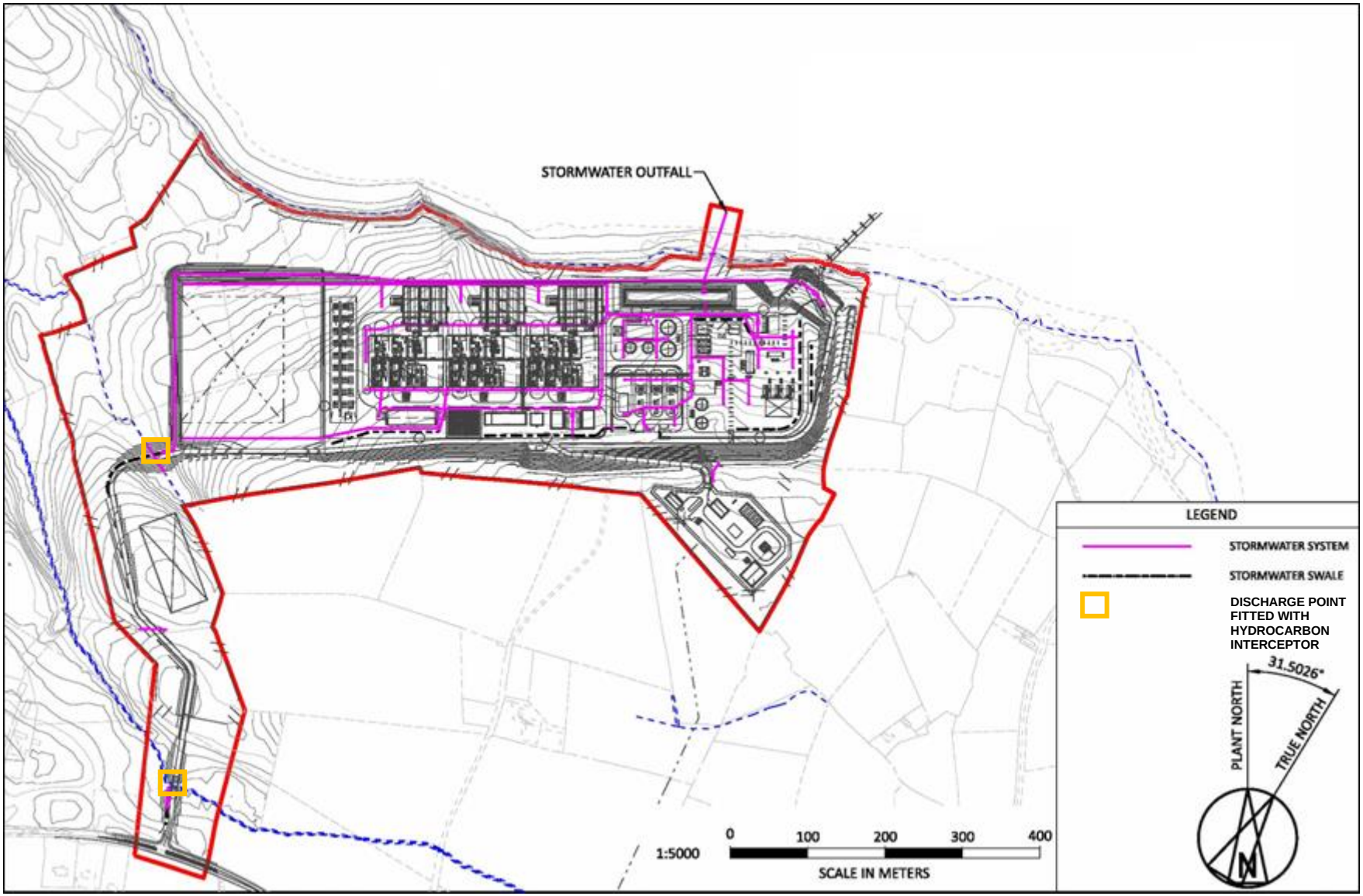

Figure 4. Proposed Site Drainage

7.3 Receptors

The Proposed Development site is in pasture, comprising primarily improved grassland with some wet grassland adjacent to the Shannon Estuary, as shown on the aerial photograph below.

Figure 5. Proposed Development Site

The Lower Shannon Special Area of Conservation (SAC) is partly within and adjacent to the site along the northern/ north-western boundary and also along part of the eastern boundary of the Proposed Development site (see below). The Ballylongford Bay Natural Heritage Area (NHA) is adjacent to a part of the north-western boundary of the Proposed Development site (see below). The Shannon-Fergus Estuary Special Protection Area (SPA) is to the west of the Proposed Development site (at a distance of approximately 750 m from the western extremity of the terrestrial elements of the Proposed Development site).

For the purpose of this assessment only the possible impacts to the most sensitive receptors will be considered (NHA, SPA and SAC). It is recognised that there are criteria for harm to other receptors but the criteria for extent and duration of harm for these receptors is less stringent than those for SACs, SPAs and NHAs.

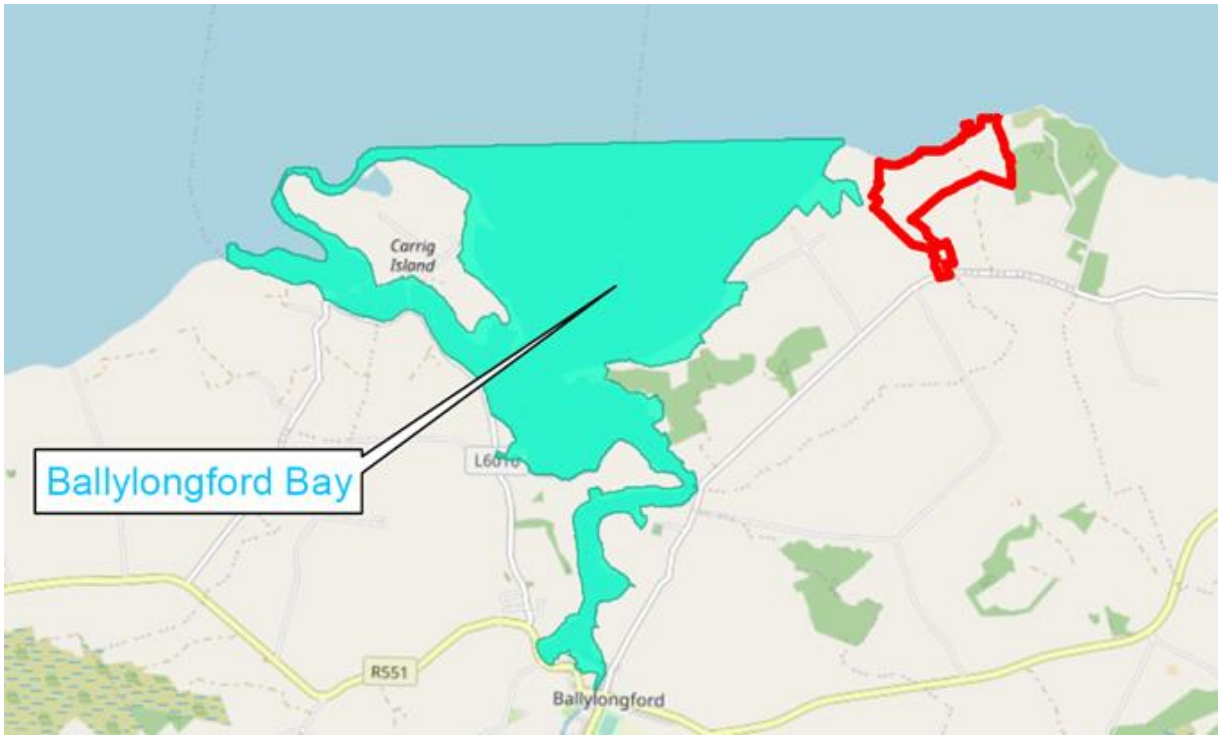

Figure 6. Proposed National Heritage Areas (NHA)

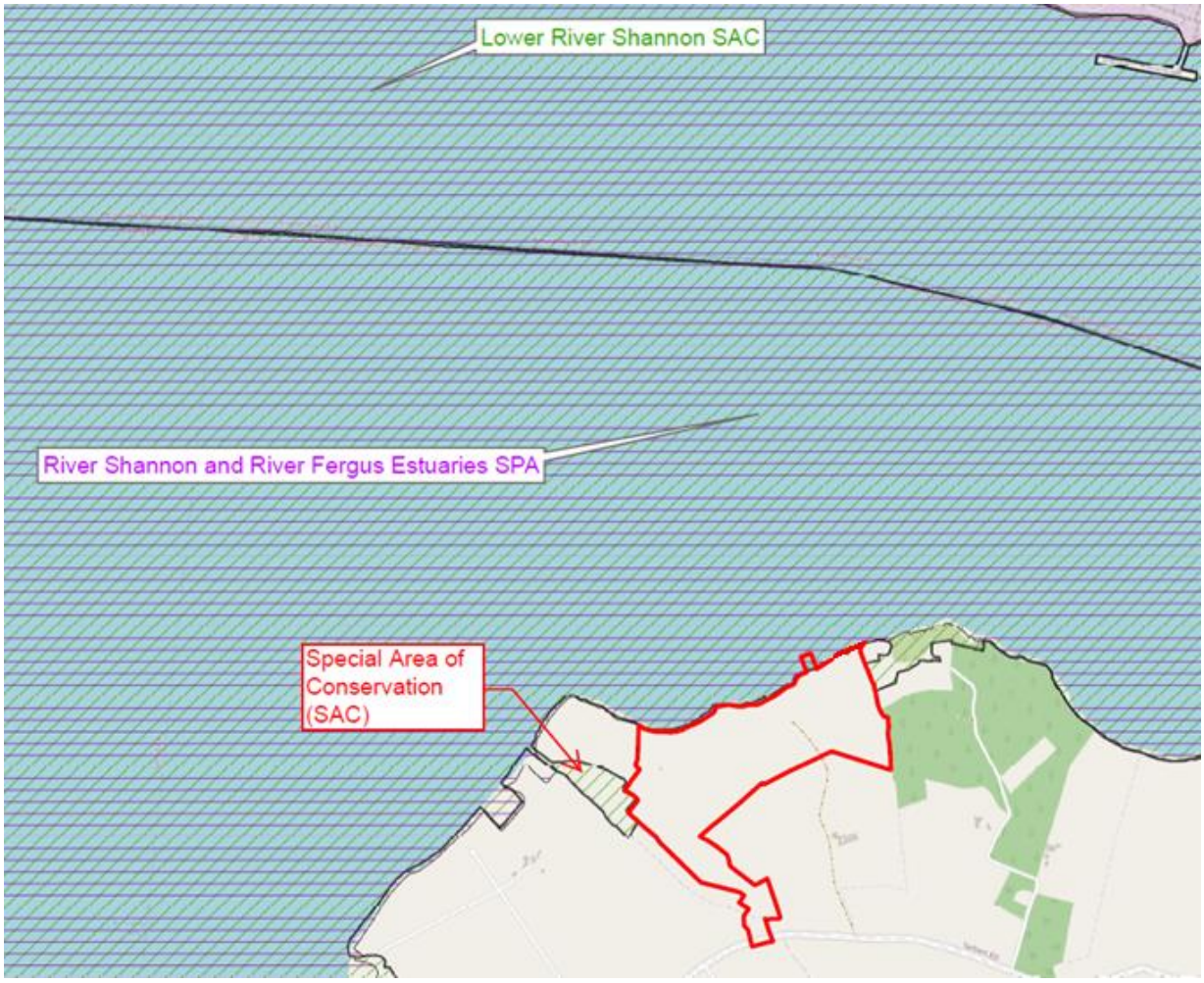

Figure 7. SPA and SAC

7.4 COMAH materials

Materials that are covered by the COMAH Regulations as either Named Substances or by their hazardous characteristics, such as flammability or toxicity require specific assessment as their release may lead to a MATTE, as detailed in the 'COMAH Classification' column of Table 3.

Materials that fall into this category are:

- Natural gas;
- Ammonia hydroxide;
- Diesel; and,
- Transformer oil.

7.4.1 Natural gas

Natural gas is not toxic to the environment, hazards are associated with exposure to fires if a release of natural gas is ignited. Environmental receptors at risk are flora and fauna in the NHA and SAC to the west of the site.

There is no MATTE associated with the natural gas used on the facility as it does not have any liquid constituents.

7.4.2 Ammonia Hydroxide

Up to 4 tonnes of ammonia hydroxide solution will be stored at the Power Plant in 1,500 litre totes. It will be used for Power Plant feedwater treatment.

Ammonia hydroxide solution is considered to be toxic to the environment under the COMAH Regulations as it classified as H400 "Very toxic to aquatic life".

A possible worst case release for ammonia solution is the loss of the contents of a tote. This could occur during offloading or during storage. Any releases within the storage building would be contained by the building's impermeable flooring or bund and could be cleaned up (e.g. using absorbent material) and disposed of safely. Releases outside the building onto roadways could possibly enter the roadway storm water drains and flow through the drainage system to the estuary. However action can be taken to contain spillages and prevent flow to the estuary by closing the storm water drainage system valve.

The loss of the contents of a Tote of ammonia solution to the estuary is likely to have short term environmental effects at the point of discharge. However, it is thought that the release would not be of sufficient size to result in a MATTE.

Spillages onto ground covered in broken stone have not been considered as possible events, as ammonia solution is not used or transported over areas with this surfacing.

Spillage of ammonia solution will lead to a pungent odour close to the spillage. For a release of a tote of ammonia hydroxide solution the odour will not lead to off-site concentrations of concern as the solution is an aqueous solution and only small quantities of ammonia will be released from it to atmosphere.

7.4.3 Diesel

Diesel is present onshore within the STEP in a number of locations, provisionally identified as:

- Power Plant CCGT Standby Diesel Generator; 3,200 litres (three off);
- Power Plant CCGT Diesel Fire Pump; 1,400 litres; and,
- Power Plant CCGT secondary diesel fuel storage for the power plant, 11,500m^3.

Diesel is considered to be toxic to the environment under the COMAH Regulations as it classified as H411 "Long-term (chronic) aquatic hazard".

The use of localised small inventory storage tanks for the items of equipment listed above means that the largest credible spillage of diesel (from the secondary diesel fuel storage) would be 11,500 m^3. This is above the Lower Tier threshold of 2,500 tonnes for petroleum products, but below the Upper Tier threshold of 25,000 tonnes [3]. The volume of diesel is less than the Lower Tier threshold for a "Long-term (chronic) aquatic hazard" of 100 tonnes.

Regulations for the storage of diesel such as the "Control of Pollution (Oil Storage) Regulations (Northern Ireland) 2010" and "HSG 176 Storage of flammable liquids in tanks", detail specific requirements for diesel storage that, if followed, mean that a release of diesel is an unlikely event.

The diesel tanks are in a triple containment system, with 2 bunded areas. This contains the diesel within the bunds and prevents the diesel from spreading to the water.

The low release frequency combined with the triple containment system mean that the likelihood of release of diesel occurring and reaching the water is considered extremely low.

7.4.4 Transformer Oil

There is transformer oil present in four transformers, each of 25,000 litres capacity.

For the purpose of this assessment Transformer oil is considered to be toxic to the environment under the COMAH Regulations as it classified as H412 "Harmful to aquatic life with long lasting effects". It should be noted that assumption of this classification is conservative as transformer oils that do not pose a significant effect to the environment are available.

If a release of transformer oil was to enter into the storm water drainage system it would be contained by the Class 1 petrol interceptor. If the interceptor was unable to contain the release and the shut off valve on the storm water drainage system was not closed, there could be a discharge of transformer oil to the estuary. Possibly resulting in a surface layer of hydrocarbons on the estuary. In unfavourable conditions it is conceivable that this could affect the SAC/SPA. A MATTE is therefore considered to be possible, but only if the release of transformer oil was very large. However, the volume of transformer oil is less than the Lower Tier threshold for an H412 category fluid of 200 tonnes.

7.5 Non-COMAH Materials

Materials that are not rated as hazardous to the environment under the COMAH Regulations require MATTE assessment where it is credible that they could be released, as the result of an incident involving a material that is covered by the COMAH Regulations [3].

The conservative assumption that incidents involving natural gas could lead to the release of any of the non-COMAH materials listed in Table 2 has been made. It should be noted that, due to the separation distances between the natural gas systems and areas where these materials are present, the likelihood of secondary releases of this type are very low.

Materials considered are:

- Tri-Sodium Phosphate;
- Sodium Bisulphite (30% - 50%); and,
- Sulphuric Acid (77-100%).

In addition, releases of cleaning chemicals, laboratory chemicals, paints and fires have been considered at a high level.

7.5.1 Tri-sodium Phosphate

Tri-sodium phosphate will be used for feedwater treatment. It is a solid material that will be stored in 1,500 kg Totes at the Power Plant water treatment store. It is not classed as hazardous to the environment under the COMAH Regulations. The material has been identified as being toxic to fish.

A possible worst-case release for tri-sodium phosphate solution is the loss of the contents of a tote. This could occur during offloading or during storage. Any releases within the storage building would be contained by the building's impermeable flooring or bund and could be cleaned up (e.g. using absorbent material) and disposed of safely. Releases outside the building onto roadways could possibly enter the roadway storm water drains and flow through the drainage system to the estuary. However action can be taken to contain spillages and prevent flow to the estuary by closing the storm water drainage system shut off valve.

The loss of the contents of a Tote of tri-sodium phosphate ammonia solution to the estuary is likely to have short term environmental effects at the point of discharge. However, it is considered that the release would not be of sufficient size to result in a MATTE.

7.5.2 Sodium Bisulphite

Sodium bisulphite solution will be used for feedwater treatment. It is a is a liquid material that will be stored in 1,500 kg Totes at the Power Plant water treatment store. It is not classed as hazardous to the environment under the COMAH Regulations. The material has been identified as being toxic to fish.

A possible worst-case release for sodium bisulphite solution is the loss of the contents of a tote. This could occur during offloading or during storage. Any releases within the storage building would be contained by the building's impermeable flooring or bund and could be cleaned up (e.g. using absorbent material) and disposed of safely. Releases outside the building onto roadways could possibly enter the roadway storm water drains and flow through the drainage system to the estuary. However, action can be taken to contain spillages and prevent flow to the estuary by closing the storm water drainage system shut off valve.

The loss of the contents of a Tote of sodium bisulphite solution to the estuary is likely to have short term environmental effects at the point of discharge. However, it is considered that the release would not be of sufficient size to result in a MATTE as a release would be limited to a single tote.

Even if a pathway between the material and an environmental receptor could be identified, release of the material would not result in a MATTE.

7.5.3 Sulphuric Acid

Approximately 3 m^3 of sulphuric acid will be present on the Power station, and also used within uninterruptable power supply (UPS) batteries.

Sulphuric acid is a mineral acid that is corrosive and toxic to the aquatic environment at low levels. As sulphuric acid is not classified as being dangerous to the environment under the COMAH Regulations, as events requiring consideration are those that are due to an incident involving a COMAH material. In the Power Plant area this could be due to an incident involving natural gas that damaged the sulphuric acid containment systems or batteries.

A possible event taken for MATTE assessment is the release of sulphuric acid on the Power Plant. A worst case scenario would be the release of the entire tank contents due to failure of both the tank and leakage from or overtopping of the bund. In this scenario up to 3 m^3 of acid could be released. As the tank is located at some distance from the buried natural gas supply line to the Power Plant, the likelihood of a release of this size is considered to be very unlikely. However, in such an event, a release of sulphuric acid into the storm water drains may be possible.

At the end of the storm water system there is a shut off valve which is normally open to allow the rainwater to discharge to the estuary. This valve can be closed in the event of spillage, as required. A spillage of sulphuric

acid could potentially be released to the estuary through this route if the shut off valve was not closed. As the quantities released would be small, and sulphuric acid is not highly toxic to the environment, it is judged that a MATTE from a leak of sulphuric acid is not credible.

7.5.4 Cleaning Chemicals, Laboratory Chemicals and Paints

Various types of laboratory chemicals, paints and cleaning materials will be stored in Maintenance & Warehouse Buildings and will be used throughout the STEP. Details of the properties of these materials are not available but it is likely that some of the materials will be hazardous to the environment or flammable.

These types of materials are commonly stored and transported on site in small containers and if accidentally spilled can be treated, absorbed into inert materials and disposed of safely. Any releases in storage areas will be contained by impermeable flooring. On this basis it is concluded that a MATTE from the release of laboratory chemicals, paints and cleaning materials is not credible.

7.5.5 Storage Building Fires

A variety of materials such as laboratory chemicals, paints, cleaning materials, oils and process chemicals will be present in storage buildings on the site. Storage building fires may occur as a consequence of a natural gas fire and a range of materials stored in the buildings could combust, be carried into the atmosphere in the smoke plume, be released to the building floor (liquids) or enter firewater.

In the event of a storage building fire the materials being released to atmosphere will be primarily carbon dioxide, carbon monoxide, water vapour, soot and unburned materials that may be carried in the smoke plume.

Local environmental factors such as wind speed and direction will influence which environmental receptors are likely to be affected and the potential for dry deposition of materials in the plume. Washout of material from the plume may occur if it is raining, leading to deposition of materials.

The primary combustion products (carbon monoxide, carbon dioxide and water vapour) in fire plumes will have short term environmental effects as they are not considered to be highly hazardous to the environment and will not produce long term contamination. Soot deposited from the plume may lead to short-term marking of vegetation but is also unlikely to lead to long term or acute environmental damage. Therefore, a MATTE from a storage building fire smoke plume is not thought to be a credible event.

Fire water run-off from a storage building fire will be expected to be contained on site and will only reach the Shannon estuary if a very large quantity of firewater is used. In this event, water contaminated with materials that may be hazardous to the environment could enter the estuary. If such a release was prolonged, and contained materials that are ecotoxic, it is possible that the local SAC/SPA could be affected, possibly leading to a MATTE. With the measures proposed for preventing building fires and controlled discharge of fire water to the estuary, the risk of a MATTE from fire water run-off is considered to be very low.

7.6 MATTE risk evaluation

The evaluation of risk associated with the identified MATTE events is provided below.

Table 4. MATTE Sources for the Power Plant only design.

Material	Risk of MATTE
Diesel	Low - the proposed 11,500 m^3 diesel stored on site falls within the Qualifying quantity (>2,500 tonnes) of dangerous substances as referred to in the COMAH Regulations, but the low likelihood of a release occurring combined with the triple containment system means that it is very unlikely for a release to occur resulting in the material entering the estuary (pathway).

Material	Risk of MATTE
Transformer oil	Very low - measures on site would prevent the material entering the estuary (pathway)
Firefighting Water	Very low – measures on site would prevent the material entering the estuary (pathway)

A review of the escalation potential, vulnerabilities, and potential environmental impacts is provided below:

Escalation

In respect of the risks of escalation, facilities will be designed to incorporate separation distances to prevent major accidents such as fires and explosions originating in one area from spreading to another area or escalating via domino effects, based on established engineering guidance for industrial site layout. Further the development will be partitioned into fire zones, where equipment is grouped by nature and / or homogeneous level of risk. The consequences of a fire, flammable gas leak or an explosion corresponding to the credible event likely to occur in one fire zone shall not impact other fire zones.

Vulnerability

In terms of the vulnerability of the project to potential disasters/accidents, including both natural and man-made disasters it is noted that the application is accompanied by a flood risk assessment, which concludes that with the exception of crossings of Ralapanne Stream by the access road, there is no development proposed within either Flood Zones A or B. The proposed watercourse crossings have been sized to have a minimal impact on the hydraulic regime in the area and provide an adequate freeboard for a 1% AEP fluvial event. The site is also remote from other major accident sites and would not be at risk from events at such sites.

Environmental impacts

Table 5. Review of Environmental Impacts

Phase	Impact	Effect	Comment
Land & Soils			Impacts that are predicted to arise in relation to Land and Soils would be avoided managed and mitigated by the measures which form part of the proposed scheme and the proposed mitigation measures. The proposed development would not have any unacceptable direct, indirect or cumulative impacts in terms of Lands and Soils.
Construction phase	Accidental spills and leakage of oils and fuels.	Minimal	
Operational	Spillages of fuel, oil, wastewater or other hazardous substances	Minimal	
Cumulative effects	N/A	N/A	

Phase	Impact	Effect	Comment
Water	Accidental spills and leaks from use and storage of liquid chemicals, oils and fuels.	Minimal	Impacts in relation to Water would be avoided, managed and mitigated by the measures which form part of the proposed scheme and by appropriate conditions. The proposed development would not have any unacceptable direct, indirect or cumulative impacts in terms of Water. See also the assessment of effects on Marine Ecology below.
Marine ecology	Accidental large-scale oil spill during operations -Habitats, Marine Mammals, Fish and crustacean species of the estuary and SAC, birds of the SPA	Not significant	Impacts that are predicted to arise in relation to Marine Ecology, would be avoided managed and mitigated by the measures which form part of the proposed scheme. The proposed development would not have any unacceptable direct, indirect or cumulative impacts in terms of Marine Ecology.
Terrestrial Ecology	N/A	N/A	N/A
Major Accidents and Disasters	Loss / spillage of other contaminants. Potential for release of contaminants in firewater.	Not significant	Impacts in relation to major accidents and disasters would be satisfactorily avoided, managed and mitigated by the measures which form part of the proposed scheme and by appropriate conditions. The proposed development would not have any unacceptable direct, indirect or cumulative impacts in terms of major accidents and disasters

7.7 MATTE assessment summary

The table below provides the results of the MATTE assessment for the Power Plant only design.

Table 6. MATTE potential for the Power Plant only design

Material	MATTE	MATTE Risk
Diesel	Yes	Low - The proposed 11,500 m^3 diesel stored on site falls within the Qualifying quantity (>2,500 tonnes) of dangerous substances as referred to in the COMAH Regulations, but the low likelihood of a release occurring combined with the triple containment system means that it is very unlikely for a release to occur resulting in the material entering the estuary (pathway).
Transformer oil	Yes	Very low - measures on site would prevent the material entering the estuary (pathway)
Firefighting Water	Yes	Very low – measures on site would prevent the material entering the estuary (pathway)
Natural Gas	No	N/A Not a MATTE
Ammonia Hydroxide	No	N/A Not a MATTE
Tri-Sodium Phosphate	No	N/A Not a MATTE
Sodium Bisulphite	No	N/A Not a MATTE
Sulphuric acid	No	N/A Not a MATTE
Cleaning materials, laboratory chemicals and paints	No	N/A Not a MATTE

8 Conclusions

The results from the MATTE assessment are summarised in the table below.

Qualitative assessment of possible scenarios for accidental releases associated with the STEP has indicated that releases or accidents of large quantities of some materials have the potential for causing a MATTE; specifically diesel and Transformer Oil. Release of firefighting water to the estuary could result in a MATTE if it is contaminated with ecotoxic materials.

Table 7. MATTE assessment summary

Material	Potential MATTE?	Evaluation	MATTE Risk
Diesel	Yes	The proposed 11,500 m^3 diesel stored on site falls within the Qualifying quantity (>2,500 tonnes) of dangerous substances as referred to in the COMAH Regulations, but the low likelihood of a release occurring combined with the triple containment system means that it is very unlikely for a release to occur resulting in the material entering the estuary (pathway).	Low
Transformer oil	Yes	Transformer oil may be hazardous to the environment depending on its chemical composition and a significant release to the estuary could result in a MATTE. Measures on site would prevent the material entering the estuary (pathway)	Very low
Firefighting Water	Yes	Firefighting the water may be contaminated with materials that are toxic to the environment and, as such, a release of a large quantity of firefighting water into the Shannon estuary may lead to a MATTE. Measures on site would prevent the material entering the estuary (pathway)	Very low
Natural Gas	No	There is no MATTE associated with the natural gas used on the facility as it does not have any liquid constituents.	N/A Not a MATTE
Ammonia Hydroxide	No	Small quantities of material that is not significantly ecotoxic with low possibility of entering the marine environment.	N/A Not a MATTE
Tri-Sodium Phosphate	No	Small quantities of material that is not significantly ecotoxic with low possibility of entering the marine environment.	N/A Not a MATTE
Sodium Bisulphite	No	Small quantities of material that is not significantly ecotoxic with low possibility of entering the marine environment.	N/A Not a MATTE
Sulphuric acid	No	Small quantities of material that is not significantly ecotoxic with low possibility of entering the marine environment.	N/A Not a MATTE
Cleaning materials, laboratory chemicals and paints	No	Materials may be harmful to the environment but only present in small quantities with low possibility of entering the marine environment.	N/A Not a MATTE

All of the identified MATTE events are described as low or very low risk, as the likelihood of a release occurring is low and measures for prevention of discharge to the estuary are present within the plant design and operating philosophy.

It is noted that the risks associated with the facility are in accordance with HSA criteria.

9 References

[1] Guidance on technical land-use planning advice. For planning authorities and COMAH establishment operators. HSA, version 2, February 2023.

[2] Health and safety authority Guidance to Inspectors on the Assessment of Safety Reports under the COMAH Regulations 2015, Rev. 4 Jan 2017

[3] Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015. SI No. 209 of 2015.

[4] Chemicals and Downstream Oil Industries Forum (CDOIF). Guideline – Environmental Risk Tolerability for COMAH Establishments v2.0.

[5] DEFRA. (2011). Guidelines for Environmental Risk Assessment, Green Leaves III. DEFRA

[6] Official Journal of the European Union. (2012). Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC

[7] Shannon Technology and Energy Park Environmental Impact Assessment Report, AECOM.

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Appendix A. Drainage

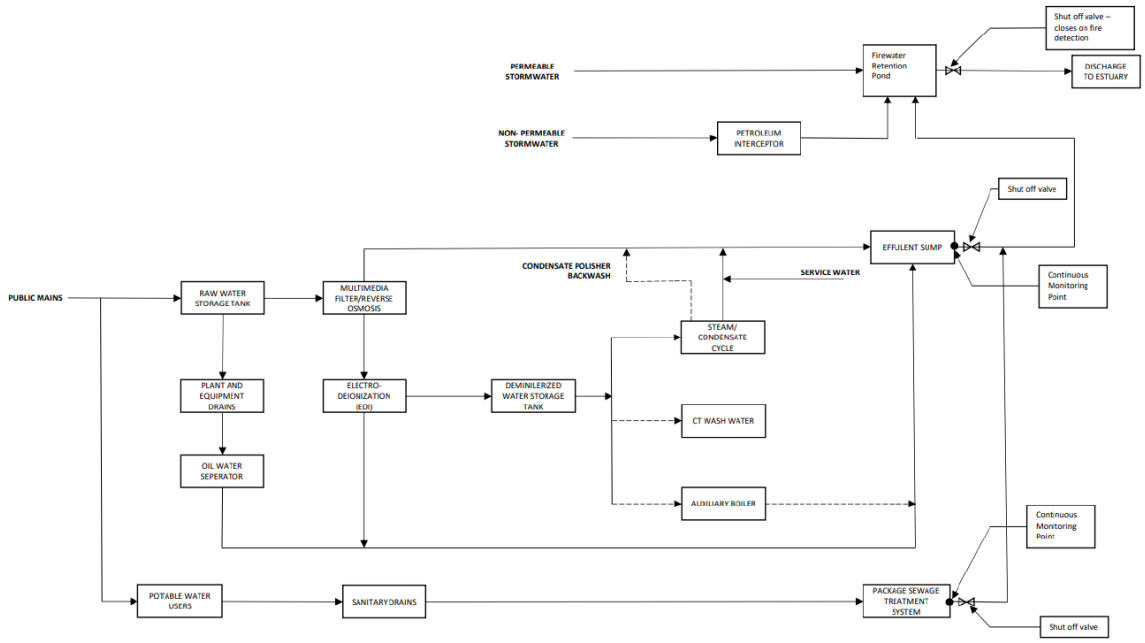

Figure 2-24 Proposed Development Water Flows

AECOM

Shannon Technology and Energy Park (STEP) Power Plant

Appendix A2.5: Oil and Hazardous and Noxious Substances (HNS) Spill Plan

Shannon LNG Limited

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Shannon Technology and Energy Park (STEP) Power Plant

Oil and Hazardous and Noxious Substances (HNS) Spill Plan

Development Framework

Developed by: Kieran O'Connor
Reviewed by: Martin Ahern
Approved by: Martin Ahern

Contents

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1. Introduction:

Shannon LNG Ltd. operator of the Shannon Technology and Energy (STEP) Park Power Plant fully recognizes it has a moral, legal and business obligation to provide a process, procedures and resources to respond to unintentional releases of hazardous substances including hydrocarbons, chemicals and gases into the environment within its area operational responsibility.

This document describes the framework in which Shannon Technology Energy Park (STEP) Power Plant will develop plans to provide a graduated and tiered response process to fulfil these obligations and to provide a robust and coordinated response to release incidents in the unlikely event they should occur. The assessment of likelihood and consequences of these release events are set out in the following documents are outside the scope of this document

- QRA and associated MATTE
- Environmental Impact Assessment Report for the proposed development
- Construction Environmental Management Plan

The developed plans will follow international best practice guidelines of the International Maritime Organization (IMO), , and International Petroleum Industry Environmental Conservation Association (IPIECA) while taking into account relevant Irish legislative and regulatory approval requirements. In particular the plans will follow the requirements made within the National Maritime Contingency Plan Oil and HNS Spills 2019 (NCP) and the National Framework for the Management of Major Emergencies. Developed Plans will interface with other emergency management frameworks, key stakeholders, and mutual aid partners.

The plan will be developed to cover both In-Land (onshore) and Marine based releases and shall cover the Construction and Operational Phases of the project.

2. Scope:

The STEP Power Plant will be responsible for the response, control and mitigation of pollution incidents within its area of jurisdiction. This will include a Combined Cycle Gas Turbine (CCGT) gas-powered power plant capable of 600 MW of electricity generation, 120 MWh (1-hr) Battery Energy Storage System (BESS), Above Ground Installation (AGI), and associated plant, equipment and infrastructure.

The Proposed Development will be required to store defined quantities of fuel onsite as specified in 'Secondary Fuel Obligations on Licensed Generation Capacity in the Republic of Ireland' (CER/09/001), was issued by the CER (now CRU4) on 12 January 2009.

For power plants, the storage requirement totals five days' worth of fuel consumption, calculated assuming the Proposed Development is operating at its maximum capacity.

The secondary fuel will only be used in the highly unlikely event that both the gas connection is unavailable and that other generation on the grid cannot meet demand.

The fuel will be contained in tanks within a bunded area adjacent to the power plant. Approximately 11,500 m3 of diesel shall be stored.

The STEP Power Plant will manage the response to any Tier 1 and Tier 2 incident for any pollution on the water within their area of jurisdiction with the full cooperation and integration of the response with the Shannon Foynes Port, the Shannon Estuary Anti-Pollution Team (SEAPT) mutual aid group

which includes the three local authorities of Kerry, Clare and Limerick and other agencies as appropriate.

3. Objectives:

The primary objectives of Oil and HNS Contingency Plans under the framework are:

- To assess the pollution risk from STEP Power Plant operations and ensure sufficient preventative and response measures are in place to ensure the risk of a pollution incident "as low as reasonably practicable" (ALARP);
- To ensure the safety of STEP Power Plant employees, contractors, response personnel and the community/members of the public throughout the response to a pollution incident;
- To detail the internal and external notification processes and set-in motion practices for an integrated efficient pollution response;
- To ensure the timely mobilisation of resources, both personnel and equipment, to combat a pollution incident within the geographical scope of this plan;
- To have in place actions and procedures to ensure the response to a pollution incident is both timely and effective in mitigating any adverse impact on vulnerable socio-economic and environmental receptors; and,
- To be compliant with regulatory and best practice guidance on pollution preparedness and response.

4. Interfacing Plans:

The STEP Power Plant Oil and HNS spill Contingency Plan will interface with the plans as shown in the example below. Depending on the severity of the pollution incident, one or all the plans shown will be implemented to support this plan.

Figure 1 Interface of Oil/HNE Response Plans

5. Oil and HNS Spill Plan Format:

In accordance with the requirements of the National Contingency Plan (NCP) Standard Operation Procedure 05, the Plan will be developed around the five operational phases of the core document:

Phase 1 – Discovery and Notification, Evaluation, Identification and Activation

Phase 2 – Development of an Action Plan

Phase 3 – Action Plan Implementation

Phase 4 – Response Termination and Demobilisation

Phase 5 – Post Operations, Documentation of Costs/Litigation

Additional technical, tactical and guidance information shall be held in the accompanying Chapters and Annexes:

CHAPTERS:

1 Abbreviations and Definitions
2 Irish Coast Guard notification
3 Incident Command Structure
4 Risk Assessment
5 Training and Exercising Regime
6 Shoreline Clean-up Assessment Technique
7 Response Strategies and Guidance
8 HNS Response Guidance
9 Dispersant Use
10 Occupational Safety and Health
11 Wildlife Rescue and Rehabilitation
12 Evidence Collection and Cost Recovery
13 Waste Management
14 Place of Refuge
15 Stakeholder Engagement and Media
16 Financial Management Protocols
17 Documentation procedures

ANNEXES:

1 Contact List
2 Certifications of Employees
3 Equipment and Resources
4 Communication Protocols
5 Service Contracts and MOU's
6 Incident Command Forms
7 Modelling Tools

The developed plans will identify realistic Tier 1 and Tier 2 scenarios, and the capability to deal with these. They will describe any escalation to Tier 3 and as discussed above interface with the National Marine Oil/HNS Spill Contingency Plan. A training and exercising programme forms part of Chapter 5, an example of which is given below.

The completed plan(s) will be submitted to the Irish Coast Guard and EPA for appropriate approvals.

6. Shannon Estuary Anti-Pollution Team:

The Shannon Estuary Anti-Pollution Team (SEAPT) is a Mutual Aid Group and the primary response organisations for oil and HNS spills within the Shannon Estuary. The SEAPT consists of the Shannon Foynes Port company, Kerry, Limerick and Clare Local Authorities and commercial and industrial entities operating within the Shannon Estuary. SEAPT was initiated to form a unified coordinated response to pollution incidents on the Shannon Estuary.

SEAPT is a member's organisation. Members contribute annually to maintain equipment, carry out exercises and training and purchase new and replacement equipment. SEAPT holds a significant stockpile of equipment. This equipment is available to respond to any pollution incident or threat thereof. STEP Power Plant would also be able to avail of spill dispersion modelling capability held by SEAPT. SEAPT are also the custodians of the Shannon Estuary Oil/HNS Contingency Plan developed in accordance with the NCP and approved by the Irish Coast Guard.

The STEP Power Plant have consulted extensively with SEAPT and the intention is to join the SEAPT organisation on successfully receiving development consents and prior to commencement of the construction phase.

Membership of SEAPT will enable the STEP Power Plant to interface directly with the approved Shannon Estuary Oil/HNS Plan and access additional response equipment to augment that held within the terminal.

Through the membership process, the STEP Power Plant will additionally be contributing to the on-going development and strengthening of the SEAPT organisation .

A letter from SEAPT confirming acceptance of membership is attached in Appendix A

7. Emergency Management System:

It is expected that Shannon Energy Park will be designated as a Lower tier COMAH/Seveso site. As such a comprehensive Emergency Management system will be developed and implemented. This system shall define and describe the Emergency Management organization, systems, processes and the actions to be taken when dealing with emergency situations including spill response. The Emergency Management system documents will contain

- Roles and responsibilities for emergency preparedness and response in the event of an emergency at the STEP Power Plant
- A process to identify, assess emergency scenarios together with appropriate strategies and tactics to control and mitigate such events
- Local Emergency plans, organization, procedures and resources
- Requirements for testing of systems, procedures and personnel
- Checklists for specific response scenarios

The Emergency Management system will be reviewed annually or following alterations to the facility that will result in significant changes to the requirements. The plan may also be updated following lessons learned from exercises onsite. The STEP Power Plant review and audit programme will include emergency management.

8. Estuary and Marine based Oil/HNS Spills:

The Oil Pollution Preparedness, Response Co-operation Convention defines the following response levels for oil spills in Ireland:

- **Tier 1 Local** (within the capability of the operator on site): A Tier 1 response is the lowest response level and requires resources to be available locally. Depending on the characteristics of the oil this may or may not include the use of dispersants. By definition these resources must be at or near the incident site. It is expected that these resources will be deployed as quickly as operational circumstances allow.
- **Tier 2 Regional** (beyond the in-house capability of the operator): For larger pollution incidents, local resources may be insufficient to deliver a proper response. In these cases it may be that resources from a regional centre will be required. A key component of IRCG offshore Tier 2 response is that operators are expected to have this capability mobilised and applied within 2 to 6 hours of an oil pollution incident.
- **Tier 3 National** (requiring national resources): For very large pollution incidents, resources supplied from national and international sources may be required. A key component of IRCG offshore Tier 3 response is that operators are expected to have this capability mobilised and applied within 6 to 18 hours of an oil pollution incident.

Oil spill emergency involves contacts and co-operation with local and/or regional authorities and governmental bodies and, depending on its size, may require the assistance of other operators, national, or international resources. An oil spill contingency plan or a checklist will be used to create the oil spill response plan.

Following the guidance of the NCP the Oil and HNS contingency plan will contain chapters covering the identification and assessment of spill and release scenarios and the response strategies, tactics and actions to be employed, in particular the following chapters:

Chapter 4 – Risk Assessment

Chapter 7 – Response Strategies and Guidance

Scenarios Identified

Mitigation methods:

The developed plans will detail potential spill or unintentional release scenarios (Chapter 4) and appropriate response strategies and guidance, Chapter 7.

Response strategies will follow best practice hierarchy described in the references shown:

Spill Response Hierarchy

Control of Source	Operating and Emergency SPO's are activated to stop release at source.
Monitor and Evaluate	Monitoring is a systematic process of collecting and recording information on the oil spill, while evaluating is the process of drawing together the information and making judgements
Shoreline Protection	If oil is expected to impact sensitive areas, booms may be used as a barrier to protect the shoreline.
Contain and Recover	The containment and recovery of an oil spill uses floating barriers (booms) to contain the oil in sufficiently concentrated quantities to enable recovery devices (skimmers) to remove the oil from the surface.
Wildlife Response	Wildlife response requires the knowledge and skills of experienced responders and handlers. Wildlife response will be addressed in detail in Chapter 11.
Waste Management	During an oil spill there are many streams of waste that have to be managed to ensure that operations can continue, and environmental impact is reduced. Waste management will be addressed in detail in Chapter 13.

9. Spills and Releases on Land:

STEP Power Plant expectation is that a major release of hazardous or noxious substances into the marine environment is not likely to occur.

The assessment of likelihood and consequences of spills and releases on land are set out in the following documents are our outside the scope of this document

- QRA and associated MATTE
- Environmental Impact Assessment Report for the proposed development
- Construction environmental management plant

Typical incident scenarios have been identified and are provided as a conservative framework to ensure decisions are based on knowledge of the potential range of events and effects, as well as allowing the STEP Power Plant to prepare for the worst-case scenarios in its emergency response preparations as required by applicable regulations and its prevailing duty of care.

Event	Potential Impact
Fire at Facility	Product contaminated firewater impacts offsite and enters Estuary via groundwater, drains and culverts.
Release of Diesel from Secondary Fuel Storage Tanks	Product enters Estuary via surface water drains and Wastewater Treatment Plant
Incident involving lorries delivering to site via security gate on R612 resulting in spill of materials	Product impacts areas along R612 and enters Estuary via culverts/drain in roadside
Leak/spill due to damage caused to storage containers during folklift truck operations in off-loading area.	Product enters Estuary via surface water drains and Waste Water Treatment Plant.
Release of Diesel from emergency generator storage tanks	Product enters Estuary via surface water drains and Wastewater Treatment Plant.
Spill/ release of odorant at AGI	Pungent-smelling gas at low concentrations (ppm) released to the environment. Highly flammable substance

Table 1 Events on Land and Potential Impacts

Stopping the spill at source:

The ESD system will continually monitor inputs from process field devices, including the ICSS and fire and Gas detection system. If a leak is detected by changes in the levels monitored, then the system initiates appropriate output actions to bring the plant to a safe condition. In addition to being automatically activated by the ICSS or F&G system, the ESD can also be manually initiated by the control room operator. Each part of the process equipment that contains hazardous liquids will be contained within a bund. In the event of a spill, trained personnel are to use the nearest available spill kit to contain the spill. Once confirmed safe to do so, the Emergency response team are deployed to clean up the spill. If unsafe to do so the emergency services are contacted, and the emergency response plan follows.

10. Personnel & Equipment:

The STEP Power Plant will develop, train and have in place emergency management and response teams in order to manage and response to any incidents including spills and unintentional releases. The teams will be trained in accordance with training schedule given below.

Response teams will have access to equipment and other resources for Tier1 and Tier 2 incidents. Equipment stockpile specifications will be developed as part of the risk assessment, scenario planning

and response strategy sections on the spill response plan. The stockpile will include fixed and mobile equipment for protection, containment and recovery and will be augmented by the Tier 2 equipment stockpile held by SEAPT at Shannon Foynes Port.

11. Training and Exercises:

As per the NCP, the Irish Coast Guard has adopted the International Maritime Organisation (IMO) levels of model Oil and HNS Spill courses; these form the basis of the national courses organised by Irish Coast Guard and will form the core The STEP Power Plant maritime spill response training regime. Associated Inland Spill training in line with IPIECA best practice for non-marine based releases. In addition to the IMO suite of spill response training, appropriate Incident Management Training will also be undertaken to ensure personnel's knowledge and understanding of specific roles and the corresponding responsibilities.

Example Technical Training Courses	Trained Staff
IMO 1 Operations Staff	To be determined
IMO 2 Supervisors and On-Scene Commanders	
IMO 3 Senior Management Personnel	
IMO HNS Operational Level (First Responders, Supervisor and On-Scene Commanders),	
IMO HNS Manger Level (Administrators and Senior Managers)	
ICS 100 - An Introduction to the Incident Command System	
ICS 200 - Applying the Incident Command System	
ICS 300 - Incident Command System	

Table 2 Example of technical Training Courses

Exercises form a fundamental part of training and competency development. Members of Incident Management and Response Teams must be familiar with spill and other emergency procedures and be prepared to carry out emergency response operations in a safe, rapid, effective, and efficient fashion.

This level of familiarity and preparedness is achieved through regular and routine drill and exercises. Below is an example of the type of Exercise program that will be implemented.

Type of Exercise	Monthly	Every 3 Months	Annually	Every 2 Years
IMT Communications Test	✓			
Full Communications Exercise		✓		
Tabletop/ Command Room Exercise		✓		
Limited Exercise			✓	
Full Scale Exercise				✓

Table 3 Example of Exercise training Schedule

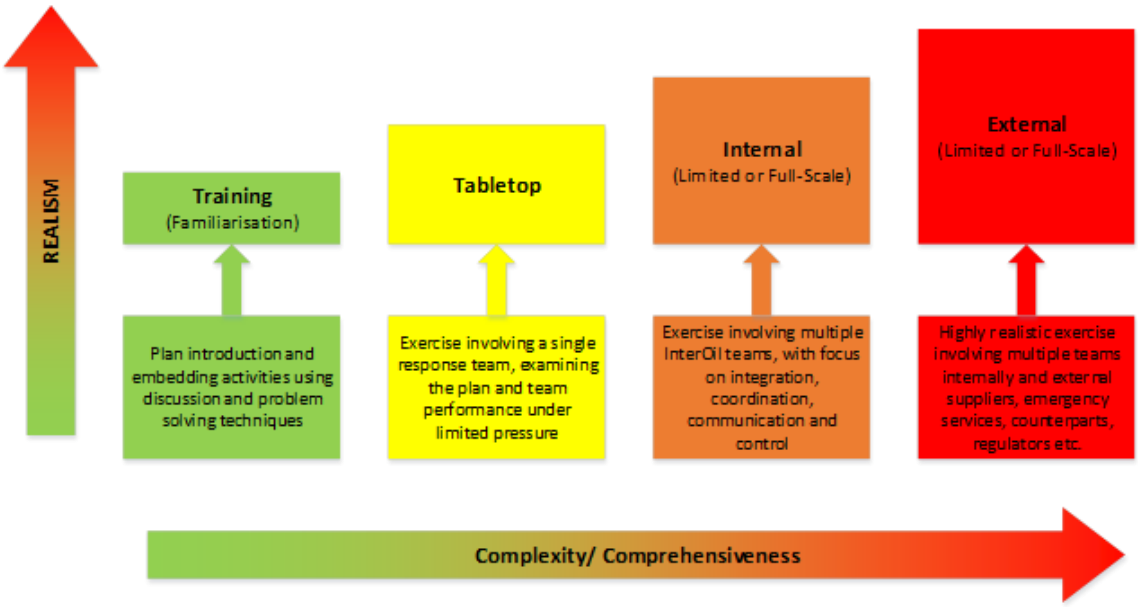

Figure 2 Description of Training and Exercise Content

12. References:

International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) 1995

Sea Pollution Act 1991, Sea Pollution (Amendment) Act 1999

National Maritime Contingency Plan for Oil and HNS Spills 2019 – Department of Transport. Irish Coast Guard: Gov.ie. NCP

International Petroleum Industry Environmental Conservation Association – Technical Document Series https://www.ipieca.org/resources/

https://www.itopf.org/knowledge-resources/

A Framework for Major Emergency Management: www.MEM.ie

European Union Control of Major Accident Hazards (COMAH) Involving Dangerous Substances Regulations 2015

Sandia Laboratories, Information Day Report, 2009

CFD methodology for simulation of LNG spills and rapid phase transition (RPT), Horvat, MMI Engineering Ltd, 2018 Institution of Chemical Engineers, Process Safety and Environmental Protection 120 (2018)

Shannon Estuary Anti-Pollution Team: Shannon Estuary Oil and HNS Spill Contingency Plan: http://www.seapt.ie

Environmental Protection Agency Guidance Assessing and Costing Environmental Liabilities (2014).

SOLAS; Safety of Life at Sea
https://www.imo.org/en/KnowledgeCentre/ConferencesMeetings/Pages/SOLAS.aspx

Shannon Energy Park QRA study, Vysus UK Limited

EIAR Shannon Energy Park QRA, AECOM

13. Appendix A: Letter of Intent for SEAPT Membership

Harbour Office
Mill House, Foynes,
County Limerick, Ireland

Tel: +353 69 73100
Fax: +353 69 65142
Email: info@seapt.ie

SEA-PT
Shannon Estuary Anti-Pollution Team

Martin Ahern
Shannon Energy Park,
Listowel,
Co. Kerry.

06th May 2021.

Dear Martin,

Thank you for your recent enquiry regarding Membership of Shannon Estuary Anti- Pollution Team.

I am very pleased to confirm that Shannon Energy Park will be able to join SEAPT when they are ready.

Membership of SEAPT fulfils requirements for Tier 2 obligations with respect to the National Maritime Contingency Plan for Oil and HNS Spills in terms of inclusion in the Shannon Estuary oil and HNS plan, access to pollution control equipment, training and exercises. The current Shannon Estuary contingency plan is approved by the Irish Coast Guard. SEAPT equipment is available to members to augment Tier 1 response as per the arrangements of the membership.

Detail on membership and associated subscriptions can be confirmed at a later date.

Yours Faithfully,

Hugh Conlon

Director.

Shannon Technology and Energy Park (STEP) Power Plant

Environmental Impact Assessment Report - Volume 2

Chapter 02 Description of the Proposed Development

Shannon LNG Limited

April 2024

Delivering a better world

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2. Description of the Proposed Development

2.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) provides a detailed description of the proposed Combined Cycle Gas Turbine (CCGT) gas-powered Power Plant capable of up to 600 MW of electricity generation, 120 MWh (1-hr) battery energy storage system (BESS), Above Ground Installation (AGI), and associated plant, equipment and infrastructure including a substation (herein referred to as the "Proposed Development"). The Site of the Proposed Development (herein referred to as "the Site") is located in the townlands of Kilcolgan Lower and Ralappane, between Tarbert and Ballylongford, Co. Kerry.

The application Site boundary ('red line') encloses an area of approximately 41 hectares (ha) and is entirely owned by the Applicant.

The main objectives of the Proposed Development are to:

1. Provide 600 MW of fast acting flexible thermal generation capacity to the Irish electricity market.
2. Provide a 120 MWh (1-hr) Battery Energy Storage System (BESS) to participate in the electricity ancillary services market.
3. To ensure that Shannon LNG's award of a capacity contract on 28th March 2023 from EirGrid to deliver 400 MW of electricity generation capacity is delivered at the Site by no later than 1st October 2026, or any subsequent date extension granted by the Regulator.
4. To support the provisions of recent national policies with respect to security of electricity supply, including the *Climate Action Plan 2024*, the *National Energy Security Framework 2022*, the government's *Policy Statement on Security of Electricity Supply 2021* and the recently published '*Energy Security in Ireland to 2030*', which all point to the need for a significant uplift in the delivery of flexible gas-fired power generation capacity to 2030.

The Proposed Development will be fuelled by natural gas (with distillate oil as a secondary fuel back-up, as required under the Grid Code).

The construction phase of the Proposed Development is outlined in **Section 2.7**. A detailed construction programme will be determined by the appointed Contractor. However, an anticipated construction programme is presented in **Section 2.7.1.1**, (refer to **Table 2.7**), including construction phases and key milestones and provides a robust basis for assessment purposes.

At the end of its design life, the Proposed Development will either be upgraded to extend its operational life (depending on system need) or decommissioned. A decision on extension of the operational lifetime or decommissioning of the Proposed Development would be expected to be made after 25 years operation approximately, refer to **Section 2.10**. However, it should be noted that the Power Plant has the capability to operate at a 50% blend of hydrogen by design, offering the potential for the Power Plant to become even more efficient in emission terms over the period to 2050 as and when the required policies and supply chains for hydrogen are implemented.

This chapter of the EIAR describes the design, construction, operation, commissioning and decommissioning of the Proposed Development, as well as the Site and surrounds, together with the proposed design parameters. In accordance with Article 5(1)(a) of the 2011 Directive as amended by Directive 2014/52/EU, as transposed into Irish planning law on 1st September 2018 by the European Union (EU) (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 298 of 2018) ('EIA Regulations'), the description of the proposal should comprise: *'… information on the site, design, size and other relevant features of the project'.*

This chapter of the EIAR is supported by a number of figures which detail the Proposed Development layout and design, refer to **Volume 3** of the EIAR.

A statement of competence of the relevant expertise and qualifications of the author to the EIAR is required by EIA Regulations. In accordance with EIA Regulations, the Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, (2018) and Environmental Protection Agency (EPA) Guidelines (2022), AECOM confirms that experts involved in the preparation of this EIAR are fully qualified and competent in their respective fields and details of each relevant expert are presented in **Chapter 01** (Introduction).

2.2 Background to the Site

2.2.1 Site Location

The Proposed Development will be located on the Shannon Estuary, approximately 4.5 km from Tarbert and 3.5 km from Ballylongford, Co. Kerry. The Site of the Proposed Development is 41 ha, refer to **Figure 2.1** below and **Figure F2.2**, of Volume 3.

Tarbert Power Station is located approximately 5 km to the north-east of the Site. Moneypoint Power Station located on the northern shore of the Shannon Estuary, approximately 3 km to the north of the Site.

There are a small number of residential properties located within 500 m of the Site. Residential properties are also located along the existing L1010 road (Coast Road) immediately south of the Site, with additional residential properties, again to the south of the Site, to the east and west along the L1010 road.

The Site is located in the vicinity of existing and permitted energy infrastructure, including power stations at Tarbert and Moneypoint, Kilpaddoge substation, the Kelwin-2 battery energy storage system (BESS), Leanamore Windfarm, the permitted 400 kV electricity transmission cables between Kilpaddoge substation and Moneypoint substation and a permitted grid stabilisation facility at Kilpaddoge substation, all supported by the provisions of the Kerry County Development Plan (CDP) 2022-2028, the Regional Spatial and Economic Strategy (RSES) for the Southern Region, the Shannon Integrated Framework Plan (SIFP) 2013-2020, and the Listowel Municipal District Local Area Plan 2020. It is also close to national gas and electricity transmission grids; 220 kV and 110 kV electrical transmission are available from the Electricity Supply Board Network (ESBN) / EirGrid Kilpaddoge 220 kV substation located approximately 5 km east of the Site and a Gas Network Ireland (GNI) owned gas transmission pipeline located approximately 26 km east of the Site. Planning permission exists for the development of a 26 km natural gas pipeline which will facilitate connection from the Site to the GNI transmission

network at Leahy's, located to the west of Foynes, Co. Limerick. The 220 kV and associated substations will be subject to a separate planning application.

Figure 2.1: Site Location

2.2.2 Site Description

The Shannon Development Landbank on which the Site is located has a total area of 41 ha. Under the Kerry CDP 2022-2028 the Site is zoned for industrial use[1] and supports the progress of strategic energy projects along with the expansion of the gas network (Objective KCDP12-3). It has also been identified as a Strategic Development Location in the Shannon Integrated Framework Plan (SIFP) 2013-2020, the Regional Spatial and Economic Strategy (RSES) for the Southern Region 2020, and the Listowel Municipal District Local Area Plan 2020, and the Shannon Estuary Economic Taskforce, refer to **Chapter 04** (Policy, Energy and Planning) for further details.

The area of the Site to be developed is characterised by predominantly improved grassland in an agricultural setting. The field boundaries predominantly consist of hedgerows with small drainage ditches. The Site is in pasture, comprising primarily improved grassland with some wet grassland adjacent to the Shannon Estuary, as shown on the aerial photograph in **Figure 2.2**.

[1] Kerry County Development Plan 2022-2028 page 177: *"This plan provides 430.6 hectares for industrial related development and employment creation opportunities in the Tarbert / Ballylongford strategic landbank".*

The Site is currently drained by a number of shallow drainage channels. Several longer drainage features cross the southern portion of the Site, generally flowing in a west or north-west direction. The drainage features along the access road all ultimately drain to a single surface water course, the Ralappane Stream, which discharges into the Shannon Estuary. The Site is bordered to the north by the Shannon Estuary and to the south by the L1010 road, connecting Tarbert to Ballylongford. Fields in pasture and forestry lie beyond the eastern boundary and the Shannon Development Landbank extends westward beyond the Site's western boundary.

The topography of the land within the Site is generally undulating. Some of the fields are waterlogged in wet weather and there are pockets of marshy ground. There are a number of old disused farm buildings and structures on the Site.

The Lower River Shannon Special Area of Conservation (SAC) is adjacent to the Site along the northern / north-western boundary and also along part of the eastern boundary, refer to **Figure F7.1**, Volume 3.

The Ballylongford Bay proposed Natural Heritage Area (pNHA) is located adjacent to a part of the north-western boundary of the Site.

The Shannon-Fergus Estuary Special Protection Area (SPA) is to the west of the Site, at a distance of approximately 750 m from the western extremity of the Site.

Figure 2.2: Site of the Proposed Development (Aerial)

2.3 Main Features of the Proposed Development

The Proposed Development will consist of the following main components (as shown on **Figures 2.3** and **2.4**):

- Three (3 No.) blocks of Combined Cycle Gas Turbines (CCGT), each block with a capacity of approximately 200 megawatts (MW) for a total installed capacity of up to 600 MW (**Section 2.3.1.**).
- A 120 MWh (1-hr) Battery Energy Storage System (BESS) (**Section 2.3.2)**.
- High voltage 220 kV Gas Insulated (GIS) Substation (**Section 2.3.3**).
- Auxiliary Boiler (**Section 2.3.4**).
- Raw water treatment and storage (**Section 2.3.5**).
- Firewater storage tanks and fire water pumps (**Section 2.3.7.4**).
- Ancillary buildings (**Section 2.3.7**).
- Secondary Fuel Offloading and Storage (**Section 2.3.8**).
- Above Ground Installation (AGI) compound (**Section 2.3.9**).
- Sewerage drainage system (**Section 2.3.13.2**).
- Process effluent collection system and sump (**Section 2.4.1**).

Figure 2.3: Layout of the Site for the Proposed Development

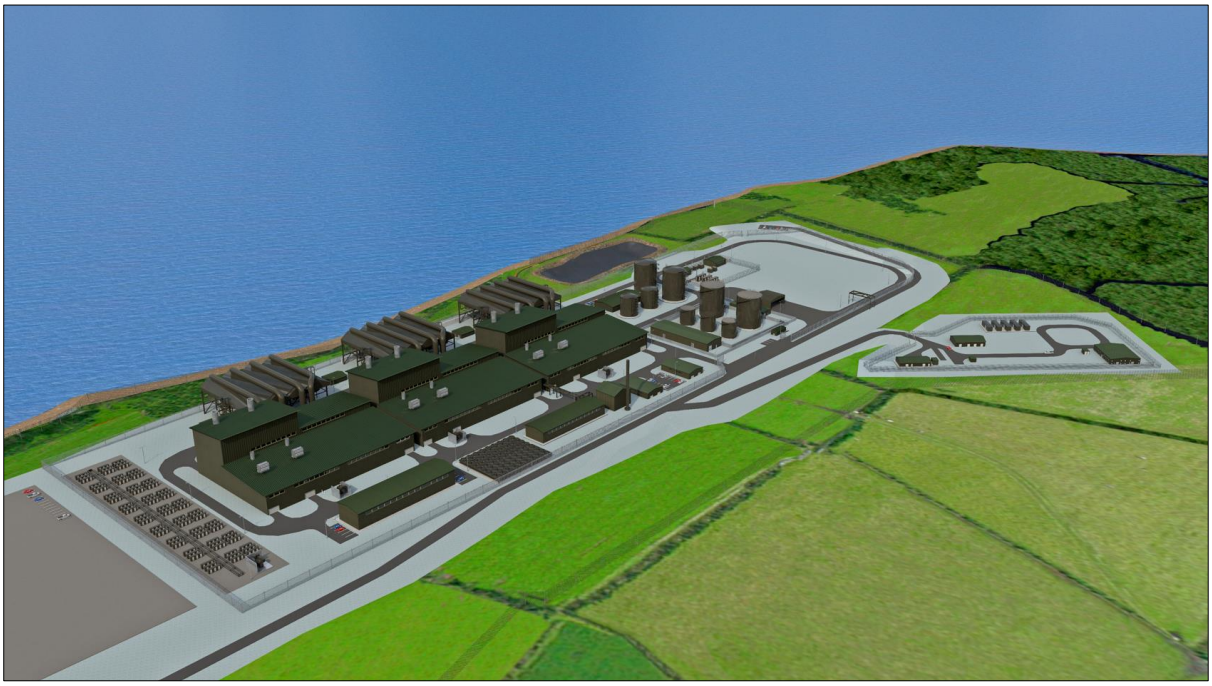

Figure 2.4: Overview of the Proposed Development

The Proposed Development will be operated using natural gas as its primary fuel (delivered to Site via the consented 26 km natural gas pipeline [Planning Reference GA08.GA0003] which will facilitate connection from the Site to the GNI transmission network west of Foynes) and generate power to be exported via the proposed 220 kV connection to the national electricity grid.

The 220 kV connection, which is subject to a separate application, will (subject to approval), be installed prior to commencing operation of the Proposed Development.

The Proposed Development is designed to operate alongside intermittent renewable electricity power generation and is expected to mainly operate at full capacity during periods of low renewable supply, and otherwise to be turned down or turned off. For example, during periods of high wind (renewable) generation it is expected that the Proposed Development will be turned off by the system operator (EirGrid) to give priority to renewable power. Similarly, during periods of sudden low renewable generation, the system operator will call on the Proposed Development to be ramped up to supply electricity. Due to the design of the CCGT with low minimum generation, and its high efficiency giving it an economic advantage relative to other facilities, it is expected that the Proposed Development is likely to be called on earlier by the system operator than other gas fuelled power plants. The operation of the Power Plant is discussed further in **Chapter 03** (Need and Consideration of Alternatives) and **Chapter 15** (Climate).

A BESS will provide electricity into the grid as the Proposed Development is being ramped up, refer to **Section 2.3.2**. Once the Proposed Development is up and running the supply from the BESS will be switched off.

The Proposed Development will have an installed capacity of up to 600 MW and will be designed in accordance with Best Available Techniques (BAT) for large combustion plants, industrial cooling systems, energy efficiency and emissions from storage.

The fuel supply to the Proposed Development will be from the gas grid through the Above Ground Installation connection (AGI) as defined in **Section 2.3.9**.

As required by the Secondary Fuelling Obligation, under the Commission for Energy Regulation's Secondary Fuel Obligations on Licensed Generation Capacity in the Republic of Ireland' (CER/09/001)CER/09/001, Secondary Fuel Obligations on Licence Generation Capacity in the Republic of Ireland, a supply of low sulphur gas oil (*i.e.*, distillate oil) for five days continuous operating will be stored on-site, equating to approximately 11,500 cubic metres (about 9,800 tonnes). The distillate oil will be contained in fuel oil tanks. The distillate oil is required to maintain the running of the gas turbines in the event of a disruption of the gas supply. Unless there is an unexpected interruption to the GNI gas supply, it is not envisaged that distillate oil would be used in the normal course of events other than for testing. Under EirGrid rules, the secondary fuel testing must be completed within five hours twice per annum.

The Proposed Development will use approximately 25.5 GWh/d[2] of natural gas when operating at full capacity. A small amount (approximately 10 MW) of the electricity generated by the Proposed Development will be used in the operation of the Proposed Development itself. The balance of the electricity produced is intended for the market and will be sold into the integrated Single Electricity Market (iSEM).

The electricity generated by the Proposed Development will be exported through a (subject to planning consent ABP-318119-23) new substation to be included in the proposed application for the 220 kV grid connection. The exact route cannot be confirmed until the detailed design is completed. This process is currently underway. The development of the grid connection will be subject to a separate planning application and associated EIAR by the Applicant.

It is anticipated that the new substation will be connected to the 220 kV transmission grid at the ESBN / EirGrid Kilpaddoge 220 kV substation, but the location and precise nature of the connection are subject to further discussions between the Applicant and EirGrid and as such do not form part of the scope of this EIAR (and will be the subject of a separate application). The new substations and grid connection are assessed in the cumulative impact assessment within each technical chapter.

The Proposed Development will use CCGT technology (refer to **Section 2.3.1**), and its design will comply with all relevant national and international codes.

The contract to supply and construct the Proposed Development will be awarded following a commercial tendering process prior to the start of construction. The tendering process will result in a contract for a particular model of electric generation plant. Therefore, the precise size, configuration, performance, and layout of the equipment will be finalised following the award of the contract and a site-specific detailed design process, however this will not affect the design of the buildings or emissions as described in this EIAR. The construction contract will identify a preferred Contractor to construct the Proposed Development, in accordance with the mitigation and monitoring measures set out in this EIAR. The Applicant will administer the construction contract and liaise with the Local Authority (Kerry County Council (Kerry Co. Co.)) to discharge planning conditions as appropriate.

[2] Gigawatt hour per day

Further descriptions of the main features of the Proposed Development are outlined in the following sections.

2.3.1 Combined Cycle Gas Turbines (CCGT)

The Proposed Development will contain three blocks (3 No.) each with one CCGT, and each block with a nominal capacity of up to 200 MW, refer to **Figure F2.4**, Volume 3. The multi-shaft arrangement of each block will provide fast acting response, such as will be required in a system with a low level of stable generation and is therefore ideally suited to support a high level of intermittent renewable power generation.

There are 3 No. CCGT blocks, with each identical CCGT block comprising:

- Two (2 No.) gas turbines with generators.
- Two (2 No.) heat recovery steam generators (HRSG) with exhaust stacks.
- One (1 No.) steam turbine.
- Electricity generator.
- One (1 No.) air-cooled condenser.
- Air-cooled heat exchanger.
- Generator step-up transformer (GSU).
- Natural gas fuel system.
- Turbine Hall.
- Condenser Polisher Equipment Enclosure.
- Air-cooled condenser (ACC) Air Extraction and Equipment Enclosure.
- High voltage electrical switchgear and 220 kV Substation.

Each proposed CCGT block will use the following process:

- The gas turbine burning natural gas will be connected to a generator for electricity production.
- Exhaust gases from the gas turbine will pass through two heat recovery steam generators to generate steam.
- The steam generated will be routed through a steam turbine, which will also be connected to a generator to produce further electrical power.
- The spent steam exiting the steam turbine will then be directed into the air-cooled steam condenser. The resulting condensate will then be pumped back into the heat recovery steam generator to repeat the steam cycle.
- Power from the three generators will be combined and the voltage increased to the export voltage by the generator step-up transformer (GSU).

The electricity generated will be fed to a set of transformers where the voltage will be stepped up to the transmission voltage, specified by EirGrid in the interconnection offer[3].

[3] Shannon LNG executed a Connection Agreement with EirGrid for a 600 MW Maximum Export Connection in April 2023.

2.3.1.1 Gas Turbine Generator

The gas turbine will consist of an air compressor, a combustion chamber and a turbine. The air compressor will take in large quantities of filtered air from the atmosphere and compress it. Fuel gas and compressed air will then be injected into the combustion chamber and the fuel / air mixture ignited. The addition of heat energy and combustion gases in the combustion chamber will raise the temperature of the combined gases to over 1,300°C. The hot gases will expand through the turbine section. The high velocity gas passing through the turbine will spin the main shaft which drives both the air compressor, which will produce the compressed air, and the generator, which will produce the rated electrical power output. The expansion of the hot gases passing through the turbine, and the extraction of mechanical work from them via the turbine will reduce the temperature of the gases to less than 600°C. The gas turbine will be coupled to a generator for power generation at 50 hertz (Hz).

2.3.1.2 Heat Recovery Steam Generator (HRSG)

The gas turbine, as described above, is referred to as operating in open or simple cycle mode. It will be possible to generate approximately 50% more electricity by operating in combined cycle mode. In combined cycle mode the hot exhaust gases leaving the gas turbine will be directed through the Heat Recovery Steam Generator (HRSG), which will extract heat to make steam. The heat recovery steam generator will be multi-pressure type. The temperature of the hot combustion gases will be reduced in this process to less than 100°C.

The HRSG will discharge the exhaust gases to atmosphere through an integral exhaust stack exiting at approximately 35 m above ground.

2.3.1.3 Steam Turbine Generator (STG)

Water supply for the Heat Recovery Steam Generator (HRSG) is discussed in **Section 2.3.1.2**. The water treatment facility will provide demineralized water for steam cycle makeup to each CCGT block.

The high-pressure steam produced by the HRSG will flow through inter-connecting pipework to the steam turbine. The steam turbine will be of a multiple stage type suitable for coupling to a generator for power generation at 50 Hz. The low-pressure exhaust steam will flow out of the steam turbine to the air-cooled condenser (ACC).

2.3.1.4 Air Cooled Condenser (ACC) (48.6 m x 55.8 m)

The ACC will be of a standard design. Steam from the steam turbine will enter the ACC and pass through air-cooled fin tubes. The steam will not be in direct contact with the air. The heat is transferred from the steam to the surrounding ambient air, which leads to the steam condensing. This condensate represents boiler quality feed water. The condensate will then be returned to the HRSG in a closed loop. *i.e.,* condensate will not be discharged to the environment. The key advantage of an air-cooled steam condensers is that cooling water and associated systems are not required.

Non-condensable gases (*i.e.*, air ingress into the ACC) will be removed from the ACC by use of vacuum pumps located in an equipment enclosure near the ACC. The condensed steam will be collected in the condensate collection tank located below the ACC where it is pumped by the condensate pumps back to the HRSG through the condensate polisher (whose purpose is to remove impurities and reduce corrosion in the water / steam cycle). The condensate polisher is located in an equipment enclosure near the condensate pumps.

2.3.1.5 Generator Step-up Transformer (GSU) (10 m x 10.4 m)

Power from the gas turbine and steam turbine generators will be collected at the generator voltage level and will be connected to the 220 kV GIS Substation through one generator step-up transformer for each of the three (3 No.) CCGT blocks.

2.3.1.6 Natural Fuel Gas System

The gas used to fuel the Proposed Development will be supplied from the AGI via the metering and regulating station at a pressure suitable for the specific gas turbine equipment selected. This fuel gas will pass through gas conditioning equipment dedicated to each block / gas turbine that is anticipated to be comprised of:

- Filter separator.
- Performance heater.
- Final pressure control station.
- Gas quantity and quality measurement as required for performance management and environmental protection monitoring.

2.3.1.7 Buildings associated with each CCGT Block

There are 3 No. CCGT blocks and each CCGT block will include the following buildings and enclosures to house the main plant equipment noted above:

- Turbine hall (65.9 m x 93.7 m x 30.145 m) x 3 (*i.e.* one per each 3 No. CCGT block).
- Condenser Polisher Equipment Enclosure (6.3 m x 16.3 m) x 3 (*i.e*. one per each 3 No. CCGT block).
- ACC Air Extraction and Equipment Enclosure (12.8 m x 15.3 m) x 3 (*i.e*. one per each 3 No. CCGT block).
- ACC Electrical Power Distribution Centre (PDC) (8.5 m x 12.2 m) x 3 (*i.e*. one per each 3 No. CCGT block).

These are described in the following sections. The buildings will be constructed using two main building methods:

- **Type 1** will be used for all buildings with the exception of the PDC. These will be steel framed buildings with concrete floor slabs; and
- **Type 2** will be used on the PDC. This building will be a pre-manufactured metal equipment enclosure using a steel base and framing to form an all-weather enclosure. The enclosure will be mounted on steel support legs or concrete piers to elevate the enclosure and allow bottom entry for electrical / control wiring.

Structural and architectural details have been prepared including particulars of the shallow and deep foundations, lifting equipment, steel structures, and protective coatings. The paint colours of the buildings will be selected to minimise the visual impact of the Proposed Development. This is discussed further in **Chapter 10** (Landscape and Visual) of this EIAR and the landscape drawings are provided in **Figures F10.1** and **F10.2**, Volume 3.

2.3.1.7.1 Turbine Hall (65.9 m x 93.7 m)

There are 3 No. CCGT blocks and each CCGT block includes this building.

This building will house the combustion turbine generator (CTG), HRSGs, STG and other balance of plant systems required for a complete CCGT Block. The turbine hall will accommodate the selected Original Equipment Manufacturers (OEM) recommended component layout, including laydown and maintenance requirements within the building. A bridge crane will be provided for steam turbine maintenance while the gas turbines are each supplied with an overhead crane for maintenance and removal of the gas turbine engine. The building will have internal rooms to house the necessary electrical and control equipment required for each CCGT block including a stand-by diesel generator. The diesel fuel tank for stand-by diesel generator will be stored in a bunded area, or in a double walled tank.

2.3.1.7.2 Condenser Polisher Equipment Enclosure (6.3 m x 16.3 m)

There are 3 No. CCGT blocks and each CCGT block includes this enclosure.

The condenser polisher equipment enclosure will house the condensate polisher associated with the ACC, as described in **Section 2.3.1.4**.

2.3.1.7.3 Air-Cooled Condenser (ACC) Air Extraction and Equipment Enclosure (12.8 m x 15.3 m)

There are 3 No. CCGT blocks and each CCGT block includes this enclosure.

The ACC air extraction equipment enclosure will house the vacuum pumps associated with the ACC, as described in **Section 2.3.1.4**.

2.3.1.7.4 ACC Electrical Power Distribution Centre (PDC) (8.5 m x 12.2 m)

Three (3 No.) power distribution centres (PDCs) will house electrical and control equipment necessary to distribute power and control throughout the Proposed Development. Each PDC will be a pre-manufactured all-weather steel enclosure. The enclosure will be mounted on steel support legs or concrete piers to elevate the enclosure and allow bottom entry for electrical / control wiring. This enclosure will house the electrical breakers and motor control centres (MCC) associated with the ACC.

2.3.2 Battery Energy Storage System (BESS) (33.9 m x 163 m)

A 120 MW (1-hr) (120-Megawatt hour (MWh)) BESS is included in the Proposed Development. The BESS will comprise 27 No. battery containers, approximately 4.5 MWh each, containing lithium-ion batteries. Refer to **Drawing 198291-SS-A4079** submitted with this application.

Each battery container is paired with two power conversion system (PCS) skids that contain the electrical systems (inverters, etc.) to deliver the power from the batteries to the grid via a 220 kV generator step-up transformer.

Due to its fast response, the BESS allows the Proposed Development to provide electricity during ‘ramp up’ and supports intermittent renewable generation.

Once the Proposed Development is operating at the necessary capacity the electrical demand is met, the BESS will be shut down and recharged.

The BESS can also charge from the grid. For example, if there were high renewable generation levels on the Irish power system at any one time, the BESS could charge from the grid instead of the power

plant[4]. This might be done as wholesale power prices would be lower than the Power Plant at that instant.

At all times, the BESS will deliver energy and system services in response to instructions from EirGrid. Fast acting power, such as power from BESS systems, will be necessary for the Irish grid in the future as Ireland transitions into a high renewable system. Refer to **Chapter 03** (Need and Consideration of Alternatives) and **Chapter 15** (Climate) for further information on this.

2.3.3 High Voltage 220 kV GIS Substation (18 m x 60.9 m)

A high voltage 220 kV substation is included in the Proposed Development. The substation will be gas insulated (GIS) and enclosed in a building. The substation will accept the 220 kV output from each CCGT block and BESS and connect to the national electricity grid. When the Proposed Development is not in operation, power from the national electricity grid will back-feed to the Power Plant via this same grid connection.

2.3.4 Auxiliary Boiler (within the Auxiliary Boiler Building, 14.3 m x 14.3 m)

The auxiliary boiler will burn natural gas, be of a standard design and be enclosed in a building with a separate 32 m high exhaust stack. Steam from the auxiliary boiler will be used by the Proposed Development to keep the equipment warm which allows for faster start up to support intermittent renewable generation.

2.3.5 Raw Water Storage Tanks (24 m x 18 m)

Water used by the Proposed Development will be supplied from a potable water connection. The Applicant has made a connection request to Uisce Éireann, which will require connection to a mains water system.

This raw water will be stored in two raw / service / fire water storage tanks. The tanks will supply service water to the Proposed Development and raw water to the water treatment facility with reserve storage for fire water. The tanks will be field fabricated welded steel tanks.

2.3.6 Main Buildings

The Proposed Development will also include the following buildings, common to the three (3 No.) CCGT blocks and BESS operations:

- Water treatment building.
- Administration building.
- Central control / operations building.
- Auxiliary boiler building.
- Workshop / stores / canteen building.
- Firewater pumps enclosure.

[4] For the purposes of calculating emissions from the BESS, a conservative assumption was taken that the BESS would charge from the Power Plant only (i.e. from Natural Gas). This is considered conservative in the context of CO2 emissions from the BESS over the stated 25.5-year operational lifetime and Ireland's target of 80% renewable power by 2030.

The other buildings and enclosures are described in **Section 2.3.7**.

2.3.6.1 Water Treatment Building (18 m x 35 m)

The water treatment building will make demineralized water for steam cycle makeup to each CCGT block. The demineralized water will be stored in two (2 No.) demineralized water storage tanks (15.5 m x 13 m) which will be field fabricated welded steel tanks.

2.3.6.2 Administration Building (14 m x 22.7 m)

The administration building will include offices, training rooms and meeting rooms for the administrative personnel stationed at the Proposed Development.

2.3.6.3 Central Control / Operations Building (14 m x 22.7 m)

During operations the Proposed Development will be monitored and controlled from the central control / operations building by the Site operator team. This building will include a control room, meeting room and offices for the operations personnel stationed at the Proposed Development. The Proposed Development will be operated from the main control room (MCR). From the MCR it will be possible to monitor and adjust all of the plant equipment and instrument control systems including all safety control systems.

2.3.6.4 Workshop / Stores / Canteen Building (14 m x 52.3 m)

The workshop / warehouse / canteen building will provide storage for equipment and material spares required to maintain an operational facility. The building will also have maintenance offices, a workshop area and canteen.

2.3.6.5 Firewater Pumps Enclosure (4.5 m x 10.5 m)

The Proposed Development will house firewater pumps that are described in **Section 2.3.7.4.**

2.3.6.6 Proposed Architectural Colour Scheme

A summary of the proposed architectural colour scheme is provided in **Table 2.1**.

Table 2.1: Summary of Proposed Architectural Colour Scheme

Building Unit	Colour
Fencing, enclosure / equipment container sides and tops, racks, evaporators, water tanks	RAL 6006 (Grey-Olive)
Building and enclosure façades	RAL 6003 (Olive green)
Building and enclosure roofs	RAL 6020 (Chrome green)
Doors, window frames, auxiliary boiler and fuel gas stacks and cooler pipes	RAL 7043 (Traffic grey B)
Façade for the turbine halls	RAL 6011 (Reseda Green)
Turbine air intakes and diesel generator/ HRSG exhaust stacks	RAL 9023 (Pearl dark grey)

2.3.7 Ancillary Buildings / Enclosures

The following buildings will also be provided:

- Security building.
- Fuel gas regulating enclosure.
- Fuel gas metering enclosures.

- Fire water storage tanks and water pumps.

The buildings will be steel framed buildings with concrete floor slabs. Structural and architectural details have been prepared including particulars of the shallow and deep foundations, lifting equipment, steel structures, and protective coatings.

2.3.7.1 Security Building (11 m x 5.8 m)

The security building will include a reception area to check in visitors, along with a break area and welfare facilities for security staff.

2.3.7.2 Fuel Gas Regulating Enclosure (12.6 m x 13.2 m)

The function of the fuel gas regulating enclosure will be to regulate the pressure and temperature of the gas used by the Proposed Development.

2.3.7.3 Fuel Gas Metering Enclosures

There will be several small unoccupied enclosures included in the gas metering area (12.6 m x 13.2 m) to house instrumentation, such as a gas chromatograph, to measure the calorific value of the gas for onsite use.

These will include:

- Metering and regulating area kiosk enclosure (3 m x 3 m).
- Metering and regulating area analyzer enclosure (3 m x 4.4 m).
- Metering and regulating area instrument enclosure (3 m x 4.4 m).

2.3.7.4 Fire Water Storage Tanks and Fire Water Pumps

Fire water will be supplied from the municipal water supply system and will be stored onsite in two (2 No.) separate tanks (24 m height x 18 m diameter), which will be field-fabricated welded steel tanks, each with a dedicated capacity representing a minimum of two hours of fire water requirement during firefighting.

In addition, one (1 No.) 100% capacity electrically driven fire pump, one (1 No.) 100% capacity diesel engine driven fire pump, and one jockey pump will be located within the fire water pump enclosure. The pumps will be designed to provide the required volume of firewater needed for any automatic suppression system plus flow for fire hydrants or hose stations. A diesel fuel tank for the diesel driven fire pump will be either located in a bunded area or within a double-walled tank.

In addition to the firewater storage tanks, additional firewater will be stored in the firewater retention pond as described in **Section 2.3.13.3**.

2.3.8 Secondary Fuel Storage

The Proposed Development will be required to store defined quantities of fuel onsite as specified in '*Secondary Fuel Obligations on Licensed Generation Capacity in the Republic of Ireland' (CER/09/001*), was issued by the CER (now CRU[5]) on 12th January 2009.

For power plants, the storage requirement totals five days' worth of fuel consumption, calculated assuming the Proposed Development is operating at its maximum capacity.

[5] Commission for Regulation of Utilities

The secondary fuel will only be used in the highly unlikely event that both the gas connection is unavailable and that other generation on the grid cannot meet demand.

The fuel will be contained in two (2 No.) storage tanks (~5,000 m^3 each) and three-day tanks (~2,000 m^3 each) within a bunded area.

The secondary fuel storage facility and associated equipment will have a footprint of approximately 3,954 m^2.

2.3.8.1 Fuel Offloading

The secondary fuel will be received via road tanker at an unloading station [adjacent to the storage tank area] and transferred to the storage tanks via a set of unloading pumps, refer to **Drawing 198291-SS-A4113A**.

A fuel transfer pump will send the fuel to a centrifuge and then to one of three-day tanks (~2,000 m^3 each). A fuel forwarding pump set will forward the secondary fuel from the day tanks when required, refer to **Drawing 198291-SS- A4112**. A sunken fuel pipe run with covers will carry the fuel forwarding and return lines under the internal access road to the CCGT's.

2.3.8.2 Fuel Storage Tanks

Fuel will be stored in two (2 No.) storage tanks (~5,000 m^3 each) and three-day tanks (~2,000 m^3 each) within a bunded area, site fabricated steel storage tanks. Bunding and associated pipework will be designed in accordance with EPA *Guidance Note on Storage and Transfer of Materials for Scheduled Activities (2004).* The secondary containment (bund) design will allow the greater of 110% of the largest tank within the bund or 25% of the total volume of substance within the bund, whichever is the larger.

The quantity of secondary fuel to be stored on site qualifies as a Lower Tier Seveso III as designated under Council Directive 2012/18/EU transposed in Ireland by the *Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (COMAH Regulations).* The Health & Safety Authority (HSA) will be notified prior to commencing construction of the facility and a Major Accident Prevention Policy (MAPP) will be prepared and reviewed prior to commencement of operation of the facility.

Figure 2.5: Layout of the Proposed Development

2.3.9 Above Ground Installation (AGI) Connection

The AGI will accommodate the valves and control equipment to facilitate the connection to the already consented 26 km natural gas pipeline. It will facilitate the transportation of gas between the national gas transmission network and the pipeline and will include fiscal metering and pressure control of the gas flow. The AGI is located in a separate fenced compound within the Site covering an area of approximately 11,282 m^2.

Access to the AGI will be via a dedicated access road off the main Site access road. Once commissioned, GNI will operate the AGI. The indicative layout of the AGI is shown in **Figure 2.6**. A detailed layout of the AGI is shown in **Figure F2.4**, Volume 3.

Figure 2.6: Layout of the AGI

The details provided on the AGI are based on information provided by GNI and will be typical of existing GNI AGIs on the national gas transmission network. In addition to gas piping and associated valves, the AGI will house the following equipment and buildings:

- AGI Compound Fencing and Access.
- Pig-trap (Bi-directional).
- Filtration.
- Fuel gas heaters / heat exchangers and associated fuel gas skid.
- Metering equipment located in a Metering Building.
- Gas pressure regulation system located in a Regulator Building.
- Gas chromatographs / Chromatograph Building.
- Generator Kiosk.
- Control and Instrumentation building.

The AGI compound will be remotely operated by GNI and will normally be unmanned.

2.3.9.1 Pig-Trap (Bi-Directional)

A bi-directional pig-trap (and associated equipment) will be installed to launch (or retrieve) the pipeline inspection gauge (pig). Pigs are in-line tools which are propelled through the pipeline for two main purposes: namely initially during the gassing-up / commissioning to clean and dewater the pipeline, and later, when the pipeline is operational, to inspect the internal condition such as the wall thickness of the pipeline. This inspection pig is also termed an intelligent pig.

2.3.9.2 Pressure Reduction / Flow Control

The pressure reduction / flow control equipment, which is to be included in a 20.5 m x 12.6 m regulator building, will enable the pressure and flow rate of the natural gas entering the Metering & Regulator (M&R) yard to be controlled as required by the network operator, GNI.

2.3.9.3 Heat Exchangers (31.9 m x 40.5 m)

During times when gas pressure is reduced, the act of reducing the pressure of the gas causes a drop in gas temperature (through the Joule Thompson effect). The gas is therefore passed through a set of heat exchangers to preheat the gas prior to pressure reduction ensuring the gas temperature before it enters the Proposed Development. The heating medium to be used for these heat exchangers will be water heaters in boiler units, refer to sections below.

2.3.9.4 Fuel Gas Heaters

The heating medium (water) combined with Alphi 11 anti-freeze is heated by gas fired boilers planned to be housed in individual buildings (3 No. 18.1 m x 17.1 m).

2.3.9.5 Metering Building (25 m x 20 m)

Fiscal metering of the gas will occur in a metering building.

2.3.9.6 Regulator Building (20.5 m x 12.6 m)

A 20.5 m x 12.6 m regulator building will enable the pressure and flow rate of the natural gas entering the M&R yard to be controlled as required by the network operator, GNI.

2.3.9.7 Chromatograph Building (3.5 m x 4.5 m)

The gas chromatography building will house a gas chromatograph where the calorific value of the gas is determined prior to entering the Proposed Development.

2.3.9.8 Generator Kiosk (4.8 m x 3.5 m)

Generator(s) will be located in the generator kiosk.

2.3.9.9 Control and Instrumentation Building (20 m x 10 m)

The AGI compound will be remotely operated by GNI. An AGI control room will be located in the control and instrumentation building for onsite control of operations when required and when the site is staffed.

2.3.9.10 Pipework

The majority of valves and pipework within the AGI compound will be located below ground level. A short section of the export pipe will extend above ground level to provide the connection for the pig trap (launcher and receiver), which will be required from time to time to allow internal cleaning or inspection of the pipeline.

2.3.10 Internal Roads, Site Access and Car Parking

2.3.10.1 Internal Roads

Internal roadways will be constructed to support delivery of equipment, facility operations, and connection between buildings, refer to **Figure 2.7**. All permanent road works will be designed, constructed and specified in accordance with relevant applicable Irish standards and codes of practice. The minimum road width is provided in **Table 2.2**.

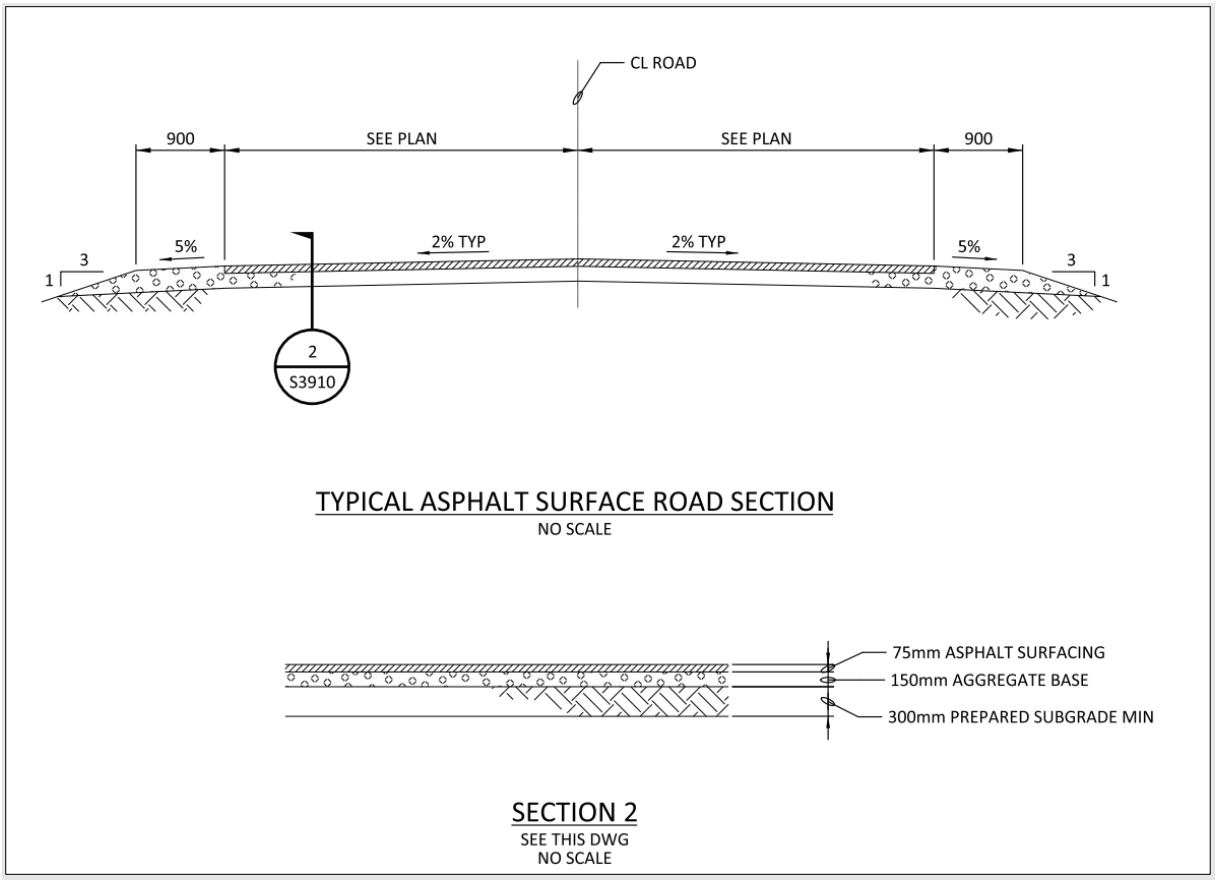

Figure 2.7: Cross Section of Internal Roads

Table 2.2: Internal Road Dimensions

Road	Total Width (m)	Paved Width (m)	Shoulder Width (m)
Paved Interior Roads	7.8	6	0.9

2.3.10.2 Site Access

Access to the Site will be located off the existing L1010 road (Coast Road) to the south of the Site, which is the primary access road to the townlands of Kilcolgan Lower and Ralappane from Tarbert and Ballylongford.

The AGI will be operated remotely by GNI and normally unmanned, but pedestrian access and vehicular access will be required for inspection and maintenance purposes.

Refer to **Section 2.3.11** for details of proposed fencing and security.

There will be three watercourse crossings within the boundary of the Site, as discussed in **Chapter 06** (Water):

- 600 mm culvert.
- 1200 mm culvert.
- Pre-cast concrete bridge over the Ralappane Stream (refer to **Figure 2.8**).

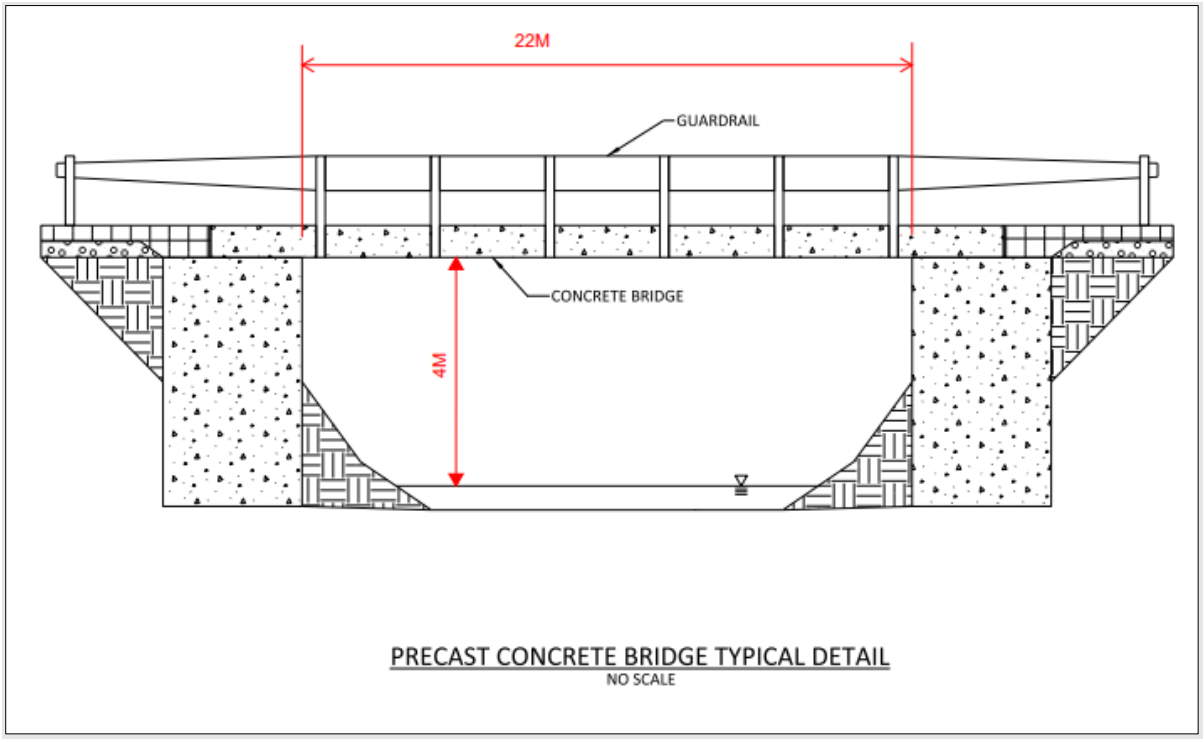

Figure 2.8: Proposed Pre-cast Concrete Bridge over the Ralappane Stream

2.3.10.3 Car Parking

On-site parking is proposed during the operational phase of the Proposed Development which will comprise:

- 42 No. car parking spaces including:
  - A minimum of 2 No. mobility spaces.
  - A minimum of 2 No. Electric Vehicle (EV) charging points.
- A minimum of 40 No. cycle parking spaces provided throughout the Site.

Additional parking is accommodated in the laydown area, which will cover any overflow requirements in the event of maintenance or shutdown, refer to **Drawing 198291-1STA-S3404** submitted with this application.

2.3.11 Site Security and Fencing

There are three separate fence lines around the Site of the Proposed Development:

1. An outer perimeter fence line surrounding the Site (**Section 2.3.11.1**).
2. An inner security fence line surrounding the Proposed Development (**Section 2.3.11.2**).

3. A separate double fence line surrounding the AGI (**Section 2.3.11.3)**.

A closed-circuit television (CCTV) system will also be installed.

2.3.11.1 Outer Perimeter Fence

The outer perimeter fence will comprise a 2.9 m high chain link fence, galvanised and PVC coated in evergreen and topped with three layers of barbed wire, refer to **Figure 2.9**.

For visual impact mitigation the outer perimeter fence line will be set back from the L1010 road to avoid crossing watercourses as far as possible. The fencing is not expected to impact surface water flow where two watercourses are crossed, as there will not be a requirement for this fencing to be extended below the water's surface.

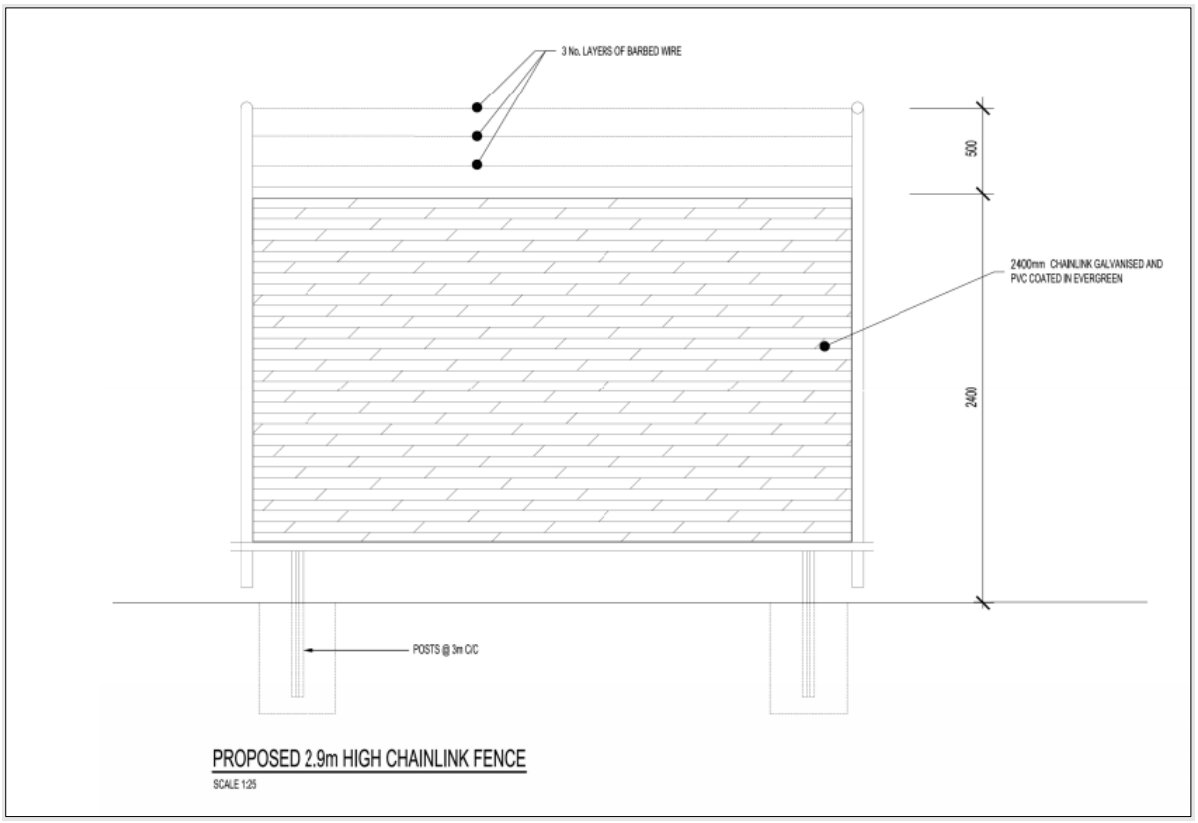

Figure 2.9: Proposed 2.9 m Outer Perimeter Fence

2.3.11.2 Inner Security Fence

A 4 m inner security fence will surround the Proposed Development, refer to **Figure 2.10**. This will comprise a fully galvanised and PVC coated palisade fence in evergreen (2.4 m high), topped with an electric wire fence. The Site will be manned for round-the-clock service for operations and maintenance purposes, although planned maintenance activities will predominantly be conducted during the daytime. The inner security fence line will not cross any watercourses.

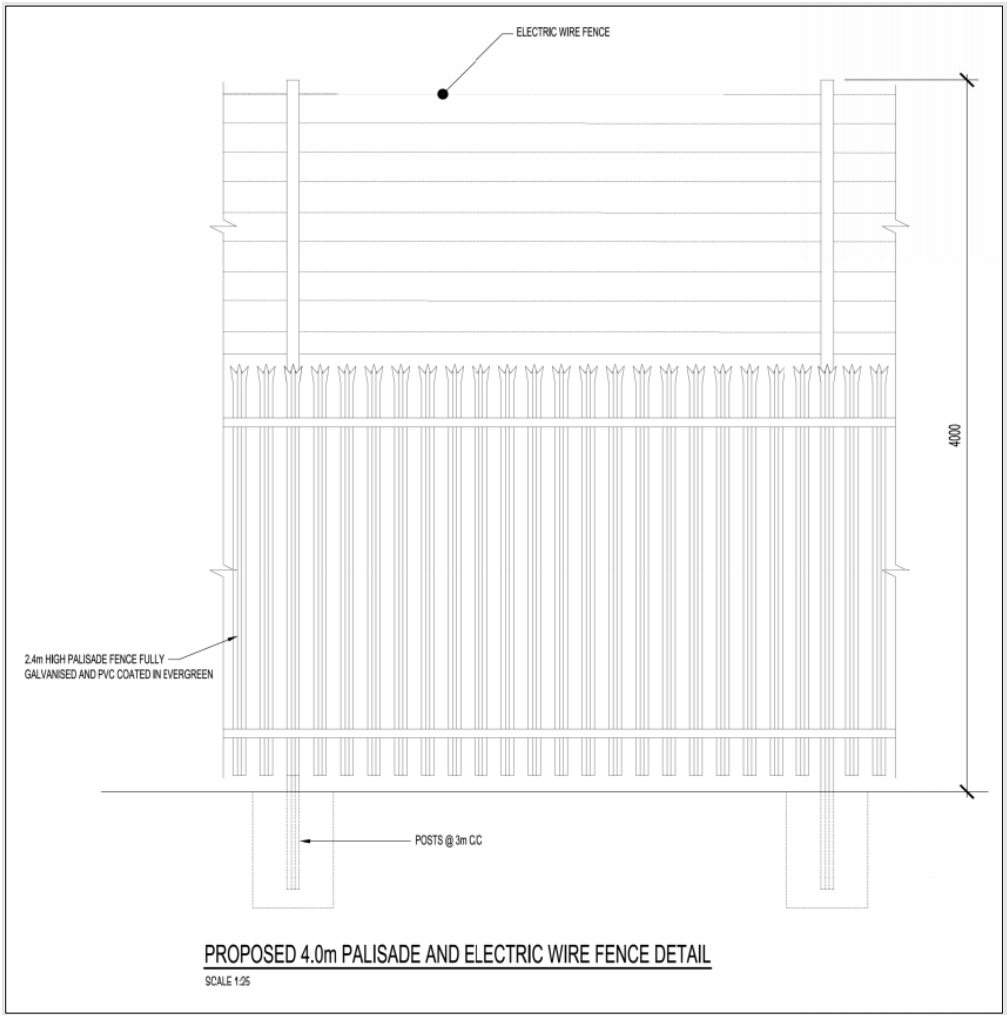

Figure 2.10: Proposed Inner Security Fence (4 m)

2.3.11.3 AGI Fenceline

Two layers of fence will surround the AGI, refer to **Figure 2.11**. This will comprise a spiked palisade fence, galvanised and PVC coated in dark green, with a weld mesh access security gate and a weld mesh fence in the same colour. The AGI double fenceline will not cross any watercourses.

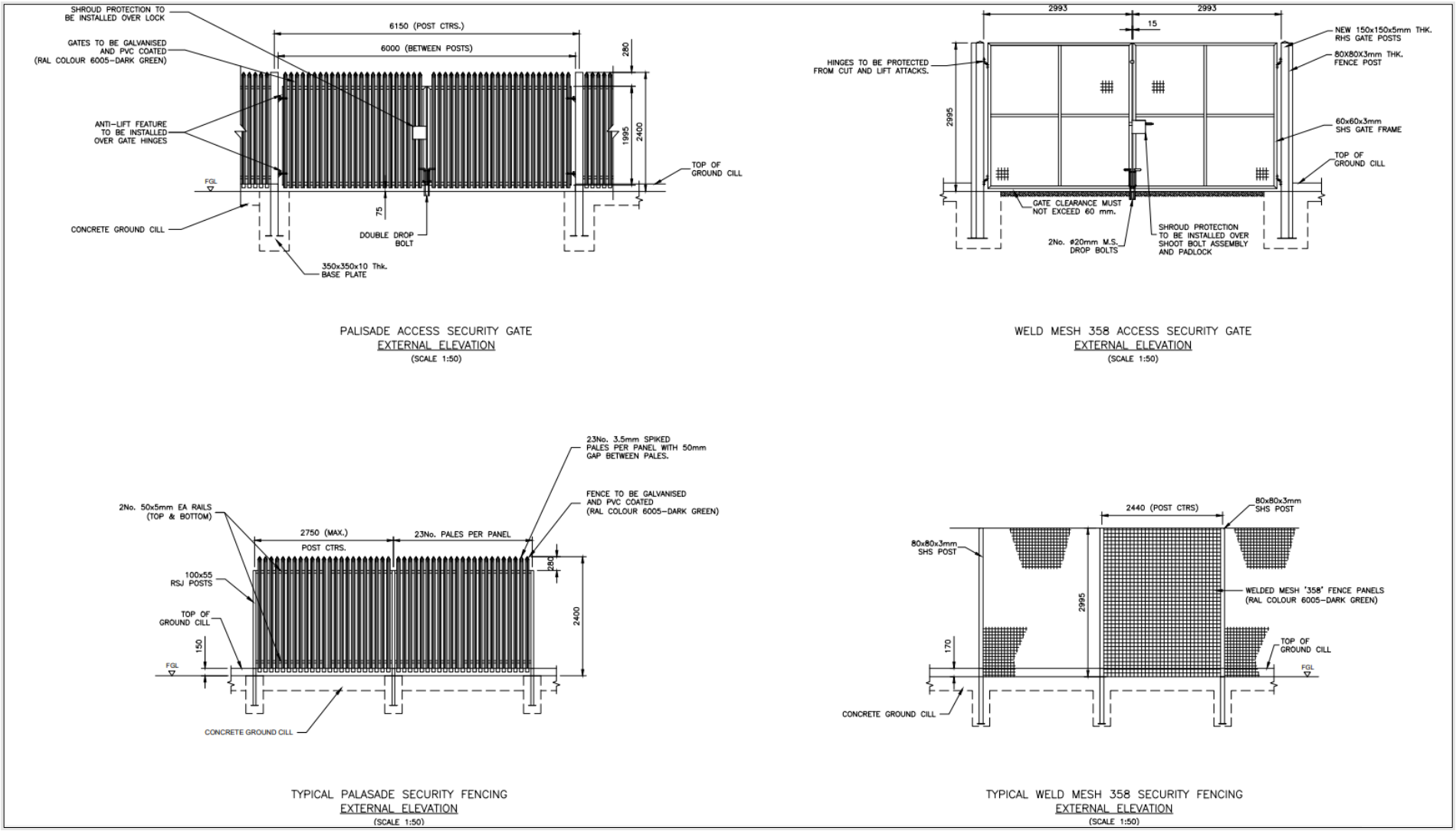

Figure 2.11: Proposed AGI Fenceline

2.3.12 Utilities

The Proposed Development will require connection to the following utilities:

- Electricity.
- Gas.
- Municipal water.
- Telecommunications.

In addition, the Proposed Development will require stormwater and surface water drainage, sewerage drainage and process effluent drainage infrastructure.

2.3.12.1 Electricity

A high voltage (HV) 220 kV grid connection to the national electrical transmission network is required to export power from the Proposed Development Power Plant, when operational.

During periods of high wind (renewable) generation it is expected that the Power Plant elements (the CCGT's) will be turned off by the system operator (EirGrid) to give priority to renewable power. In this scenario, the Power Plant will not be generating power. But the standby power plant needs about 10 MW of power. This power will be imported via the proposed future 220 kV high voltage grid connection.

If the 220 kV grid connection is not available, for example due to a cable malfunction, a medium voltage (10 / 20 kV) grid connection will be used as a backup power supply.

The 220 kV high voltage connection and the medium voltage (10 / 20 kV) will be subject to connection agreements with EirGrid and ESBN respectively. These grid connections will be subject to separate planning applications and do not form part of the Proposed Development.

Additional information on the potential future 220 kV and medium voltage (10 / 20 kV) grid connections are outlined in the following sections.

2.3.12.1.1 High Voltage 220 kV Connection

Shannon LNG executed a 600 MW 220 kV grid connection agreement with EirGrid for the Proposed Development Power Plant on 14th April 2023.

The exact route cannot be confirmed until the detailed design is completed and approved by EirGrid and other stakeholders. This process is currently underway. The development of the grid connection will be subject to a separate planning application and associated EIAR by the Applicant once the precise connection details are known. The aspects and impacts of the construction and operation of the grid connection have been included in the cumulative impact assessments in this EIAR.

The current proposal is that the connection point will be the ESBN / EirGrid Killpaddoge 220 kV substation which is located approximately 5 km east of the Site with connection provided via a 220 kV cable(s) under the L1010 road as shown in **Figure 2.22**. The grid connection will be laid under the L1010 road from the Proposed Development to the entrance road to Kilpaddoge 220 kV substation. At the entrance road to Kilpaddoge substation, the grid route will follow the substation access road and connect to the Kilpaddoge substation. No works are anticipated at Kilpaddoge 220 kV substation. The cable route will be approximately 4.6 km in length and is anticipated to be located entirely under private

and public roadways. Approximately 3.5 km will be installed under public roadway (L1010). Local access will be maintained throughout the cable installation process.

It is anticipated that the 220 kV grid connection will require an onsite EirGrid 220 kV substation. This is currently proposed to be located onsite and approximately 500 m from the Proposed Development main Site entrance. The details of the planned EirGrid 220 kV substation will be included in the future 220 kV connection planning application.

It is expected that the planned EirGrid 220 kV substation will comprise lightning protection masts, cable sealing ends, high voltage disconnectors, circuit breaker, current and voltage transformers all contained within a fenced area, approximately 60 m by 50 m. The electrical equipment is not expected to exceed 9 m in height with the exception of the lightning protection monopoles which are expected to be between 15 – 18 m in height. A single storey control building of masonry block construction, up to 5 m in height, with an estimated footprint of approximately 375 m^2 is also planned within the Site boundary.

The planned EirGrid 220 kV substation will in turn connect to the Power Plant 220 kV GIS substation.

The aspects and impacts of the construction and operation of the grid connection have been included in the cumulative impact assessments in this EIAR.

2.3.12.1.2 Medium Voltage Connection (10 / 20 kV)

If the 220 kV grid connection is not available, for example due to a cable malfunction, a medium voltage (10/ 20 kV) grid connection will be used as a backup power supply.

Therefore, a separate medium voltage (10 / 20 kV) connection to power the facility in the absence of the 220 kV high voltage grid connection will be installed. This medium voltage (10 / 20 kV) grid connection will be reserved as a backup power supply. However, the connection is subject to a connection agreement with ESBN and will be considered under a separate planning application. This will be included in the cumulative impact assessment within each EIAR chapter.

If consented, the medium voltage (MV) connection will be via a new onsite substation and underground cable from the existing ESBN / EirGrid Kilpaddoge 220 kV substation. The onsite substation will be adopted by ESBN post commissioning and will form part of the overall medium voltage (10 / 20 kV) distribution system.

The onsite substation will be located within the Site red line boundary approximately 800 m from the Site entrance. The onsite substation will comprise a single storey building size of 10 m x 4.5 m approximately and will include separate ESBN and Customer MV switch rooms. The proposed underground cable route will follow the L1010 road route in parallel with the 220 kV cables as described above.

2.3.12.2 Municipal Water Supply

The Proposed Development will require water supply for the following:

- Domestic staff: 3.6 m^3/day.
- Process water: ranging between 10 m^3/hr and 33 m^3/hr.

The Applicant has made a connection request to Uisce Éireann, which will require connection to a mains water system. It is anticipated that this will be provided along the L1010 road (Coast Road) from

Ballylongford to the Site, refer to **Figure 2.12**. The water connection does not form part of the scope of this EIAR.

In addition, the fire water supply will come from the potable water supply system and will be stored onsite in two separate firewater tanks, refer to **Section 2.3.7.4**.

Figure 2.12 Proposed Electrical and Water Connections

2.3.12.3 Telecommunications

The Proposed Development will require a connection to a broadband network. It is anticipated that it will be serviced by a new fibre cable which will be supplied via a new duct under the widened L1010 road. The installation of telecommunication utilities does not form part of the scope of the EIAR.

2.3.13 Drainage

2.3.13.1 Stormwater and Surface Water Drainage

It is proposed that stormwater from all paved and impermeable areas, within the Site will be collected and discharged directly to the Shannon Estuary via a discharge pipe with an outfall located 5 m beyond the low water mark at a water depth of approximately 2.4 m. Refer to **Figure F2.5**, Volume 3 for an overview of the proposed drainage at the Site. There will also be two discharge points along the access road at D1 and D2 stream crossings.

Impermeable areas include the following:

- Heater Building, regulator building, electrical substations, heat exchangers, administration and security buildings.
- Laydown and car parking area.

- Access road and footpaths.
- Lined outfall.
- A percentage of the side slope and landscaping areas.

A surface water drainage network comprising piped drainage and swales / catch basins will be constructed to collect, convey, and attenuate the surface water runoff generated.

The access road levels will be profiled to drain road runoff to an engineered swale adjacent to the road, the majority of which will drain to the engineered storm drainage system at the Site and discharge to the shared constructed outfall to the Shannon Estuary.

All stormwater collected from paved and impermeable areas will pass through an attenuation system including Class 1 hydrocarbon interceptors prior to discharge. There will be a stormwater discharge point at the Ralappane (D1) stream crossing located 50 m from the Site entrance (refer to **Drawing 198291-1STF-S3001**), and a second stormwater discharge point will be located at the (D2) stream crossing located 20 m from the construction laydown area (refer to **Drawing 198291-1STF-S3002**).

The discharge to the Shannon Estuary will be via the outfall pipe located 5 m beyond the low water mark and in a water depth of approximately 2.4 m. The stormwater discharge rate has been calculated at 162 L/s/ha. Stormwater collected from roof drains and permeable areas will discharge directly to the Shannon Estuary via the final discharge monitoring station. All bunded areas within the Site will have valved discharge points as part of their connection to the drainage network.

Groundwater seepages from springs or at the toe of cut slopes will be collected via a groundwater drainage network which will then discharge directly to the Shannon Estuary via the same discharge outfall pipe as the surface water.

Silt traps will be incorporated in all groundwater drainage points prior to discharge.

During the operational phase, all drainage from the Site will be controlled and monitored in compliance with the terms of the Industrial Emissions (IE) licence for the Site (which will be applied for post planning consent for the Proposed Development).

2.3.13.2 Sewerage Drainage System

In the Proposed Development, sanitary effluent (foul water) will be generated at the following locations on the Site:

- Administration building.
- Central control / operations building.
- Workshop / stores / canteen building.
- Each turbine hall.
- The AGI Control and Instrumentation Building.

All sanitary effluent from the Proposed Development will be transferred to the dedicated onsite wastewater treatment plant (WWTP) which will treat the wastewater using a biological Wastewater Treatment System prior to discharge to the Shannon Estuary via the storm water outfall pipe. The WWTP will be designed to treat wastewater for up to 67 No. personnel, which is the maximum number

of staff anticipated to be onsite during normal working hours. An average flow of 0.4 L/s (34.5 m^3/day) is expected to be discharged from the WWTP.

Figure 2.13 provides an overview of the treatment process. The treated wastewater will be monitored for compliance with the IE licence limits prior to discharge and will be continuously monitored for pH before discharging to the estuary. The automatic control system associated with the WWTP will sound an alarm if pH falls outside of expected range. This will alert the operator to take corrective action to remedy the problem. If the problem continues to go outside the pre-set range, this will automatically close the discharge valve and effluent will be diverted to a holding tank. **Table 2.3** summarises the characteristics of the WWTP discharge.

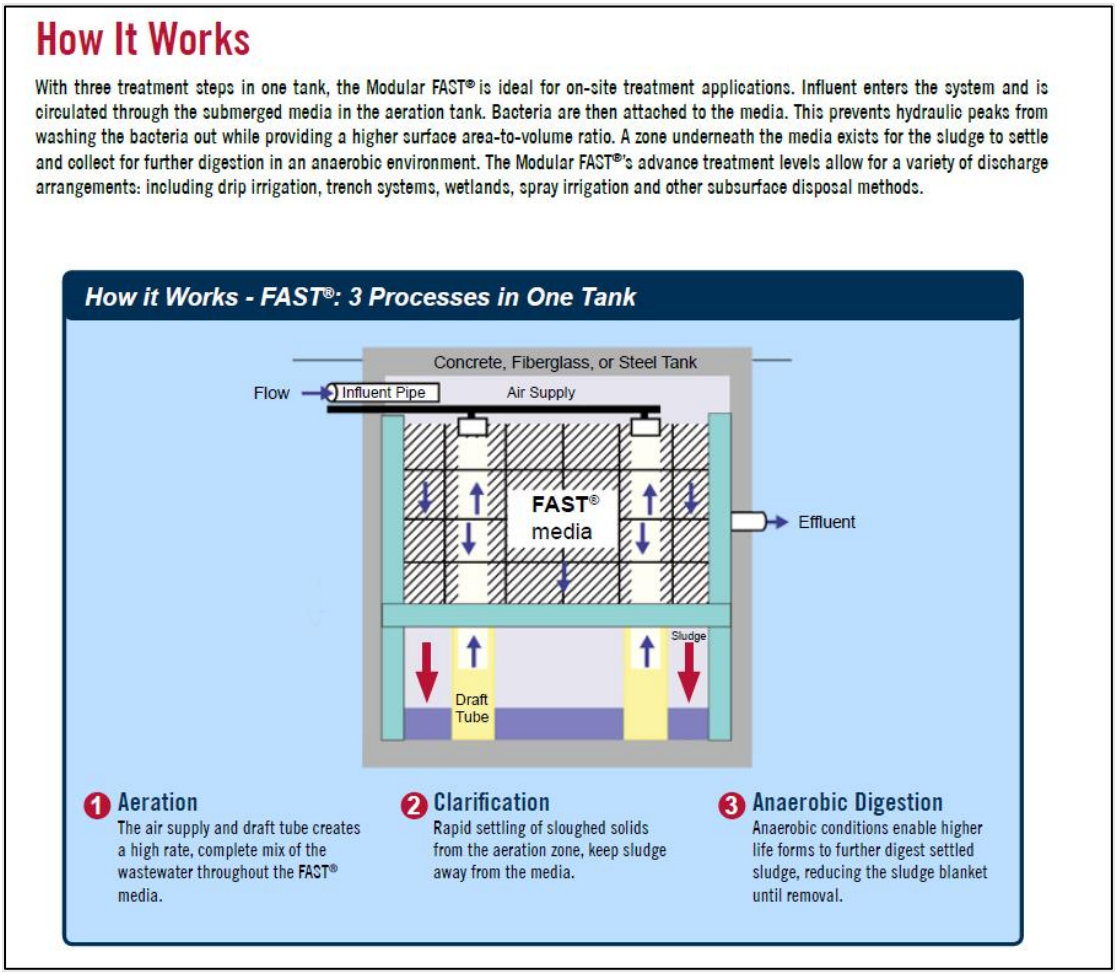

Figure 2.13: Overview of Proposed Wastewater Treatment System

Table 2.3: Characteristic of Wastewater Treatment Plant Discharge

Parameter	Discharge Limit Value
Volume	35 m^3/day
pH	6 – 10
BOD	25 mg/l
Suspended Solids	35 mg/l
Ammonia	5 mg/l as N
Total Phosphorous	2 mg/l as N

Parameter	Discharge Limit Value

Table 2.4 provides estimated of expected operational waste quantities from the Proposed Development operations.

Table 2.4: Estimated Waste Quantities

Waste Type	Waste Classification	Quantity per Year (m^3)	Potential Waste Management Route
General office waste from onshore activities.	Non-hazardous	50	Source segregation of recyclables (e.g., paper / card, plastics, metal & glass). Residual waste transported to licensed waste treatment facility (landfill or energy-from-waste).
Hazardous materials, e.g., chemicals from CCGT.	Hazardous	10	Export to hazardous waste management facility for recycling / recovery or high-temperature incineration – delivery to an approved reception facility offshore.
Sanitary waste from site washrooms.	Not applicable (not subject to Waste Framework Directive).	Faecal wastewater ('black water'): 270 m^3. Other sanitary wastewater ('grey water'): 2,430 m^3.	Treated by onsite wastewater treatment plant (WWTP) and discharged.

2.3.13.3 Firewater Retention Pond

A firewater retention pond is included in the Proposed Development and sized according to the EPA *Guidance on Retention Requirements for Firewater Runoff (2019)*, as the most effective and suitable measure for retaining firewater. The retention pond will be rendered impermeable by use of an appropriate liner, and integrity-tested in line with the requirements of the Site's licence. All drainage will pass through the retention pond. An automatic shut-off valve linked to the site's fire detection system will be installed on the drainage outlet point.

2.4 Discharges and Emissions

2.4.1 Process Effluent Collection System and Sump

The Proposed Development will generate several process water effluent streams. Some of the effluent streams will be collected and transported offsite to a licensed facility and the remaining effluent streams will be pumped or fall by gravity to the effluent sump. Refer to the water flow diagram, **Figure 2.14**.

The wastewater effluent collection for all elements of the Proposed Development will comprise:

- Water treatment process effluent.
- Steam cycle blowdown / drains.
- Auxiliary boiler blowdown / drains.
- Turbine hall drains.
- Gas turbine wash water effluent.

2.4.1.1 Water Treatment Plant Effluent

A wastewater stream will be produced by the Water Treatment Plant (WTP). The effluent streams arising from these activities will contain inorganic dissolved solids as well as negligible traces of dilute solutions of acid, caustic, sodium bisulfite and antiscalant. The WTP effluent will be directed to the effluent sump before discharge into the Shannon Estuary in accordance with the Industrial Emissions (IE) licence for the Site.

2.4.1.2 Steam Cycle Blowdown / Drains

In the case of the Heat Recovery Steam Generator (HRSG), a continuous stream of water approximately 2% of the volume, called blow-down, will be removed from the otherwise closed water systems. It will be necessary to remove this water to maintain the level of dissolved solids in the steam at an acceptable level in order to minimise corrosion and deposition in the boiler water circuits, as well as maintaining steam quality. The boiler water will be dosed to ensure it will stay within the operating limits of the Proposed Development. As a result, the blow-down will contain salts and will be alkaline with a pH typically up to pH 9. The blowdown will be collected in a blowdown tank, cooled with service water to a temperature between 25°C and 40°C, and then pumped to the effluent sump.

Other intermittent effluent streams from the steam cycle are process steam drains and backwash of the condensate filter. During normal operation, superheated steam from the steam turbine will be sent to the HRSG; however, during start-up and shutdown when the steam piping is heating and cooling the steam will condense and be drained to the process effluent sump via the blowdown tank. There will also be intermittent backwash of the condensate polisher that will be sent to the effluent sump.

2.4.1.3 Auxiliary Boiler Blowdown

Similar to the heat recovery steam generator, a continuous stream of water approximately 2% of the volume, called blow-down, will be removed from the auxiliary boiler. It will be necessary to remove this water to maintain the level of dissolved solids in the steam at an acceptable level in order to minimise corrosion and deposition in the boiler water circuits, as well as maintaining steam quality. The boiler water will be dosed to ensure it will stay within the operating limits of the Proposed Development. As a result, the blow-down will contain salts with a typical up to pH 9 (*i.e.,* alkaline). The blowdown will be quenched with service water to a temperature of approximately 60°C and pumped to the effluent sump.

2.4.1.4 Drain Down of Feed Water and Heat Recovery Steam Generator System

During maintenance it may be necessary to drain the feed water and HRSG or auxiliary boiler systems and dispose of the water contained within these systems. This water will be sent to the effluent sump.

2.4.1.5 Turbine Hall Floor Drains

There will be floor drains in the turbine halls to collect water from floor washing and process equipment. The effluent from the floor drains will be collected and sent through an oil water separator. The water discharged from the separator will be sent to the effluent sump. The oil waste will be collected and removed offsite by a licenced waste carrier to an appropriate waste licensed facility.

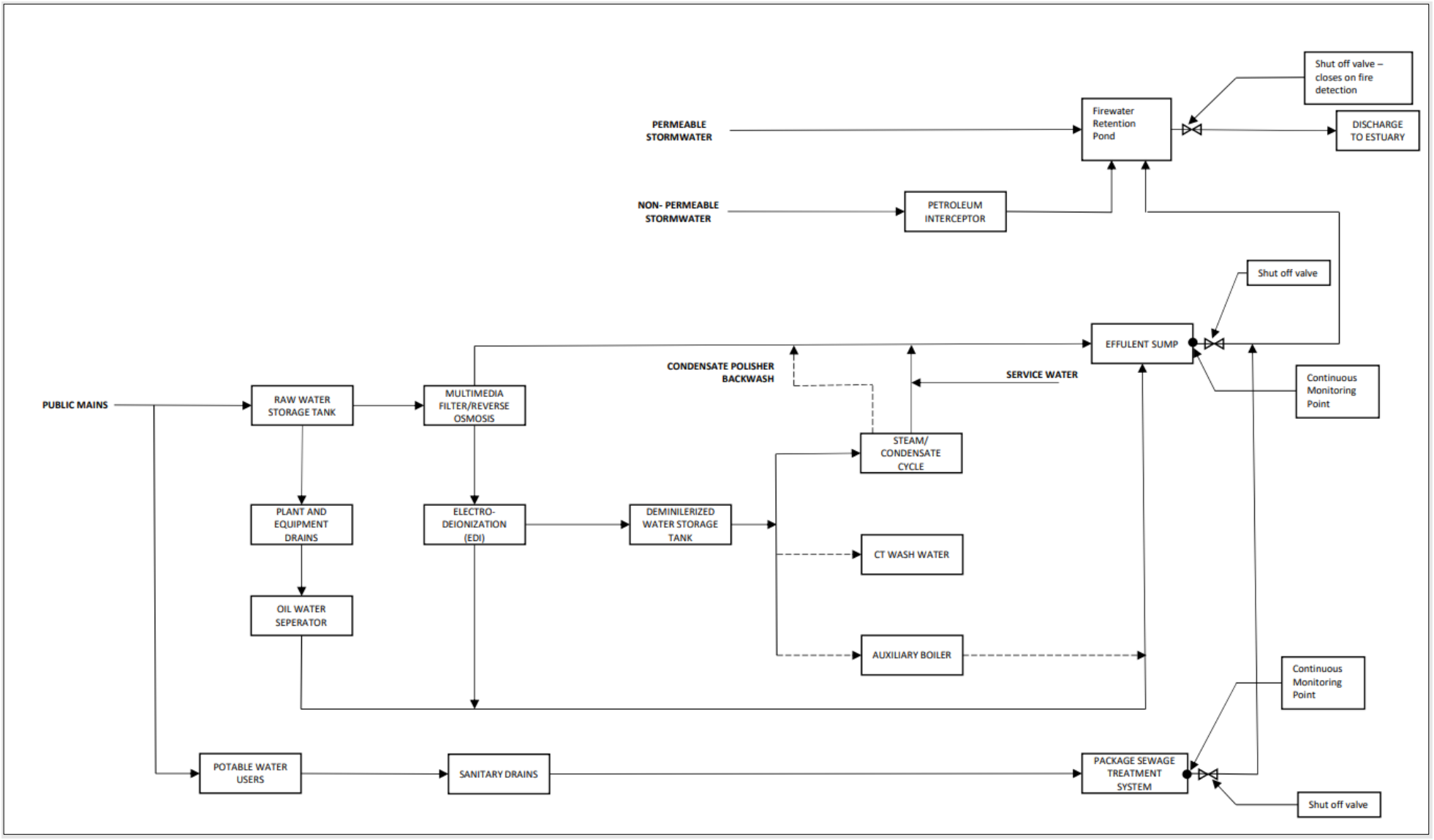

Figure 2.14: Proposed Development Water Flows

2.4.1.6 Other Process Liquid Wastes

There will be other liquid wastes from the process equipment that will not be sent to the effluent sump but will be collected and removed offsite to an appropriate waste licensed facility. These other waste streams are as noted below:

- Gas turbine water wash: collected in wash water tanks one per CTG (~2 m^3 each).
- Closed cycle cooling water system drain down: collected by tanker truck or frac tank.
- Sludges from petroleum interceptors: collected in-situ.

2.4.1.7 Outfall Discharge to Estuary

As noted above, the access road levels will be profiled to drain road runoff to an engineered swale adjacent to the road, the majority of which will drain to the engineered storm drainage system at the Site and discharge to the shared constructed outfall to the Shannon Estuary.

There will also be a stormwater discharge point at the Ralappane (D1) stream crossing located 50 m from the Site entrance and a second stormwater discharge point will be located at the (D2) stream crossing located 20 m from the construction laydown area. Both will be fitted with Class 1 hydrocarbon interceptors.

Process water effluent leaving the effluent sump will be continuously monitored for pH before discharging to the estuary. The automatic control system associated with the effluent sump will sound an alarm if the pH goes outside a pre-set range – typical pH 6 to 9. This will alert the operator to take corrective action to remedy the problem. If the pH continues to go outside the pre-set range, this will automatically close the discharge valve and open the associated re-circulation valve and will then start the re-circulation process during which period the sump will be dosed with either acid or caustic soda to return the pH to between 7 and 8. At this stage the automatic discharge valve will re-open and the re-circulation valve will close.

Regular visual checks will be undertaken for oils and greases in the sump to ensure that the discharge will be free of these contaminants before discharge.

The process effluent in the sump will be monitored for compliance with the IE licence limits and then discharged, via the storm water outfall pipe, to the Shannon Estuary, refer to **Chapter 06** (Water).

Table 2.5 summarises the process effluents generated from the Proposed Development and provides estimated quantities.

Table 2.5: Estimate of Water Discharges

System	Source	Characteristics	Monitoring	Rate
Boiler water treatment plant	Filter effluent. Effluent from treatment plant stages and back wash / regeneration / concentrate as appropriate to system installed.	High/ Low pH prior to treatment. Negligible traces of salt, dilute solution acid, caustic, sodium bisulfite and anti scalant. Effluent treated to give a pH at outlet of 6-9.	Effluent sump. Monitoring of pH and visual checks of oil and grease contamination.	8.6
HRSG and Auxiliary Boiler blowdown	Outlet from blowdown vessel via a cooler. Water from drain header.	High purity water with traces of ammonia, and phosphate. pH 6 to 9. Temperature about 60°C. Trace salt in the form trisodium phosphate 5-6 ppm and silica 3-5 ppm, BOD 20 mg/l.	Effluent sump.	14
Drain down of plant	Occurs during maintenance when necessary to drain feedwater and HRSG system.	High purity water with traces of ammonia, and phosphate.	Effluent sump.	Maintenance activity
Turbine hall floor drains	Wash down of floor drains and equipment process drains form turbine hall.	Traces of oil.	Removed offsite for disposal at licensed facility, approximately once per year.	0.03
Gas turbine washing	At intervals it is necessary to wash the gas turbine compressor blades.	Traces of oil detergent.	Removed offsite for disposal at licensed facility.	N/A
Drain down of closed cooling water system	Occurs during maintenance of these systems (based upon operating hours, typically 2-3 years).	High purity water containing traces of sodium molybdate.	Removed offsite for disposal at licensed facility.	N/A
Disposal of Oil	Various (bunds, site interceptors, oil / water interceptor).	Oil and sludge.	Removed offsite for disposal at licensed facility, approximately once per year.	N/A

Table 2.6 summarises the characteristics of the process effluent discharge.

Table 2.6: Characteristic of Process Effluent Discharge

Parameter	Typical Range of Emissions (min to max)
Maximum flow rate	774 m^3/day
pH	6 - 9
Temperature range	40°C
BOD	20 mg/l
Suspended Solids	30 mg/l
Total Dissolved Solids	5000 mg/l
Mineral Oil	20 mg/l
Total Ammonia (as N)	5 mg/l
Total Phosphorous (as P)	5 mg/l

2.4.2 Air and Noise Emissions

During its operation, the Proposed Development will produce air and noise emissions from a number of different sources.

2.4.2.1 Air Emissions

During the operational phase of the Proposed Development there will be a number of sources with emissions to air associated with combustion plant, to generate heat and power for onsite activity. Emissions to air associated with such plant vary with the type of plant and its purpose, the thermal capacity of the plant and the fuel used to enable combustion.

Natural gas will be the primary fuel source for all non-emergency plant at the Site. Emissions from natural gas-fired plant predominantly include the pollutants NO_X and CO but may also include other pollutants to a lesser extent for some sources, including THC, some of which will comprise of VOC, including CH_2O.

Liquid fuel will also be utilised. This fuel is limited to generators that will only ever be operational in the event of an emergency and for limited periods of testing and maintenance. The Proposed Development will be operated under the conditions of an IE licence, the terms of which will require that any fugitive emissions are controlled at source through appropriate mitigation and monitoring measures, possibly set out as part of an Operational Emissions Management Plan, or a specific Odour Management Plan, refer to **Chapter 08** (Air Quality).

2.4.2.2 Noise Emissions

During the operational phase of the Proposed Development there will be a number of noise emission sources as outlined below:

- Noise generating mechanical plant associated with the Proposed Development including the Air Intake Filter House and Generator Cooling Outlet (air cooled).

In addition, there are a number of noise sources which will operate intermittently, these are:

- Firewater Pumps.
- Firewater Jockey Pumps.

Noise generating plant associated with the AGI will comprises the following:

- Package Boiler Units.
- Gas Fired Generator.
- Pressure Regulating Stream.

The noise levels from the aforementioned sources are outlined in **Chapter 09** (Airborne Noise and Groundborne Vibration).

2.4.3 Emissions from Lighting

The Proposed Development will have area lighting installed on a down angle to cover the facility and the car parking areas while minimising impact to surrounding neighbours.

The height of the proposed light columns has been kept to a minimum throughout the Site, and light temperatures reviewed to minimise the content of blue light. Light columns will be fitted with focused luminaires to avoid glare, sky glow and light spill to the estuary, refer to **Figure F2.6**, Volume 3.

An uninterruptible power supply for emergency lighting shall be provided to allow for safe escape of staff from accessible areas of the plant in the event of a power and essential lighting failure or an emergency.

2.5 Process Control and Monitoring

During operations the Proposed Development will be monitored and controlled by site operational staff from the central control / operations building. This building will include a control room, meeting room and offices for the operations personnel stationed at the Proposed Development, refer to **Section 2.3.1.6.3**.

2.5.1 Integrated Control and Safety System (ICSS)

The ICSS will be a distributed control system that will provide process control, fire and gas detection, event logging, and emergency shutdown (ESD) functions. The functions will be fully integrated and standardised hardware and software will be utilised throughout the system as far as possible. The system is intended to minimise the need for communication gateways or bridges between software systems, thus improving the system reliability and increasing operational flexibility.

The primary objective in the design of the ICSS is to provide high reliability and availability. The system will provide safe, efficient and reliable equipment of proven design. The system will use current technology with modern diagnostic capability to increase failure reporting and reduce maintenance requirements.

Dual redundant architecture will be used to avoid common mode failure points and increase availability.

The ICSS will comprise the following sub-systems:

- Process Control System (PCS).
- Process Safety System (PSS).
- Emergency Shutdown (ESD).
- Fire and Gas System (FGS).

The PCS will function to produce on specification product. It will automatically correct disturbances caused by changing process conditions. The safety system is mainly composed of the ESD, FGS and PSS.

Unsafe process and operational conditions in any part of the Proposed Development (Power Plant) can be detected and will activate the FGS, PSS and / or ESD systems accordingly. The FGS, PSS and / or ESD system will provide a controlled shutdown of the facilities. The shutdown system has the optionally to be initiated manually or automatically. The ESD will provide a reliable response to the process and fire and gas detection systems and will take the necessary executive action to avoid escalation of the event.

2.5.2 Alarm Systems

The alarm system will form an essential part of the operator interface with the ICSS. Within the alarm management framework determining the roles and responsibilities of facility operations and maintenance support personnel is paramount to ensuring that the alarm system is operated, managed and improved to obtain optimum plant efficiency through the management of abnormal conditions. The alarm system will provide vital support to the operators managing complex systems by warning them of situations that need their attention. The alarm system warns the operator that the process is moving from a “Normal” to an “Abnormal” state.

2.5.3 Above Ground Installation (AGI)

The AGI, which is normally unmanned, is operated and controlled from GNI’s central control system which will have a continual data link to the AGI. Refer to **Figure 2.6** for the proposed AGI layout and **Section 2.3.9** for a description of components that will be included in the AGI.

2.6 Health, Safety and Environment

The Applicant recognises and accepts its moral and legal responsibilities for ensuring the health, safety and welfare of its employees, contractors, visitors and members of the public who could be affected by its activities; it is committed to compliance with all applicable Irish health, safety and environmental laws and regulations.

The Directors and Senior Management of the Proposed Development have overall responsibility for the implementation of its HSE policies. These policies will be reviewed periodically to ensure that they remain relevant and appropriate to the Proposed Development’s operations and business.

The Applicant will implement a HSE Management System, which will include setting of objectives and targets, measuring progress, reporting results as a commitment for continual improvement, and fostering a culture where incidents are reported and investigated and lessons learned are shared through the organisation. It will use regular audits to ensure its controls are effective. It will provide appropriate health, safety and environment training and guidelines to employees and contractors to enable them to meet the required standards of performance.

The Applicant aims to minimise the health, safety and environmental impacts of its activities and prevent pollution by utilising a structured risk management approach, which includes emergency preparedness and contingency planning. All new activities will be assessed for environmental impact and appropriate health and safety provision, and ongoing activities will be subject to periodic review. Health, safety and environmental protection will be given equal priority to the business objectives of the company.

The Applicant is committed to effective communication and consultation on health, safety and environmental matters with all interested parties and will make its policies available to them subject to appropriate privacy and business confidentiality protections. The Applicant will routinely monitor, assess and report on its health, safety and environmental performance with data on the rate of lost time injuries and occupational injuries. Fire and gas detection systems and associated alarm processes are summarised in **Sections 2.5.1** and **2.5.2**.

The Applicant will ensure that operating, maintenance, and emergency response procedures and manuals will be subject to regular review and will be updated to reflect best industry practice, or to reflect the addition of new procedures, equipment or other facilities.

2.6.1 Internal Fire and Rescue Plan

Safety is the main consideration in the Proposed Development design. The main fire hazards on the Proposed Development are identified from the Quantitative Risk Assessment (QRA), which was undertaken by Vysus (previously Lloyds Register) for the Proposed Development on behalf of the Applicant, refer to **Appendix A2.4**, Volume 4.

The QRA includes hydrocarbon flash fires, jet fires and pool fires. To limit the consequences of fire scenarios and to cope with any potential domino effects, the Proposed Development will be partitioned into fire zones, which are areas within the installation where equipment is grouped by nature and / or homogeneous level of risk attached to them. The partition of an installation into fire zones will result in a significant reduction of the level of risk. The consequences of a fire, flammable gas leak or an explosion corresponding to the credible event likely to occur in the concerned fire zone shall not impact other fire zones.

In order to mitigate or control these hazards, the proposed ESD coupled with the PCS and the FGS, are crucial to ensure the safety of the plant. Should there be a loss of containment and / or subsequent fire, the FGS will activate. The potential hydrocarbon release to be detected is a clean non-toxic single-phase gas in a well-ventilated area. On confirmed FGS detection, the active fire protection system will operate. A voting logic will be implemented to avoid spurious trips.

The fire hazards associated with the Proposed Development will be mitigated by the use of passive and active fire protection. Passive fire protection (PFP) is aimed to protect personnel and ensure that escape, evacuation and rescue (EER) systems can enable safe evacuation in all scenarios linked to hydrocarbon fire hazards at the Site. PFP is mandatory on equipment and structures that could be exposed to a fire that could lead to loss of integrity.

Active fire protection (AFP) aims to control fires and limit escalation, reduce the effects of a fire to enable personnel to undertake emergency response actions or to evacuate, extinguish the fire where it is considered safe to do so, and limit damage to structures and equipment. The AFP equipment at the Site will include a combination of:

- Fire water mains network, with hydrants and monitors.
- Water spray systems.
- Water curtains / hydro shields.
- Portable dry chemical powder systems.
- Firefighting vehicle(s).
- Portable / mobile fire extinguishers.

An appropriate firefighting and rescue trained crew will be available / provided onsite and ready at all times. Employees will be trained in all emergency response actions including natural gas leak and fire situations. Fire safety certificates will be required from the Chief Fire Officer of Kerry Co. Co. prior to

construction of the facility for each building on the Site. The plant shall be operated in a safe and efficient manner compliant with national health and safety legislation.

The activation of firefighting equipment could be manual by push buttons located locally or control room to initiate extinguishing agent, or automatically through the FGS.

Escape routes will lead to the muster area(s). An alternative muster point will be provided for should access to the main muster point be impaired. Muster areas are safe places where all personnel normally muster while investigations, emergency response and evacuation pre-planning are undertaken. The main functions of the mustering are to protect personnel, to number and identify personnel, to provide first aid and to provide information.

An emergency plan will be drawn up in consultation with the port authority, fire brigade, gardai, etc., and shall integrate with any other relevant plans, such as the port emergency plan. The plan will include as a minimum:

- The specific action to be taken by those at the location of the emergency to raise the alarm.
- Initial action to contain and overcome the incident.
- Procedures to be followed in mobilising the resources, as required by the incident.
- Evacuation procedures.
- Assembly points.
- Emergency organisation, including specific roles and responsibilities.
- Communications systems.
- Emergency control centres.
- Inventory and location of emergency equipment.

The Proposed Development will have an emergency team whose duties include planning, implementing and revising emergency procedures, as well as executing them. The emergency plan, when formulated, will be properly documented in an *'Emergency Procedures Manua*l', which will be available to all personnel whose work relates to the present facilities.

A QRA was undertaken by Vysus for the Proposed Development on behalf of the Applicant. The major accident hazards at the establishment were identified and their consequences and frequences were calculated.

The QRA has been carried out for the purpose of Land Use Planning (LUP) in accordance with HSA guidance on technical land-use planning advice for planning authorities and COMAH establishment operators, version 2, February 2023 (HSA, 2023). The land use planning zone boundaries are defined as:

- Zone 1 (inner): within the 1E-05/y individual risk of fatality contour.
- Zone 2 (middle): between the 1E-05/y and 1E-06/y individual risk of fatality contours.
- Zone 3 (outer): between the 1E-06/y and 1E-07/y individual risk of fatality contours.

The criteria for new establishments according to the HSA guidance are:

- The maximum tolerable risk to a member of the public should not exceed 1E-06/y.

- The maximum tolerable risk to a person at an off-site work location should not exceed 5E-06/y.

The QRA provides a quantification of the risks associated with the reasonably foreseeable major accident scenarios identified. The method involves calculating the frequency of a set of scenarios defined in the guidance.

The physical consequences of these scenarios are modelled as well as the impact on people, considering a range of weather conditions. The information is combined to give a numerical representation of the risk from all considered scenarios, in terms of “individual risk” to members of the public offsite, and also “societal risk”.

The QRA results are compared against tolerability criteria presented above, to demonstrate that the risk levels associated with the operations of the power plant are tolerable.

2.6.2 Pollution Mitigation and Response

As discussed in **Chapter 01** (Introduction), the operation of the Proposed Development will be controlled and regulated by the following bodies:

- Environmental Protection Agency (EPA).
- Commission for Regulation of Utilities (CRU).
- Health and Safety Authority (HSA).
- Local Planning Authority (Kerry Co. Co.).

2.6.2.1 Shannon Estuary Anti-Pollution Team (SEAPT)

The Shannon Estuary Anti-Pollution Team (SEAPT) is a Mutual Aid Group and the primary response organisations for oil and HNS spills within the Shannon Estuary. The SEAPT consists of the Shannon Foynes Port company, Kerry, Limerick and Clare Local Authorities and commercial and industrial entities operating within the Shannon Estuary. SEAPT was initiated to form a unified coordinated response to pollution incidents on the Shannon Estuary. SEAPT is a member’s organisation. Members contribute annually to maintain equipment, carry out exercises and training and purchase new and replacement equipment. SEAPT holds a significant stockpile of equipment. This equipment is available to respond to any pollution incident or threat thereof. The Proposed Development will also be able to avail of spill dispersion modelling capability held by SEAPT. SEAPT are also the custodians of the Shannon Estuary Oil / HNS Contingency Plan developed in accordance with the National Contingency Plan (NCP)and approved by the Irish Coast Guard. Shannon LNG Limited has consulted extensively with SEAPT, and the intention is to join the SEAPT organisation on successfully receiving development consents and prior to commencement of the construction phase. The Proposed Development has (provisional to project go-ahead) been accepted as a member of the SEAPT. Membership of SEAPT will enable the Proposed Development to interface directly with the approved Shannon Estuary Oil / HNS Plan and access additional response equipment to augment that held within the Proposed Development. Through the membership process, the Proposed Development will additionally be contributing to the ongoing development and strengthening of the SEAPT organisation.

2.6.2.2 Incident Response

In accordance with the requirements of the NCP Standard Operation Procedure 05, and the final STEP Oil and HNS Spill Plan, there will be the five operational phases of an incident response:

- Phase 1 – Discovery and Notification, Evaluation, Identification and Activation.
- Phase 2 – Development of an Action Plan.
- Phase 3 – Action Plan Implementation.
- Phase 4 – Response Termination and Demobilisation.
- Phase 5 – Post Operations, Documentation of Costs / Litigation.

The Proposed Development will manage the response to any Tier 1 (Local – within the capability of the operator on site) and Tier 2 (Regional – beyond the in-house capability of the operator) incident for any pollution on the water within their area of jurisdiction with the full cooperation and integration of the response with the Shannon Foynes Port, the SEAPT mutual aid group which includes the three local authorities of Kerry, Clare and Limerick and other agencies as appropriate. The developed plans will identify realistic Tier 1 and Tier 2 scenarios and the resources required to effectively respond to and mitigate these scenarios. The plans will further describe any escalation to Tier 3 (requiring national resources) and as discussed above, interface with the National Marine Oil / HNS Spill Contingency Plan. A training and exercising program forms part of the plans. The completed plans will be submitted to the EPA for appropriate approvals. Further detail can be found in the Oil and Hazardous and Noxious Substances (HNS) Spill Plan Development Framework for the Proposed Development, refer to **Appendix A2.5**, Volume 4).

Additional technical guidance can be found in the NCP and annexes.

2.7 Construction Phase

The Applicant will appoint an Engineering, Procurement and Construction (EPC) Contractor for the duration of the construction phase. The EPC Contractor will appoint sub-contractors to undertake all the specific construction and civil works.

The construction phase of the Proposed Development will comprise:

- Temporary construction and laydown areas (hardstanding).
- Open storage areas, temporary facilities and plant storage areas.
- Construction compound to include the staff office and welfare facilities.
- Temporary parking facilities.
- Security fencing / gates and signage.

This section describes the construction activities associated with the Proposed Development including the following phases:

- Construction Site management *i.e.*, programme and hours.
- Enabling, earthworks and site preparation.
- Construction of the Proposed Development.
- Construction environmental management and protection measures.

There is no requirement for any additional temporary land take to support the construction phase; all laydown areas will be accommodated within the footprint for the Site.

2.7.1 Construction Site Management - Programme, Hours, Staffing

A construction management team will be onsite for the duration of the construction. This team will supervise the construction of the Proposed Development, including monitoring the Contractors performance to ensure that the proposed construction phase mitigation and monitoring measures are implemented, and that construction impacts and nuisance are minimised.

Kerry Co. Co. will be notified of the identified point of contact onsite for the duration of the construction phase. Further details on the construction management structure, environmental management, site audit system, and community feedback arrangements are contained within the Construction Environmental Management Plan (CEMP), refer to **Appendix A2.3**, Volume 4.

2.7.1.1 Construction Programme

Subject to planning consent and other approvals an anticipated start date of January 2026 is taken as a construction start date (however this is subject to change).

The construction programme is anticipated to take 32 months, subject to seasonal and other planning constraints. This is the basis of the impact assessment contained within this EIAR. The whole construction phase is broken into four sections, as outlined in **Table 2.7**.

Table 2.7: Construction Programme

Description	Start On Site	Duration (months)	Completion	Duration From Start Date (Months)
Enabling, Earthworks & Site Preparation	Jan 26	10	Oct 26	10
220 kV and medium voltage (10 / 20 kV) connections[6]	Aug 26 (+ 8 months)	14	Sept 27	21
CCGT - 2 Blocks	Oct 26 (+ 10 months)	21	June 28	30
CCGT - 1 Block	Mar 27 (+ 15 months)	18	Aug 28	32

An additional period of up to six months will be required for commissioning prior to operation as described in **Section 2.8**.

The proposed construction manpower and vehicle traffic profile projections based on the dates above are provided in **Figure F2.7**, Volume 3.

2.7.1.2 Construction Hours

Construction phase works will take place between the hours of 07:30 to 18:00 (Monday to Friday) and 08:00 to 14:00 (Saturday). No works will take place on Sundays or Bank Holidays.

[6] While the 220 kV and medium voltage (10 / 20 kV) connections are outside the Proposed Development, number and traffic from their construction is included in this EIAR. This includes the associated onsite Eirgrid 220 kV and ESBN 20 kV substations.

It is proposed to stagger the various shift starting and ending times within the construction complex (for example civil employees 07:30 to 18:00, or 07:45 to 17:45). This small stagger in shift start and ending times could lessen the impact of traffic peaking, refer to **Chapter 11** (Traffic and Transport).

Construction works outside these hours will only take place in exceptional circumstances (*i.e.*, for specific engineering works e.g., concrete pours etc.). It is likely that a number of continuous construction phase works will also be required outside these hours on a limited number of occasions. These works will be agreed in advance with Kerry Co. Co. Work conducted outside of core hours, will comply with any restrictions agreed with the planning authorities, in particular regarding the control of noise and traffic.

2.7.1.3 Staffing / Employment

Levels of employment will vary throughout the construction phase. It is envisaged that the initial construction phase will last approximately 32 months, with an additional six months commissioning prior to operation. During the initial phase, approximately 1,070 No. people will be employed onsite at peak.

Construction personnel will comprise engineering, management, skilled and semi-skilled workers during the anticipated 32-month construction programme. A number of indirect employment opportunities will be created in a variety of different trades as a result of the construction works.

While some of the construction personnel will be specialists who will travel from outside the area, it is intended that many of the jobs will be filled by personnel recruited locally, with appropriate training provided as necessary. Where required, construction personnel will be accommodated locally in hotels and guesthouses.

2.7.1.4 Site Access and Security

Construction traffic will access and egress the Site via a new priority junction and right turn pocket along the upgraded L1010 road. This new vehicular entrance will serve all traffic arriving to the Site.

All Heavy Goods Vehicle (HGV) construction traffic will only be allowed to travel from the N69 / N67, through Tarbert town and along the upgraded L1010 road to the Site. No HGV traffic will be permitted to travel / from the Ballylongford Village direction to the Site or along the R551. Refer to **Chapter 11** (Traffic and Transport) and the Construction Traffic Management Plan (CTMP), **Appendix A11.1**, and **Section 2.7.2.3** for further details on the Site access establishment.

Fencing, gates and access control measures will be provided for the Site. Access to the Site will be security controlled and all Site visitors will be required to sign in on arrival and sign out on departure. There will be security fencing around the construction compound and specific areas of the Site for access control, safety and security, refer to **Section 2.7.2.4** for further details.

2.7.1.5 Construction Compound

The proposed location of the construction compound will be entirely within the Site of the Proposed Development. The locations and extent of the construction compound are presented in **Figure F2.2,** Volume 3. The construction compound will be secured with temporary fencing and will accommodate employee parking, canteens, offices, medical, changing, and welfare facilities, drying rooms and temporary services on the Site.

The construction compound will not be for long-term storage of materials, and storage but will be for the duration of the construction phase only.

Foul water from welfare facilities during the construction phase will be collected and periodically removed from the Site by road tanker.

For the duration of the construction phase, mobile plant will be returned to a secure overnight plant storage area on the Site, at the end of each shift. Drip trays will be utilised under the various types of plant.

Storage areas will be provided for flammable / toxic / corrosive materials, in a separate location that will be locked, impermeable bunded and fenced off. Material data sheets will be used for all these materials.

2.7.1.6 Parking

As noted above, parking will be available onsite for all construction staff vehicles within the construction compound.

Employment levels will vary throughout the construction phase, and it is expected that peak staffing levels will occur in September 2027, when 1,070 No. staff will be required, equating to 594 No. construction vehicles and 80 No. Light Goods Vehicle (LGV) delivery trips (two-way). Refer to **Chapter 11** (Traffic and Transport).

2.7.1.7 Construction Materials Sourcing and Transportation

Construction materials will be sourced locally from authorised quarries, where possible to minimise the environmental impact of transportation. It is intended that this will include all suitable stone recovered on during the enabling works will be reused as hardcore. For this purpose, rock crushing and screening plant will be provided. Additional rock, stone and sand materials could be procured from local quarries as required including the following:

- Ardfert Quarries, Ardfert, Co. Kerry.
- O' Mahoney Quarries, Tralee, Co. Kerry.
- Roadstone, Foynes, Co. Limerick.
- Liam Lynch, Adare, Co. Limerick.

All the materials will be transported to the Site by road. It is anticipated that up to 26,000 tonnes of imported aggregates will be required for the Proposed Development.

There may be periods in the early stages of construction where onsite haul roads are not surfaced. To reduce dust these routes can be dampened down (including the reuse of water from the wheel washing facilities) and maximum speed limits will be signposted and imposed.

Some of the process equipment and structural elements will arrive onsite as complete units or sub-assemblies, which may be larger than normal construction loads. It is anticipated that all the units will be delivered by ship to Foynes, and from there transported to the Site by road. Some of the units could be 'extra-large loads' / abnormal indivisible load (AIL) and a Garda escort may be required when they are on the road network. The timing of their transport to the Site will be chosen to minimise disruption to other roads users. This will be managed in accordance with the CTMP and the Abnormal Load Assessment, refer to **Appendix A11.1** and **A11.2,** respectively, Volume 4.

2.7.1.8 Construction Traffic

Construction signage will be provided for the Site. Signage at the Site entrance will be provided to outline details of the project and will include a contact telephone number for the public.

Construction phase traffic will be managed such that the impact on public roads will be minimised. This will be achieved by the implementation of the CTMP which will be agreed by Kerry Co. Co. in advance of the works. The traffic volumes on the public road will largely comprise HGV deliveries and arrival of personnel (LGV) to the Site. Refer to **Section 2.7.4.2** for details on the Construction Traffic Management Plan (CTMP).

Traffic management and road signage will be in accordance with the Department of Transport: *Traffic Signs Manual - Chapter 8: Temporary Traffic Measures and Signs for Road Works* and in agreement with Kerry Co. Co. All work on public roads will be subject to the approval of a road opening license application.

2.7.1.9 Construction Waste Management

Construction and demolition waste is the largest 'municipal' waste stream contributing to the current pressure on landfills in Ireland.

During the construction phase, the Proposed Development will generate a range of non-hazardous and hazardous waste (e.g., oils and chemicals) materials during construction. Waste materials will be required to be temporarily stored onsite pending collection by a waste contractor. The Contractor will endeavour to ensure that material is reused or recovered offsite insofar as is reasonably practicable or disposed of at authorised facility.

The Contractor will be required to develop a detailed Resource and Waste Management Plan (RWMP) that complies with the EPA (2021) '*Best Practice Guidelines for the Preparation of Resource Management Plans for Construction and Demolition Waste Projects'.*

The Contractor will regularly review and update where required the assumptions on waste arisings and management and record and implement procedures for assessing, managing and recording waste arising onsite. Refer to **Section 2.7.4.3** and **Chapter 16** (Waste Management) for further information regarding waste management.

2.7.2 Enabling, Earthworks and Site Preparation

2.7.2.1 Pre-Construction Surveys

Pre-construction environmental surveys will be undertaken in advance of the enabling works. Following the surveys, licences will be sought from the National Parks and Wildlife Service (NPWS), as appropriate. Exclusion works will be carried out in the appropriate season in line with the information presented in **Chapter 07B** (Terrestrial Ecology).

An extensive programme of pre-development licensed archaeological testing will be undertaken in the areas of the site which will be subject to development. Refer to **Chapter 12** (Cultural Heritage) for more details on archaeological, architectural and cultural heritage. This will include the demolition of a small farm complex and remains associated with a pillbox, refer to **Drawing 60619377-DEM-C-SLNG-0001**, submitted with this application, for the location of all structures to be demolished. It is anticipated that archaeological survey and investigation works will commence in advance of the main enabling works

in accordance with the relevant licenses. Enabling works will only be carried out on areas where archaeological survey and investigation works have been completed, refer to **Chapter 12** (Cultural Heritage).

Prior to the start of works onsite areas to be protected (such as ecologically sensitive habitats or notable trees) will be fenced off to protect from accidental damage. Some hedgerows, bushes and trees, and disused buildings, will also be removed during this phase. It is noted that the seasonality of some of the activities is likely to be limited, for example, by seasonal environmental ecological restrictions and constraints (e.g. bird nesting season), and / or by restrictions on when soils can be placed. Where this is the case, the overall programme will be adapted to limit or prevent the risk of impacts in accordance with the CEMP.

2.7.2.2 Enabling, Site Preparation and Earthworks

Enabling, site preparation and earthworks activities will be required for the Proposed Development and ancillary facilities and will comprise:

- Construction of safe access and temporary Site roads.
- Erection of perimeter and environmental protection fencing.
- Installation of pre-earthworks drainage.
- Establishment of the laydown construction area.
- Earthworks to create level platform at +18 m OD (metres above Ordnance Datum) for the main footprint of the development excluding AGI.

2.7.2.3 Site Access Establishment

The Contractor will begin by setting out the Site entrance as early as possible in the programme consistent with seasonal environmental restrictions and constraints. This operation will begin with the clearance of existing hedgerows and vegetation at the Site entrance on the L1010 road and progress along the route of the access road to the construction laydown area. This will be followed closely by the excavation of vegetation and topsoil for the access road which follows the existing ground levels and then the placement of crushed stone (to create a 6 m wide access road) to create an initial access and roadway to the construction laydown.

All topsoil will be retained onsite for future use. Topsoil will be placed in temporary stockpiles at various locations throughout the Site for re-use on slopes, with any excess material placed in the vicinity of the contractor's compound. Approximately 26,000 tonnes of imported aggregate will be delivered from local quarries along the L1010 road from the Tarbert direction. Refer to Section **2.7.1.7** for details on construction materials and sourcing.

It is anticipated that the creation of this initial access will take approximately two to three months. Apart from the delivery of materials, the operation will all take place within the Site boundary with personnel using mobile plant. Following the construction of the Site access, a perimeter fence will be erected around the Site boundary.

Traffic management measures approved by Kerry Co. Co., Limerick Co. Co. and An Garda Síochána will be implemented prior to the commencement of works to ensure the Site access is safe for all road users.

2.7.2.4 Fencing

Fencing will be erected along the perimeter of the Site as early as possible, refer to **Section 2.3.11**. Particular care will be taken at the boundary between the Site and the SAC, SPA and pNHA so that construction activities do not cause damage to habitats in this area. These habitats will be securely fenced off early in the construction phase. The fencing will be clearly visible to machine operators and include relevant areas in which works are planned, such as utilities. Fencing will be installed to protect the Ralappane stream.

To prevent incidental damage by machinery or by the deposition of spoil during site works, hedgerow, tree and scrub vegetation which are located in close proximity to working areas will be clearly marked and fenced off to avoid accidental damage during excavations and site preparation.

2.7.2.5 Construction Compound Establishment

Refer to **Section 2.7.1.5** for details on the construction compound. The construction compound will be constructed by stripping back the topsoil (to be used later in the landscaping) and placing a layer of stone over a layer of geotextile membrane as required. The construction compound will be suitably drained and any areas which will involve the storage of fuel and refuelling will be paved with bunding and hydrocarbon interceptors to ensure that no spillages percolate into the surface water or groundwater systems.

During the removal of the topsoil and placement of the stone for the laydown areas precautions will be taken to minimise runoff into ditches, drains or the stream, refer to **Section 2.7.3.4**.

Additional mitigation and monitoring measures, as required, will be implemented in CEMP including the RWMP and CTMP, refer to **Section 2.7.4**.

Following completion of construction, the construction compound will be cleared and re-instated, temporary buildings and containers, parking areas and material such as stone, aggregates and unused construction materials will be removed as appropriate. As much of this material as possible will be re used onsite as part of landscaping and construction works.

2.7.2.6 Pre-Earthworks Drainage

To prevent the risk of contaminating surface water and groundwater, temporary surface water drainage (including dewatering measures) and silt ponds will be constructed to control runoff from the earthworks stage. This will flow through a filtration system (such as hay bales) to slow down flow to an acceptable level. Silt traps will be placed at crossing points to avoid siltation of watercourses.

Attention will be paid to preventing the build-up of dirt on road surfaces, caused by lorries and other plant entering and exiting the Site, via wheel washes and road sweepers as required. The layout of the temporary surface water drainage system will incorporate the mitigation and monitoring measures outlined in this EIAR and conform to the requirements of the CEMP, RWMP, CTMP, Natura Impact Statement (NIS) and planning conditions.

Rainwater runoff will be diverted away from the construction areas into the Shannon Estuary. Rainwater runoff will pass through an attenuation system including ponds with straw bales or silt bags to prevent sediment from entering the estuary. Discharge water quality targets will be agreed with Kerry Co. Co. and included in the CEMP. Regular water inspection and sampling regimes will be put in place via the

CEMP on the foreshore during construction activity onsite to monitor compliance with the discharge conditions.

2.7.2.7 Earthworks

The Proposed Development will be constructed to a finish grade platform with an elevation of 18 mOD. In order to create this platform, approximately 475,000 m³ of overburden soils and rock will be excavated and moved within the Site, refer to **Table 2.8**.

Some of the rock will need to be broken up before it can be excavated. This will be done either by percussive rock breaking equipment mounted on tracked excavators or by blasting depending on the hardness and depth of the rock to be removed. The soil and rock will then be excavated using tracked excavators. Excavated material will be stockpiled for use as engineering fill, landscaping and other uses throughout the Site. Stockpiles will be no more than 2 - 3 m high and will be seeded with an appropriate seed mix. All excavated material will be reused onsite within the Site.

Table 2.8: Estimated Material Volumes

	Excavation (m^3)	Backfill (m^3)
Topsoil	35,000*	35,000
Soil (excluding Topsoil)	356,054	437,115
Rock	81,062	
Total	**472,115**	**472,115**

**Excess topsoil will be placed on the laydown area or spread onsite.*
Note: 10,000 m3 imported aggregates.

The overburden will be, in places, quite thin, and to create the level platforms for the facilities. It is expected that limited blasting will be required to excavate some of the rock, which cannot be removed by rock breaking equipment mounted on tracked excavators. The blasting will be carried out in a controlled manner in accordance with a pre-approved plan, and in a controlled manner to minimize the noise and ground vibrations. This is done by designing a blast pattern with a small charge in many holes drilled into the rock at close spacing; the individual charges are then set off in a sequence using an electronic relay so that the maximum charge going off at any instant (this is referred to as the 'maximum instantaneous charge') is only the small amount of charge in any one of the holes. This causes cracks in the rock which allows the rock to be broken up further using mechanical rock breakers; the rock is then excavated using tracked excavators. No more than one blast per day is envisaged to occur in any given day and associated noise and vibration levels will be transient and very short lived, refer to **Chapter 09** (Airborne Noise and Groundborne Vibration).

Excavated material will be stockpiled for use as engineering fill, landscaping and other uses throughout the Site.

Earthworks are expected to be completed within four months, with blasting taking place intermittently over a 2-3 month period in this four month window.

Monitoring of dust, noise and vibration levels will be undertaken during blasting operations at appropriate locations around the boundary in accordance with the measures outlined in the CEMP.

The CEMP will also identify mitigation and monitoring measures required to protect watercourses from pollution associated with the earthworks and set out the specific arrangements for the strict control of erosion and generation of sediment or any other pollutants. It will detail appropriate sediment control temporary works and plant, including silt curtains, settlement lagoons, flow control arrangements etc. to ensure no pollutants are discharged to waterbody, refer to **Section 2.7.4.1** and **Appendix A2.3,** Volume 4.

2.7.2.8 Earthworks Traffic Management

The traffic associated with the earthworks and Site preparation phase will be managed such that the impact on public roads will be minimised. This will be achieved by the implementation of the CTMP which will be agreed by Kerry Co. Co. in advance of the works. The traffic volumes on the public road will largely comprise HGV deliveries and arrival of personnel (LGV) to the Site.

Chapter 11 (Traffic and Transport) outlines how deliveries will be co-ordinated with the planned L1010 road upgrade works, which is anticipated to overlap with the enabling works phase. These activities will be completed at about the same time to allow the main construction phase works to proceed.

2.7.3 Construction of the Proposed Development

2.7.3.1 Proposed Development (Power Plant)

Construction of the Proposed Development (the Power Plant) will begin after the platform level has been excavated to 18 m OD and the surface prepared, as outlined in **Section 2.8.3**.

The construction equipment required for the Proposed Development includes compressors, mobile cranes, tower cranes, generators, hoists, gantries, and various types of excavators, loaders, trucks, trailers, vans, etc. Other equipment required will include diesel fuel tanks, gas storage cages, electric power supply, mechanical repair shops, etc.

A number of tower cranes may be required. Hard standing areas will be required for these and will be located away from environmentally sensitive sites.

The construction works for the Proposed Development will be divided into four sections:

- Civil and structural works.
- Mechanical and electrical installation.
- Gas infrastructure.
- Connection to the EirGrid 220 kV Substation.

Foundation construction will include excavating to a depth of approximately 2 m to 3 m, installation of concrete forms, fixing of steel reinforcing, and the pouring of concrete. Pile foundations are likely to be necessary for parts of the Proposed Development, depending upon soil conditions and design loading.

Buildings to house the Proposed Development are expected to be steel framed with infill construction and cladding. Structural steel for buildings is anticipated to be delivered by road and assembled onsite.

The majority of the plant and building materials for the Proposed Development will be procured as complete units or modular, where practicable, and delivered to the site for installation. Pipe work and ducting will be assembled onsite.

The mechanical activities will include the installation of:

- Gas turbine generators.
- Steam turbine generators.
- Heat recovery steam generator.
- Air cooled condenser.
- Auxiliary cooling water system.
- Feed water / condensate system.
- Fuel gas supply system.
- Water supply / treatment system.
- Fire protection system.

The main electrical activities will include the installation of the following:

- Transformers.
- Distributed control systems.
- Switchgear.
- Low and medium voltage and control and instrument systems.
- Batteries and Uninterruptible Power Supply systems.
- BESS.
- 220 kV GIS Substation.

2.7.3.2 AGI Construction

The construction of the AGI will be undertaken following enabling works over a period approximately 12 months and will encompass the following activities:

- Placement of concrete foundations, drainage system, power and instrumentation conduits.
- Installation and erection of process and utility equipment, piping and instrumentation.
- Construction of buildings.
- Site landscaping.

Buildings associated with the AGI will mostly be steel framed with infill construction and cladding. Structural steel for buildings is anticipated to be delivered by road and assembled onsite.

The majority of the building materials for the AGI will be purchased as complete units, where practicable, and delivered to the Site for installation. Pipe work and ducting will be assembled onsite.

Drainage system power and instrumentation conduits will be installed along with the placement of concrete foundations, followed by the building superstructures (including metal frames, cladding and additional finishes. Later stages of the initial phase will see the installation of the major mechanical and electrical equipment, instrumentation and process piping. Final stages of the initial phase will see the fit out and completion of the buildings, and completion of site access roads, with landscaping. The facilities will be tested and commissioned, and the Proposed Development will commence operations.

2.7.3.3 Drainage Outfall Construction

A drainage outfall into the Shannon Estuary will be constructed, refer to **Figure F2.5**, Volume 3. Within the Site, surface water from paved and impermeable areas and groundwater will be collected by an underground drainage system and will discharge to either, the existing stream and / or drainage ditches within the Site, or to the Shannon Estuary via the drainage outfall pipe which will extend across the foreshore to below the low water mark.

All discharges through the drainage outfall will pass through a Class 1 Hydrocarbon Interceptor. Any bunded areas within the Site will have valve-controlled discharge points as part of their connection to the outfall drainage network. Drainage runoff from these areas will be tested for contamination prior to release to the outfall drainage network.

The drainage outfall pipe will be buried as it crosses the shoreline and will extend approximately 5 m beyond the low water mark. A check valve will be installed at the end of the outfall drainage pipe to prevent ingress of water from the estuary back into the drainage system.

It is anticipated that the construction of the drainage outfall pipe will be an open cut trench technique as follows:

- Excavate a trench across the foreshore to a maximum depth of approximately 2.4 m.
- Install a 900 mm diameter concrete drainage pipe in trench and backfill with concrete.
- Reinstate the foreshore and shoreline.

The outfall trench will be excavated above the low water mark using a hydraulic rock breaker mounted on a tracked excavator. This operation will be carried out in the dry at all times working above the tide during a suitable period of spring tides.

Where the outfall extends beyond the low water mark into the estuary, excavation of rock will be undertaken using an expanding grout placed by divers into drilled holes to pre-split the rock to the required levels and facilitate its removal by long reach excavator bucket. Trenches excavated across the shoreline will be backfilled with concrete suitable for underwater use and the surface will be embedded with cobbles and stone excavated from the trench to minimise the visual impact. The excavated material will be removed from the foreshore and incorporated as part of the earthworks and landscaping for the Proposed Development. Below the low water mark, the trench will remain open, and the sides of the trench will be battered back to avoid creating a pocket for siltation. Additionally, the cliff face will be armoured with rock to prevent erosion and maintain the integrity of the foreshore. Disturbance of the seabed below the low water mark will be small, arising primarily from the excavation of the trench and clearing and levelling of the ground to install the outfall pipe. This will result in temporary habitat loss of approximately 90 m^2 of Annex I habitat above the low water mark and 10 m^2 below the low water. Loss of Annex I habitat ‘Estuaries habitat’ is estimated to be approximately 100 m^2, while the loss of ‘Reef habitat’ is approximately 65 m^2. Installation of the pipe will result in the loss of 0.000041% and 0.000030% of the Annex I habitats ‘1130 Estuaries’ and ‘1170 Reefs’ respectively. This is discussed further in **Chapter 07A** (Marine Ecology) and **Chapter 07B** (Terrestrial Ecology).

All refuelling of equipment and machinery will take place at designated refuelling areas on the Site. No refuelling will take place on the foreshore. Arisings from trenching, or other works, will either be used for reinstatement. Details on this will be outlined in the CEMP, refer to **Appendix A2.3**, Volume 4.

2.7.3.4 Water Management

2.7.3.4.1 Foul Water during the Construction Phase

Foul water will arise from the Site offices, canteens, toilets and showers. The foul water will be collected in tanks and self-contained toilet units for removal by road tanker by a licensed haulier to a licensed facility.

2.7.3.4.2 Stormwater and Surface Water Drainage during the Construction Phase

Surface water and groundwater on or adjacent to the Site could become contaminated with silt or debris during the construction phase. Therefore, temporary surface water drainage and silt ponds will be constructed to control runoff from the earth-works stages. Water will be reused onsite where possible, for example grey water will be used for wheel washing activities.

Surface water will flow through a filtration system (such as hay bales) to slow down flow to an acceptable level. Silt traps will be placed at crossing points to avoid siltation of watercourses. Attention will also be paid to preventing the build-up of dirt on road surfaces, caused by lorries and other plant entering and exiting the Site, via wheel washes and road sweepers as required.

The layout of the temporary surface water drainage system will incorporate the mitigation and monitoring measures outlined in this EIAR and conform to the requirements outlined in the CEMP, RWMP, CTMP and NIS and planning conditions.

2.7.3.5 Utilities Construction

2.7.3.5.1 Electricity

During the construction phase of the Proposed Development, electricity will be supplied via a series of portable site units prior to the medium voltage electricity connection becoming available.

2.7.3.5.2 Water Supply

Water will be required for consumption by the construction personnel, for general construction works, hydrotesting of tanks and pipework, for the construction of the concrete elements, and for wheel wash facilities and dust suppression. It is anticipated that water supply for the construction phase will be obtained from a water main along the L1010 road. The Applicant has submitted a pre-connection agreement application to Uisce Éireann for this supply. If this supply is not available, water will be delivered by road and stored in a temporary tank onsite.

The maximum potable water demand for construction will be 98 m^3/day. The Proposed Development will incorporate water efficiency measures such as collection of grey water to minimise water consumption as far as possible.

2.7.4 Construction Environmental Management and Protection Measures

Works will be undertaken in accordance with the following environmental management technical guidance documents:

- CIRIA (2001). *Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (C532).*
- CIRIA (2006). *Control of water pollution from linear construction projects. Technical guidance* (C648).
- CIRIA (2016). *Environmental Good Practice on site pocketbook (C762).*
- EPA (2021). *Best Practice Guidelines for The Preparation of Resource Management Plans for Construction & Demolition Projects*.

2.7.4.1 Construction Environmental Management Plan (CEMP)

A CEMP has been produced as part of this planning submission, refer to **Appendix A2.3,** Volume 4. A Contractor's CEMP will be produced by the appointed Contractor prior to the main construction works. The CEMP will detail the Contractor's overall management and administration of the works. The CEMP will also include any commitments included within the statutory approvals.

The CEMP will set out the necessary approach to managing the environmental aspects and impacts associated with the construction of the Proposed Development. It will also contain details of the monitoring and reporting system which will be implemented to document compliance with the following:

- Environmental commitments identified in the environmental assessment.
- The conditions of the relevant statutory consents including the planning consent and the foreshore licence associated with the Proposed Development.

The Contractor will be required to include the following information:

- Project details and the scope of works (including the locations of construction compounds and information on construction periods and phasing).
- A summary of relevant policy and project and environmental aims and objectives.
- The planning and currently approved foreshore licence conditions relevant to the construction activities and a summary of how and where they will be addressed within the CEMP.
- Information on the roles and responsibilities of key individuals, including the environmental management and reporting structure (as provided by the Contractor or as available at the time of writing the CEMP).
- An outline communication strategy, making recommendations to the contractors, for example such as the implementation of toolbox talks (environmental discussion on issues encountered onsite) by the Contractor relating to environmental constraints and procedures to be adhered to onsite.
- Methods to identify non-conformances, details of non-conformances and breaches of environmental limits and reporting measures.

- A summary of the potential environmental effects as identified by the EIAR, the schedule of mitigation and other existing documentation.
- The schedule of identified potential environmental impacts, risks and mitigation and monitoring measures.
- Method statements and work programmes for specific tasks such as the management of concrete washout onsite.
- Requirements for and maintenance of concrete washout areas.
- Requirements for fencing off of any protected environmental sites such as areas of ecological or archaeological importance.
- Protection of vegetation including hedgerows and trees etc.
- An environmental monitoring programme and details of monitoring locations as required.
- An outline emergency response plan and procedure for environmental incidents including accidental spills.
- Requirements for inspection and auditing.
- An outline reporting programme and procedure to be updated by the Contractor.

The CEMP will be treated as a 'live document' and periodically reviewed and updated as required during the course of construction.

As a minimum, the CEMP will be reviewed every six months. Notwithstanding the above requirements, the CEMP will also be reviewed at least two weeks prior to the construction phases listed below:

- Start of works.
- Start of each succeeding stage of the works.
- Start of any site activity that may potentially have an effect on sensitive habitats / species.
- Start of the landscaping works.

2.7.4.2 Construction Traffic Management Plan (CTMP)

A CTMP has been prepared as part of this planning application, refer to **Appendix A11.1,** Volume 4. A Contractor's CTMP will then be produced by the Contractor as part of the contractual agreements for the construction of the Proposed Development and will be updated as needed during the construction period.

This CTMP will be agreed with Kerry Co. Co. and Limerick Co. Co. prior to the commencement of works and shall apply to all traffic to and from the Site including those works carried out by the Contractor and any subcontractors, as well as have regard to traffic associated with works associated with the AGI and the gas export pipeline and electricity connections. The plan will include measures to direct construction traffic (including Site access), as much as practicable, along the upgraded road from Tarbert to the Site rather than along the road from Ballylongford to the Site.

2.7.4.3 Resource and Waste Management Plan (RWMP)

The Contractor will be responsible for developing a RWMP related to the construction phase activities. The RWMP will establish a waste recording system to test and track all waste loads going offsite for appropriate disposal. This includes Waste Acceptance Testing (WAC) to determine the appropriate disposal route for the waste.

The RWMP will also contain details of waste permits and hauliers who will be authorised to remove waste from the Site and it will detail waste audits to be carried out. A RWMP has been prepared as part of this planning application, refer to **Appendix A16.1,** Volume 4.

2.8 Commissioning Phase

Following completion of construction and installation of equipment, and before the Proposed Development commences operations, there will be a testing and commissioning phase. The commissioning phase will be similar to the operational phase but may have a greater number of start-ups and shutdowns. This phase will comprise:

- Installation compliance checks.
- Commissioning tests.
- Performance demonstration tests.

2.8.1 Installation Compliance Checks

This will be a process of systematically checking that all systems and equipment have been constructed, assembled, aligned and installed correctly, in accordance with the design specifications and drawings, and that all interconnecting pipe work, cabling and wiring has been installed in compliance with the design specifications and drawings.

2.8.2 Commissioning Tests

The function of each item of equipment and each system will be tested and verified, in a systematic manner, as being in accordance with the design and specifications. All the alarm and control systems and instrumentation will be tested to demonstrate that they are functioning correctly. Following these tests, each system will be checked to ensure that it is ready to be commissioned under operating conditions including using real materials, temperatures, pressure and voltages.

2.8.3 Performance Demonstration Tests

In this commissioning phase the individual items of equipment and systems will be tested under operating conditions using the materials, temperatures, pressure, and voltages to which they will be subjected when in operation. Once the operation of all equipment and systems has been tested and verified individually, they will be integrated and the operation of complete systems will be tested.

The Proposed Development's safety and fire prevention systems and the Operational Emissions Management Plan will be subject to the same rigorous testing protocols as the other systems.

2.9 Operational Phases

2.9.1 Industrial Emissions (IE) Licence

In the operational phase, the Proposed Development will comply with the requirements of the *EU (Large Combustion Plants) Regulations 2012, S.I. No. 566 of 2012*, under an IE licence. The emissions which have the potential to impact to air, soil, surface water and groundwater and human health, will be mitigated against and avoided where possible.

An IE Licence is required for operation of the Proposed Development in accordance with Activity 2.1 of the First Schedule of the EPA Act as amended '*Combustion of fuels in installations with a total rated thermal input of 50 MW or more*'.

An Environment Management System (EMS) which will be implemented by the operator and will set out the requirements and procedures required to ensure that the Proposed Development is operating to appropriate standards. The EMS will be certified to International Standards Organisation (ISO) 14001.

Environmental monitoring (including analysis of pollutants) will be carried out, where required, including monitoring of exhaust emissions levels using Continuous Emission Monitoring Systems (CEMS) prior to discharge from the flue gas emissions stacks, in accordance with the IE Licence.

2.9.2 Fuel Supply

As outlined in **Section 2.3.1.6**, the fuel supply to the Proposed Development will be from the gas grid through the AGI. The Proposed Development will use approximately 25.5 Wz per day of natural gas when operating at full capacity.

Secondary Fuel (Backup Fuel)

To comply with Commission for Regulation of Utilities (CRU) requirements, low sulphur gas oil will be required as a backup fuel in the event of interruption to natural gas supply, *i.e.*, the loss of a flow from the transmission pipeline during a period of high electricity demand. The use of secondary fuel is only expected to occur during an emergency scenario, refer to **Section 2.3.8**.

The Proposed Development will be required to storage a total of five days' worth of fuel consumption, calculated assuming the Proposed Development is operating at its maximum capacity. The fuel will be contained in two (2 No.) storage tanks (~5,000 m^3 each) and three-day tanks (~2,000 m^3 each) within a bunded area. The storage tanks are shown on **Drawing 198291-SS-A4112**, submitted with this application.

2.9.3 Operational Site Management

2.9.3.1 Operational Hours

The Proposed Development will be manned and operational 24 hours, seven days a week outside of outages. During the operational phase, the Proposed Development will be operated, maintained and managed by the Applicant.

2.9.3.2 Staffing / Employment

During the operational phase permanent staff will be employed, some of whom will work in shifts as the Proposed Development will be operational for 24-hours. It is anticipated that a total of 34 No. staff will be required for the operational phase, as follows:

- 26-day staff (08:30 – 17:00).
- 40 No. shift staff: five shifts of eight employees.

Additional contract staff and service personnel will be utilised as needed. Personnel will perform the following functions:

- Management and administration.
- Operations.
- Maintenance.
- Marine operations.
- Health, Safety, Security and Environment.
- Finance and accounting.
- Sales and marketing.

Managerial staff will be experienced personnel from the energy industry, operations, maintenance and support personnel employed for the Proposed Development will be recruited locally to the extent possible.

The Applicant will operate and maintain the Proposed Development to meet or exceed all applicable EU and Irish employment regulations and requirements. The Applicant will prepare, maintain and update a comprehensive set of operations, maintenance, safety, and emergency response manuals for the combined operations. All operations and maintenance personnel will be trained in accordance with the procedures in these manuals.

Maintenance staff will carry out routine inspections, maintenance, and repairs, as well as major equipment overhauls, where applicable, refer to **Section 2.9.3.4**. Security personnel, and catering / cleaning personnel will be provided by third parties. Warehouse personnel are anticipated to be contract staff.

Above Ground Installation Staffing

The AGI will normally be an unmanned facility, operated by GNI. GNI personnel will visit the AGI as and when required for inspection and maintenance purposes.

2.9.3.3 Training

The Proposed Development, through its training regime, will ensure every employee is aware of their responsibility to work safely, adhere to safety rules and work procedures, use safety equipment provided, is environmentally responsible, and play an active role in the Proposed Development's drive for continual improvement in health, safety and environmental (HSE) performance.

Pre-operational training and regular refresher courses, using simulators, will be undertaken, involving all relevant parties, including Kerry Co. Co.'s Fire Department and the employees.

2.9.3.4 Operational Phase Maintenance

Routine maintenance will be carried out in accordance with the maintenance procedures provided by the Contractor and manufacturer.

The Proposed Development will be required to undertake an annual inspection, as per the manufacturer's requirements. During this time the Proposed Development will be shut down to allow the inspection to be completed (by the manufacturer's personnel).

2.9.3.5 Health and Safety (H&S) - Emergency Planning

Measures to prevent the risk of fires, spillages, floods and other major incidents will be embedded in the design of the Proposed Development. Measures to prevent potentially major incidents include:

- Hazardous and polluting liquids such as diesel fuel and transformer oils will be stored in tanks located in bunds.
- Diesel fuel unloading bay will be designed to contain spillages.
- Storage tank level indicators and oil detection sensors in bunds will be provided with alarms.
- Class 1 full retention Oil Water Separator will be provided in the surface water drainage system.
- Measures to isolate the surface water drainage system will be provided to prevent discharge of contaminated water.

The Applicant will ensure that operating, maintenance, and emergency response procedures and manuals will be subject to regular review and will be updated to reflect best industry practice, or to reflect the addition of new procedures, equipment or other facilities.

Operational procedures will be in place that will clearly outline responsibilities and the appropriate communication channels for operational staff / site personnel. Operational measures will be included in the Environmental Management System (EMS) and regulated by EPA through the IE licence.

2.9.3.6 Operational Traffic and Transport

Full details on operational phase traffic movements are detailed in **Chapter 11** (Traffic and Transport).

During the operational phase, there will be no vehicle movements associated with the supply of natural gas for the Proposed Development. Permanent staff will be employed, some of whom will work in shifts as the Proposed Development will be operational for 24-hours, refer to **Section 2.9.3.2**.

However, in an emergency situation - when operating with distillate oil - HGV deliveries will arrive on-site. However, this is not expected to be a regular occurrence. A distillate oil fuel delivery by road will be limited to the hours of 07:00 and 19:00, and no deliveries will take place on Sundays or at night, except in the case of extended emergency operations.

Routine maintenance will be carried out in accordance with the maintenance procedures provided by the contractor and manufacturer, refer to **Section 2.9.3.4**.

2.10 Decommissioning Phase

The Proposed Development is expected to have a design life of 25 years, but this could be extended by maintenance, equipment replacement and upgrades or by the transition of the Site to use hydrogen capability (which will be subject to a future planning application). It is expected that it would be a

condition of the IE licence for the Proposed Development that a closure and residuals management plan, including a detailed decommissioning plan, be submitted to the EPA for their approval.

Decommissioning activities will include, as a minimum:

- All wastes at the facility at time of closure will be collected and recycled or disposed of by an authorised waste contractor, as appropriate.
- Utilities will be drained of all potential pollutants such as lubricating oils or sealed to prevent leakage if being moved offsite or reused elsewhere.
- All raw materials, oils, fuels, etc. onsite at the time of closure will be returned to the supplier, or collected and recycled or disposed of by an authorised waste contractor, as appropriate.
- All buildings and equipment will be decontaminated, decommissioned and demolished in accordance with a phased demolition plan, and either sold for reuse or recycled, or disposed of by an authorised waste contractor, as appropriate. In general, specialist equipment, pipelines and storage tanks will be sold for reuse, where possible, or disposed of offsite.
- Roadways to be broken up and removed and security fences dismantled.
- All hazardous and non-hazardous process substances to be removed.
- All roads and hardstanding areas to be removed and recycled or disposed of by an authorised waste contractor, as appropriate.
- Landscaped will be reinstated in accordance with a landscape reinstatement plan.
- On completion of safe decommissioning of equipment, the potable water, fire water and electrical power supplies could be disconnected, and removed or abandoned in place.

When operations at the Proposed Development have ceased, and assuming confirmation from the monitoring programme that all emissions have ceased, it is expected that there would be no requirement for long-term aftercare management at the Site of the Proposed Development.

The Gas AGI will be managed as part of the national gas networks. At the end of its design life, it is expected that the gas connection may have residual life remaining and the operational life may be extended if appropriate and / or the asset refurbished and retained as part of the national transmission network.

2.11 References

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Shannon Technology and Energy Park (STEP) Power Plant

Environmental Impact Assessment Report - Volume 2

Chapter 14 Major Accidents and Disasters

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14. Major Accidents and Disasters

14.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) assesses the potential Major Accidents and Disasters (MA&Ds) scenarios which are pertinent to the Proposed Development, taking into consideration the materials, operations and location of the Proposed Development and associated facilities.

The Site is located in the townlands of Kilcolgan Lower and Ralappane, between Tarbert and Ballylongford, Co. Kerry. The application Site boundary ('red line') encloses an area of approximately 41 hectares (ha) and is entirely owned by the Applicant.

MA&Ds are incidents which can result in immediate or delayed significant harm to human health and / or the environment and require the use of resources beyond those of the proposed developer or its contractors to manage, such as the emergency services. In the context of this assessment, major accidents are typically anthropogenic in nature and include for example, the accidental loss of containment of significant quantities of dangerous substances such as natural gas and gas oil, leading to fires and / or explosions. Disasters are typically naturally occurring events, such as earthquakes, landslides and flooding, and can also include manmade or external hazards such as acts of terrorism.

In this assessment, the MA&Ds pertinent to the Proposed Development are identified and qualitatively assessed to determine the potential impact on the following receptors:

- Population and human health.
- Biodiversity, with particular attention to species and habitats protected under The Habitats Directive (EU Council Directives on Birds and Habitats (Council Directive 92/43/EEC)).
- Land, soil, water, air and climate.
- Property and material assets, cultural heritage, and the landscape.

The assessment of MA&Ds considers the full lifecycle of the Proposed Development, from construction, through operation, maintenance, and the eventual decommissioning and demolition of the facilities.

Credible MA&Ds scenarios which are identified are termed 'Risk Events' and the mitigation measures to reduce these risks are considered. These measures include the engineering design and operational controls to prevent MA&Ds, and if Risk Events were to occur, reduce their impact and severity. Mitigation measures are therefore considered, along with the anticipated emergency management arrangements which would be initiated if the event occurred.

For each Risk Event, the qualitative assessment contained in this chapter will conclude if sufficient measures are in place to reduce risks associated with reasonably foreseeable worst-case impacts to acceptable limits, or if further mitigation is required.

This chapter contains an overview of the regulatory requirements to identify and assess major accidents and disasters. The methodology for identification of such is initially by consideration of the substances which will be present onsite, and which have the potential for major accident, by virtue of their chemical

or physical properties. Substances which have the potential to initiate and / or contribute to a major accident will be identified within this chapter for qualitative assessment.

The potential for natural disasters such as flooding and seismic events is primarily determined by the location of the facilities.

Full details on the background, Site history and the Proposed Development is provided in **Chapter 02** (Description of the Proposed Development) and also the Planning Statement submitted with this planning application.

14.2 Competent Expertise

This chapter has been prepared by a team including:

Dr Alex Freeman has a degree in Environmental Biogeochemistry from Glasgow University, a PhD. in Environmental Geochemisty from University of Edinburgh, and twenty two years of consultancy experience in both the UK and US for industrial clients designing and implementing ground investigations and groundwater remediation schemes, conducting due diligence and environmental compliance audits, preparing environmental permit applications and surrenders and preparing MADS chapters for DCOs / EIARs for power stations across the UK and Ireland including carbon capture and hydrogen schemes. Alex has also authored technical guidance for UK government agencies on topics including waste to land and DSEAR risk assessments.

Bob Hudson has a degree in Chemistry from Imperial College, post graduate diploma in Biochemical Engineering from Teesside University, and a Masters degree in Integrated Pollution Control from UMIST, and thirty five experience including work as a regulator (HMIP / EA), industrial manufacturer (Tioxide / bp) and consultant with three different environmental engineering consultancies.

14.3 Regulatory Overview

This section identifies the relevant policy, legislation and guidance informing the scope of the assessment and sets out the requirements stipulated within Directive 2011/92/EU on the assessment iseof the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 (the EIA Directive).

14.3.1 Legislation

The assessment of the vulnerability of the Proposed Development to MA&Ds is included within EIAR following changes to EU legislation now transposed into Irish law within the revised EIA Directive 2014/52/EU and S.*I. No. 191 of 2020 - European Union (Environmental Impact Assessment) (Environmental Protection Agency Act 1992) Regulations (as amended by S.I. No. 421 of 2022).* These Regulations state the need to assess:

“The significant effects to be identified, described and assessed include, where relevant, the expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters that are relevant to that development”’.

"A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and / or natural disasters which are relevant to the project concerned".

In accordance with the requirements of the Regulations, an assessment of the potential risks of MA&Ds relevant to the Proposed Development is required. This assessment shall consider the measures envisaged to prevent or mitigate significant adverse effects on the environment associated with these incidents and provide details of the preparedness for a proposed emergency response should they occur.

This assessment is a preliminary review, based on the current engineering design, drawings and documentation.

Further detailed hazard and risk analysis studies will be carried out throughout the project lifecycle. The engineering design of the project will be subject to formal process safety risk assessments, such as Hazard Identification (HAZID), Hazard and Operability (HAZOP) and Layers of Protection Analysis (LOPA) at the appropriate project / design stage(s). The purpose of these studies is to subject the design to a rigorous, structured assessment by suitably qualified, experienced people, to identify potential hazards. These hazards can then be subject to analysis to identify measures to manage the hazards and to reduce the level of risk.

Many regulations have been made which are of relevance to the control of MA&Ds of the Proposed Development, including the following:

- *Act No.10/2005* - Safety, Health and Welfare at Work Act (HSWA) (ISB, 2005). Including associated amendments:
    - *S.I. No. 231/2021* - Safety, Health and Welfare at Work (Chemical Agents) (Amendment) Regulations (ISB, 2021).
    - *S.I. No. 528/2021* - Safety, Health and Welfare at Work (Construction) (Amendment) Regulations (ISB, 2021).
    - *S.I. No. 255/2023* - Safety, Health and Welfare at Work (General Application) (Amendment) Regulations (ISB, 2023).
- Act No. 10/1972 (as amended by Act No. 21/1979) - Dangerous Substances Act (ISB, 1972).
- *S.I. No. 272/2008* - European Communities (Classification, Packaging, Labelling and Notification of Dangerous Substances) Regulations (CLP) (ISB, 2008).
- *S.I. No. 566/2012* - European Union (Large Combustion Plants) Regulations (ISB, 2012).

Another regulation of importance to the Overall Project and Proposed Development is the EU SEVESO III Directive (2012/18/EU) which is implemented in Ireland through the Chemicals Act (Control of Major Hazards Involving Dangerous Substances) Regulations SI. No. 209/2015 ("the COMAH Regulations"). This applies to sites, such as the Overall Project and Proposed Development, which store significant quantities of hazardous materials. The Proposed Development intends to store volumes in a quantity above the 'Lower Tier' and less than the "Upper Tier" COMAH qualifying thresholds. The Proposed Development will therefore be a Lower Tier Establishment.

14.3.2 Policy

The Department of Housing, Local Government and Heritage (DHLGH) as part of the Government of Ireland has published a series of guidance documents in line with their Major Emergency Management Framework in order to set out arrangements for co-ordination at local, regional and national levels of emergency management. The framework also introduces a system to immediately determine a lead agency in all emergency situations (DHLGH, 2022).

The Kerry County Development Plan (CDP) 2022-2028 (KCC, 2022), does not provide guidance regarding the assessment of MA&Ds but does refer to the implementation and control of Major Accident Hazard Sites, as defined by the SEVESO III Directive (2012/18/EU), within objective KCDP 9-91:

> *"Control the following, for the purposes of reducing the risk or limiting the consequences of a major accident (regard will be had to the provisions of the SEVESO III Directive and any regulations, under any enactment, giving effect to that Directive).*
>
> - *The siting of Major Accident Hazard sites.*
> - *The modification of an existing Major Accident Hazard site.*
> - *Specified development in the vicinity of a Major Accident Hazard site."*

14.3.3 Guidance

Key considerations for undertaking a MA&Ds assessment are provided in the European Commission: Guidance on the preparation of the Environmental Impact Assessment Report (EC, 2017).

There is no specific guidance available which sets out the approach for undertaking a MA&Ds assessment within an EIAR. However, the scope of the assessment has been developed with reference to the Institute of Environmental Management and Assessment (IEMA) publication "Major Accidents and Disasters in EIA: An IEMA Primer" (IEMA, 2020) which lays out emerging best practice.

Other guidance that is of relevance to the assessment of MA&Ds includes those published by the Environmental Protection Agency (EPA, 2022), the Health and Safety Authority (HSA, 2023) and the Chemicals and Downstream Oil Industries Forum (CDOIF, 2017).

As an emerging topic within environmental impact assessment (EIA), the IEMA, EPA, HSA, and CDOIF Guidelines provide useful guidance on the assessment of MA&Ds via the application of a process involving hazard identification via the consideration of typical guidewords, assessment of consequences and the consideration of means to eliminate or mitigate credible scenarios. The methodology used within this assessment is detailed in **Section 14.5.**

14.3.4 Definitions

For the purpose of this assessment, the definition of a 'Major Accident' is taken from the guidelines on MA&Ds within the IEMA Primer (IEMA, 2020).

"A major accident is an event (for instance, train derailment or major road traffic accident) that threatens immediate or delayed serious environmental effects to human health, welfare and / or the environment

and requires the use of resources beyond those of the client or its appointed representatives (i.e., contractors) to manage".

Major accidents can be caused by disasters resulting from both man-made and natural hazards.

A disaster is a man-made / external hazard (such as an act of terrorism) or a natural hazard (such as an earthquake) with the potential to cause an event or situation that meets the definition of a major accident.

In general, major accidents and / or disasters should be considered as part of an assessment where the development has the potential to cause the loss of life, permanent injury and/or temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration".

The Proposed Development will be classified as a 'Lower Tier' COMAH Establishment and the criteria for a major accident, listed in Schedule 6 of the COMAH Regulations (Regulation 19(2)), are appropriate for consideration in this assessment. These criteria (for a major accident) are listed below.

- An injury to a person which is fatal.
- Up to six persons injured within the establishment and hospitalised for at least 24 hours (hrs).
- One person outside the establishment hospitalised for at least 24 hrs.
- A dwelling outside the establishment which is damaged and unusable as a result of the accident.
- The evacuation or confinement of persons for more than 2hrs where the value (persons × hrs) is at least 500.
- The interruption of drinking water, electricity, gas or telephone services for more than 2hrs where the value (persons × hours) is at least 1,000.
- Permanent or long-term damage to terrestrial habitats:
    - 0.5 hectares (ha) or more of a habitat of environmental or conservation importance protected by legislation; or
    - 10 or more hectares of more widespread habitat, including agricultural land.
- Significant or long-term damage to freshwater and marine habitats:
    - 10 km or more of river or canal.
    - 1.0 ha or more of a lake or pond.
    - 2.0 ha or more of delta; or
    - 2.0 ha or more of a coastline or open sea; or
    - Significant damage to an aquifer or underground water: 1.0ha or more.
- Damage to property in the establishment, to the value of at least EUR 2 million.
- Damage to property outside the establishment, to the value of at least EUR 500,000.

14.4 Overview of Proposed Development

14.4.1 Description of Proposed Development

A detailed description of the Proposed Development is contained in **Chapter 02** (Description of the Proposed Development) and the following section lists the key features.

The Proposed Development will consist of the following main components, summarised as follows:

- Three (3 No.) blocks of Combined Cycle Gas Turbines (CCGT), each block with a capacity of approximately 200 megawatts (MW) for a total installed capacity of up to 600 MW.
- A 120 MWh (1-hr) Battery Energy Storage System (BESS).
- High voltage 220 kV GIS Substation.
- Auxiliary Boiler.
- Raw water treatment and storage.
- Firewater storage tanks and fire water pumps.
- Ancillary buildings.
- Secondary Fuel Offloading and Storage, consisting of;
  - Two storage tanks, each with a capacity of 5,000 m^3 (10,000 m^3 in total).
  - Three day-storage tanks each with an approximate capacity of 2,000 m^3 (6,000 m^3 in total).
- Above Ground Installation (AGI) compound.

Figure 14.1 shows the layout of the Proposed Development.

Figure 14.1: Proposed Development Layout

The Proposed Development (Power Plant) will operate using natural gas as its primary fuel and is designed to operate alongside intermittent renewable electricity power generation. It is expected to mainly operate at full capacity during periods of low renewable supply, and otherwise to be turned down or turned off.

The BESS will assist in providing electricity to the grid during start-up of the Combined Cycle Gas Turbines (CCGT), once they are operating at the necessary capacity the BESS will be switched off and recharged. The BESS can also charge from the grid. For example, if there were high renewable generation levels on the Irish power system at any one time, the BESS could charge from the grid instead of the power plant (Section 2.3.2 Chapter 2 Project Description).

Natural gas will be delivered to Site via a consented 26 km natural gas pipeline facilitating connection [Planning Reference GA08.GA0003] from the Site to the Gas Network Ireland (GNI) transmission network west of Foynes. This will generate power to be exported via the 220 kV connection to the national electricity grid.

The Proposed Development also consists of secondary fuel storage and offloading which will supply distillate oil for a minimum of five continuous operating days (approximately 10,000 m^3), as required by '*Secondary Fuel Obligations on Licensed Generation Capacity in the Republic of Ireland' (CER/09/001*), issued by the Commission for Regulation of Utilities (CRU). This reserve will only be used in the event

that the gas connection is unavailable and generation on the grid cannot meet demand. The total reserve consists of two storage tanks (~5,000 m^3 each) and three day-storage tanks (~2,000 m^3 each) with a combined capacity of approximately 16,000 m^3. Tertiary containment, bunding and associated pipework will be designed in accordance with EPA Guidance Note on Storage and Transfer of Materials for Scheduled Activities. The tanks will be located in a bunded area, which will allow for either 110% of the largest tank within the bund or 25% of the total volume of substance within the bund, whichever is the larger, in accordance with CIRIA C736, *Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industrial and commercial premises, (*CIRIA, 2014).

The distillate oil will be supplied to the Site by HGV tanker at an unloading station adjacent to the storage tanks, which will feed the distillate oil into one of the three day-tanks.

The planning application boundary of the Proposed Development is shown by the redline in **Figure 14.1**. The quantity of distillate and natural gas present within this boundary has been assessed to be above the Lower Tier, and less than the Upper Tier, qualifying threshold at which regulation under the Chemicals Act (Control of Major Accident Hazards (COMAH) involving Dangerous Substances) Regulations 2015, S.I. 209, will apply. The Proposed Development will therefore be a Lower Tier Establishment. . Compliance with the COMAH Regulations places a number of duties on the operators of installations. These include the following:

- Lower Tier and Upper Tier – Preparation of a Major Accident Prevention Policy (MAPP).
- Lower Tier – Preparation and Implementation of a Safety Management System (SMS).

Consultation with the HSA has been ongoing throughout the design development of the Proposed Development. COMAH notifications and documentation will be submitted for regulatory review at the appropriate juncture.

The COMAH SMS (Lower Tier) will include a detailed description of the technical standards used in the design of process, mechanical, electrical and civil engineering equipment and structures. These include International and European standards such as:

- The National Fire Protection Association (NFPA) suite of Recommended Practise (RP) documents, specifically NFPA 850: RP for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations.
- Institution of Gas Engineers and Managers suite of standards, including IGEM/ SR/ 16 Edition 2 - Odorant systems for gas transmission and distribution.

14.4.2 Site Location

The Proposed Development is located on a site adjacent to the Shannon Estuary, between Tarbert and Ballylongford in Co. Kerry.

The Site is zoned as industrial by Kerry Co. Co. (Kerry CDP 2022-2028) and supports the progress of strategic energy projects along with the expansion of the gas network (Objective KCDP12-3). The Proposed Development is in alignment with local, regional and National policies, as specified within **Chapter 04** (Policy, Energy and Planning).

The Site is located approximately 4.5 km from Tarbert and 3.5 km from Ballylongford in Co. Kerry. This area is characterised by predominantly improved grassland in an agricultural setting. Field boundaries predominantly consist of hedgerows with small drainage ditches. A small section of the Ralappane Stream which runs in a north westerly direction, discharging into the Shannon Estuary, is located in the most southern part of the Site. The L1010 (Coast Road) is located to the south of the Site.

There are a small number of residential properties located within 500 m of the Site and additional residential properties located along the L1010 road. The nearest COMAH Establishments to the Site are as follows:

- The decommissioned SSE Tarbert HFO Power Station which is approximately 5 km east of site.
- The National Oil Reserves Agency (NORA) facility, known as the Mainland Tank Farm, which is also approximately 5 km east of site. SSE Tarbert HFO Power Station and the NORA facility are both Upper Tier COMAH installations and adjacent to one another.
- Moneypoint Power Generating Station, which is an Upper Tier COMAH installation, located on the northern shore of the Shannon Estuary, approximately 3 km to the north of the Site.

The main site of the Tarbert Power Station has been decommissioned but is expected to be refurbished during 2024 such that it will continue operations using Hydrogenated Vegetable Oil (HVO) as its Primary fuel instead of Heavy Fuel Oil (HFO). It is currently unclear what, if any, COMAH status will be assigned to the redeveloped site. During this transition, to ensure power can still be supplied to the grid, the station is currently constructing a Temporary Emergency Generating (TEG) facility to run on distillate fuel.

The Moneypoint Power Station is the Republic of Ireland's largest, and only coal-fired power station. However, the power station is expected to cease coal burning activities as of 2025 and will instead operate using HFO from 2025 to 2029. During this period the power station will only operate to compensate for shortfalls in generation capacity that threaten consumer supply.

There is no local Fire station within the environs of the Proposed Development. A firewater system will be installed within the Proposed Development including fire water storage and fire pumps. Additional mobile resources such as fire tenders will be considered along with provision of specialist training to site personnel.

There are a number of designated environmental sites in the area of the Proposed Development, including the Lower River Shannon Special Area of Conservation (SAC), which is adjacent to the Site, along the northern / north-western boundary and also along part of the eastern boundary. The Ballylongford Bay proposed Natural Heritage Area (pNHA) is adjacent to a part of the north-western boundary of the Site. The Lower River Shannon SAC and the River Shannon and River Fergus Estuaries Special Protection Area (SPA) extend along the north-western shoreline boundary of the Site. These sites are identified within **Figures F7.1** and **F7.2** in Volume 3.

The Proposed Development is not located within a groundwater drinking water source protection area. A search of the Geological Survey of Ireland well records found no springs and a relatively small number of low-yielding groundwater abstraction wells recorded between 1 and 2 km from the Site. These

groundwater abstractions are likely to be wells serving single houses or farms and all are hydraulically up gradient of the Site and therefore are unlikely to be impacted by the Proposed Development.

Surveys and test trench excavations have been carried out to inform previous planning applications on the Site. The surveys and test trenches were carried out to assess the presence of areas of archaeological potential. A ringfort (fortified settlement dating approximately to the Bronze Age) has been identified. These sites are constructed from earth and stone, and largely buried, therefore they are not considered to be vulnerable to the potential major accidents and disasters pertinent to this Proposed Development.

The Proposed Development will source local materials such as rock and stone for use during construction, with materials such as concrete and tarmac also being used. Lime and concrete (specifically, the cement component) is highly alkaline and any spillage which migrates through subsoil could impact groundwater quality, therefore a Construction Environmental Management Plan (CEMP) will be produced for the construction phase, refer to CEMP in **Appendix A2.3** of Volume 4, and will incorporate measures for safety and environmental protection during the construction of buildings, pipelines and concrete structures, such as pavements and culverts.

The onshore operational equipment will be enclosed within a security fence provided with pedestrian and vehicular access. The AGI compound will be remotely operated and normally no personnel will be present in this area.

The access road levels will be profiled to drain road runoff to an engineered swale adjacent to the road, the majority of which will drain to the engineered storm drainage system at the Power Plant site and discharge to the shared constructed outfall to the Shannon Estuary.

There will also be a stormwater discharge point at the Ralappane D1 stream crossing, located 50 m from the Site entrance (Drawing Ref: 198291-1STF-S3001), and a second stormwater discharge point will be located at the D2 stream crossing located 20m from the construction laydown area (Drawing Ref: 198291-1STF-S3002). Both will be fitted with Class 1 hydrocarbon interceptors.

All rainwater drainage falling on paved surfaces will pass through Class 1 hydrocarbon interceptors, which will be installed upstream of each stormwater discharge point. The interceptors will collect any accidental spills of fuels or oils used in vehicles onsite.

Spill kits will be located at strategic points around the Proposed Development to ensure a quick response to any spillages should they occur. Any used spill kits will be disposed of using a hazardous waste disposal contractor and in accordance with all relevant EU and Irish waste management legislation (*i.e.* the Waste Management Acts 1996-2011 and any regulations made thereunder, and the Waste Framework Directive).

A firewater retention pond is included in the Proposed Development and sized according to the EPA *Guidance on Retention Requirements for Firewater Runoff (2019)*, as the most effective and suitable measure for retaining firewater. The retention pond will be rendered impermeable by use of an appropriate liner, and integrity-tested in line with the requirements of the Site's licence. All drainage will pass through the retention pond. An automatic shut-off valve linked to the site's fire detection system will be installed on the drainage outlet point.

The EPA Guidance Note 'Storage and Transfer of Materials for Scheduled Activities' (EPA, 2013) shall be taken into account when designing material storage and containment onsite.

14.5 Methodology

The assessment of MA&Ds has been based on the application of a standard hazard identification and risk assessment methodology, which is typically applied at COMAH Installations and follows the IEMA Primer and EPA guidance where applicable.

Reference has been made to the guidance provided by the CDOIF Guideline, Environmental Risk Tolerability for COMAH Establishments.

The methodology aims to identify credible hazard scenarios, which are pertinent to the Proposed Development by virtue of the substances present, operations carried out and the geographic location. For each scenario identified, the precautionary measures associated with these hazards are taken into consideration and the residual risk is assessed. Following implementation of mitigation measures, the residual risk should be commensurate with a level considered by the Health and Safety Authority and EPA to be 'as low as reasonably practicable' (ALARP).

A proportionate, precautionary approach has been used in this assessment, based on the relative likelihood of the credible hazardous scenarios identified. A greater level of detail will be applied to the assessment of scenarios, which are considered more likely to occur, or to scenarios with potentially more significant consequences.

The approach used in this assessment is summarised as follows:

- Identify the hazardous substances which could be present over the lifecycle of the Proposed Development. These include flammable substances, materials harmful to the environment and materials harmful to human health.
- Consider the quantities and storage arrangements associated with these substances and the operations carried out at the Proposed Development involving these materials.
- Identify the credible major hazard scenarios associated with these materials and operations.
- Assess the location and vulnerability of the Proposed Development to hazards as a result of infrastructure, climatic conditions and geological events.
- In general, credible MA&D scenarios will fall into one of three categories:
    a) events that could not realistically occur, due to the substances present, the type of development or its geographic location;
    b) events that could realistically occur, but for which the Proposed Development, and associated receptors, are no more vulnerable than any other development; and
    c) events that could occur, and to which the Proposed Development is particularly vulnerable, or which the Proposed Development has a capacity to exacerbate.
- Where credible major accident or disaster scenarios are identified, describe the potential for any change in the relevant environmental and human health receptors in qualitative terms.

- Describe the mitigation measures which will be adopted during the design, construction and operation of the Proposed Development, to provide documented evidence to support and demonstrate that likely effects have been mitigated or managed to an acceptable level.

Sections 14.6 and **14.7** contains a screening process to identify the credible Risk Events for further consideration. The specific mitigation measures associated with each Risk Event are presented and the general mitigation measures to reduce risk are discussed in **Section 14.9**.

14.5.1 Potential Impacts

The potential hazards associated with substances present at the Proposed Installation, which are described in **Table 14.1** and have the potential for a major accident, are summarised in the following section. All the identified hazards listed below require a loss of containment to occur, such as catastrophic damage or failure of pipework or equipment.

- Fire:
  - **Flash Fire:** A flash fire can occur following a loss of containment of flammable liquid, vapour or gas which results in a flame which passes through the mixture at less than sonic velocity such that explosion overpressures are negligible. A flash fire may be caused by releases at high or low pressure into an open, unconfined area which contacts an active source of ignition.
  - **Jet Fire**: A jet fire can occur following a loss of containment of high pressure gas, liquid or vapour released via a source such as a leak or failure of flanged pipework joints, pipework or another asset which contacts an active source of ignition.
  - **Pool Fire**: A pool fire involves the combustion of vapour from a pool of flammable liquid. It may occur within a clearly defined boundary or be unconfined. Flames generated by a pool fire are often accompanied by quantities of smoke with both flames and smoke orientated downwind.
- Explosion:
  - **Vapour Cloud Explosion (VCE)**: A loss of containment of flammable gas or vapour, which does not ignite immediately, may form a cloud of flammable material depending on the conditions of the release. If this cloud enters an area of confinement and contacts an active source of ignition, a VCE can result and generate potentially harmful overpressures.
  - Overpressures generated by explosions are related to the degree of confinement or congestion in the area in which the material is released. For example, in complex industrial structures with a lot of pipework and equipment in close proximity, the pressures generated are much larger than in open areas, due to the effect of these structures accelerating and / or reflecting the pressure wave.
  - **Boiling Liquid Expanding Vapour Explosion (BLEVE):** A BLEVE can occur if a storage vessel containing a flammable liquid held under pressure is heated to a temperature above its boiling point, for example, by exposure to a fire, which eventually causes the

vessel to rupture. Material released from the vessel will likely ignite, resulting in a fire and potentially harmful overpressures.

- Thermal Runaway:
  - A thermal runaway can occur if enough heat is supplied to a process that is accelerated by an increase in temperature, leading to further uncontrolled temperature increases. This reaction can significantly increase the severity of fires and / or explosions by increasing their duration and / or area of effect.
- Major Accident to the Environment:
  - A loss of containment of liquids such as fuel oils which are accidentally released to water, land and / or groundwater in significant quantities can cause harm to the environment.

A detailed description of the properties of the hazardous substances and an assessment of their potential hazards is contained in **Sections 14.6** and **14.7**.

14.5.2 Hazardous Substances and Operations

14.5.2.1 Construction Phase

The identification of potential MA&Ds during construction considers the substances which will be present, and the typical activities associated with the works, such as demolition works, ground preparation, excavation, construction of buildings and process structures including bulk storage tanks and bunding.

The following substances will be present at the Proposed Development during construction:

i. Construction materials such as liquid concrete

This material can be harmful to human health and the environment and will present in significant quantities during construction, where it is used to construct buildings, site surfacing, equipment supports and other assets.

ii. Oxy-acetylene and nitrogen

These materials, contained in compressed gas cylinders, may be present on-site to carry out welding during construction activities.

iii. Diesel

Diesel will be stored in a temporary above ground bunded storage tank, for use in refuelling site activities.

Construction activities include works required to connect electrical power generated at high voltage (HV) at the Proposed Development to the transmission system via equipment such as transformers and switchgear. There are hazards associated with HV electricity, particularly during construction when work is carried out at or near to overhead power lines and underground cables. Contact with HV electricity can cause fatal injuries therefore must be carefully managed to control risks. An accident which causes an interruption to the supply of electricity to local residents and businesses could be within the criteria for a MA&Ds event. Major Accident and Disaster risks associated with these works will be identified within the MADs Chapter for the 220 KV works.

General demolition and construction activities, such as excavation, and construction of buildings and other structures will require the use of vehicles and tools. The hazards associated with activities include the potential for vehicle impact, particularly during reversing and vehicle overturning. The controls around this work will be carefully managed via risk assessment to control the risks to people, the environment and the existing operational areas.

A further risk during construction is the potential for a spill / loss of containment of fuel during refuelling of site vehicles which could pose a risk to the environment. This risk will be mitigated through the adoption of safety controls detailed in the CEMP.

14.5.2.2 Commissioning Phase

Potential MA&Ds during commissioning activities involve the same hazardous substances as the operational phase, but with a higher risk profile due to the one-off nature of the some of these activities (i.e. charging the storage vessels, testing of the critical safety equipment such as shutoff valves). Commissioning procedures, including details of any mitigation measures, should be detailed in a commissioning report which is typically required to support both the Environmental Permit and the COMAH reporting and will require approval from HSA and EPA.

As well as the substances present at the Proposed Development during operation as detailed in **Section 14.5.2.3**, the following substances will be present at the Site during commissioning of the Proposed Development, the MA&Ds scenarios associated with each material are considered in **Table 14.1**.

i. **Compressed Nitrogen**

   This material will be used at the Proposed Development for gassing up and dewatering of the pipelines to ensure it is suitable for safe operation. This material will also be used during operation to purge the pipeline for integrity testing and may be used for other maintenance activities such as pigging.

ii. **Propane**

   Propane is commonly used in pilot ignition systems for combustion plants and as reference gases in the continuous emissions monitoring systems installed within the stack(s).

14.5.2.3 Operational Phase

The identification of potential Major Accidents during operation considers the substances present at the Proposed Development, identifying those which are potentially dangerous, such as flammable materials and substances toxic to human health and / or the environment. The assessment also considers the equipment in which these substances will be stored and used.

The following substances will be present at the Proposed Development during operation, the MA&Ds scenarios associated with each material are considered in **Table 14.1.**

i. **Compressed Natural Gas**

   This will be the main fuel source used at the Proposed Development. This will be supplied to the Site using a 26 km underground pipeline from the national gas transmission network. The

majority of pipework at the site will also be underground other than a short section of the gas import pipeline to allow for connection to a bi-directional pig-trap.

ii. Distillate Oil

This is the secondary fuel source, which will be stored at site to be used if natural gas cannot be supplied to the Site and the generation to the grid cannot meet demand. This substance will be stored using three 2,000 m^3 (day tanks) and two 5,000 m^3 (bulk) storage tanks for a total capacity of 16,000 m^3, which should allow for at least five days of continuous operation. Distillate Oil will be supplied to site by HGV tankers, which will connect to one of the three 2,000 m^3 storage tanks. It is not envisaged that distillate oil would not be used in the normal course of events other than for about three hours per annum for test firing.

iii. Lithium and other metals / hazardous materials

Lithium will be used in the sites BESS, which will occupy a 33.9 m by 163 m area and comprise of 27 battery containers, each with a capacity of 4.5 MWh and dimensions of 6.5 m x 2.4 m x 2.5 m (L x W x H). Other hazardous materials may be included in the BESS dependent on the type of battery used, including chemicals containing fluoride and chloride.

iv. Acidic and caustic substances

These materials are typically used for water treatment works to create demineralised water for steam cycle makeup for each CCGT. Dependent on the volume required, these will be stored in aboveground storage tanks (ASTs) with appropriate secondary containment (110%) and segregation.

The following substances may also be present on the Site, albeit in much smaller quantities:

- Gas Oil (Diesel) will be stored in a storage tank on Site as part of the Sites containerised fire water module which includes an emergency diesel fire water pump, as well as a storage tank for a stand-by diesel powered electrical generator, used for the CCGTs electrical and control equipment. Diesel will also be used in HGVs for onsite operational traffic and transport (e.g., for distillate oil fuel deliveries).
- Hydrogen compressed gas stored in pressurised cylinders, commonly used as a coolant in the gas combustion turbine generator cooling system.
- Oxyacetylene and nitrogen contained in compressed gas cylinders may be present on-site to carry out welding when operational during maintenance activities.
- General oils and lubricants for rotating machinery.
- Carbon dioxide (CO_2) compressed gas for fire suppression, where water / foam cannot be used.
- Biocides and corrosion inhibitors are materials often used at power generation facilities, which incorporate steam systems in order to treat water used in the steam system..

All materials will be safely contained on Site within dedicated storage tanks or appropriate areas / cages, *i.e.,* compressed gas cylinders. All materials will be stored in suitably bunded areas with weather protection and will be inspected regularly.

Firewater runoff could be generated on-site during a major accident. In the event of a major fire on-site, water potentially containing a foam concentrate could be applied to extinguish fires within the distillate oil fuel storage area. Firewater generated in such an incident could contain a mixture of materials that are harmful to the environment if allowed to enter the ground and groundwater. These include un-combusted distillate oil, products of combustion etc. Consequently, firewater runoff is considered as a potentially dangerous substance in this assessment.

The CCGT system comprises a large combustion engine, which mixes compressed air with natural gas or distillate oil fuel, the energy released from combustion is then used to heat water making steam which subsequently drives a steam turbine to generate electricity. The system is housed within an enclosure to provide a controlled environment, which incorporates pressurised systems to prevent the ingress of external hazardous materials such as dusts and flammable gases.

The CCGT systems use well established technology and are in operation within many facilities worldwide, as they provide an efficient means of generating electricity very quickly. There are however recognised hazards associated with their use as they comprise complex, high speed mechanical components and operate at high temperatures and pressures, with a flammable mixture of fuel in air. These systems must be carefully managed and controlled via safety systems; therefore, the use of this equipment is considered in the assessment of potential major accidents.

14.5.2.4 Decommissioning Phase

When decommissioning takes place, all above-ground equipment associated with the Proposed Development will be emptied, cleaned, disassembled and removed from the Site. However, prior to the removal of plant, all residues and operating chemicals will be cleaned out from the plant and recycled or disposed of at a suitably licenced facility. The majority of the plant and equipment will have some limited residual value as scrap or recyclable materials and will be recycled at the time.

Contamination prevention is a requirement of the IE licence during the lifetime of the licence, *i.e.* during construction, commissioning, the operational phase and the decommissioning phase. Therefore, the Proposed Development has been designed to prevent new areas of ground from being contaminated or pathways to receptors as a result of construction or operation. Once the plant and equipment have been removed to ground level, the hardstanding and sealed concrete areas will be left in place. This is a recognised demolition practice.

Method statements and risk assessments for the demolition activities will be key mitigation measures adopted during the eventual decommissioning phase of the Proposed Development.

In addition to these measures, other general safety controls will be incorporated into a Decommissioning Plan (including a Decommissioning Environmental Management Plan (DEMP)) which will be produced when required and agreed as part of the Industrial Emissions (IE) licence of the Site and site surrender process.

14.5.2.5 Consequence Modelling

A Quantitative Risk Assessment (QRA), including consequence modelling, was carried out for the Proposed Development in 2021 and updated in 2024, with regards to offsite impacts related to land use planning. This involved the impact assessment on offsite receptors of natural gas and diesel fuel fires

and explosions, through pipeline and vessel storage losses. The QRA employed HSA guidance for credible release scenarios and the embedded data on frequency of loss and probability of ignition. The consequence modelling involved the use of proprietary modelling software (DNV SAFETI – version 8.9) to identify impact contours that are consistent with the three Land Use Planning (LUP) contours, used to assess developments relative to offsite receptors. The results showed that there were no incompatible land uses near the site for the three LUP zones and that the individual risk at nearby residential properties is negligible. There were no populated areas within any of the LUP risk curves and so the societal risk was not calculated but is considered negligible. No lethality is expected in populated areas near to the site.

14.6 Identification of Potential Accidents

The substances associated with the Proposed Development, which are potentially dangerous and could therefore be a credible source of Major Accident Hazard (MAH) during the lifecycle of the development, are described in **Table 14.1**.

Substances are generally classified in accordance with the Classification, Labelling and Packaging (CLP) Regulations (EC, 2008). This is a harmonized system of identifying the hazardous properties of materials, for example those which are flammable, toxic and harmful to the environment. Where substances are not classified by CLP, for example, wastes, the general characteristics are considered in order to determine the potential for a Major Accident Hazzard (MAH).

This assessment considers the potential interactions of substances present on the Proposed Development, which could potentially create harmful materials or the release of energy.

Where substances are identified as being dangerous by their properties, the means by which they could result in harm is then considered. Where there is the potential for a MAH, this is identified for further assessment, which is contained in **Table 14.3**.

Where a major fire and / or explosion could cause harm both on and offsite, this would be considered as a MAH. This aligns with the criteria for the notifiable incident referred to in Regulation 20 the COMAH Regulations, which is a fire involving a dangerous substance that may result in suspension of normal work in the establishment for more than 24 hours (Government of Ireland, 2015).

If a release of a dangerous substance resulted in significant damage to the environment or property, this would be considered a MAH. The Guideline on Environmental Risk Tolerability for COMAH Establishments (CDOIF, V2 March 2016) contains information on the severity of harm at sensitive receptors resulting from accidents, which might be considered to be a Major Accident to the Environment (MATTE). This guidance has been taken into consideration in the review of releases within **Table 14.1**.

As the Proposed Development will be required to notify as a COMAH site, the principals of the COMAH Regulations have been used to identify and assess scenarios which could result in a MAH or MATTE. These principals present a clear and robust methodology for facilities where substances such as natural gas are present.

Table 14.1: Screening Assessment Dangerous Substances and Major Accident Hazards (MAH)

Substance	Description of use	CLP Hazard Classification	Screening and Identification of Potential Major Accident Hazard	Further Assessment Required (Y/ N)
Natural Gas	Gaseous hydrocarbon mixture, predominantly methane, supplied to the site using a 26 km pipeline from the National Gas Transmission Network. Natural Gas is then forwarded to the CCGT where it is used for energy generation.	H220 - Extremely flammable gas. H280 - Gas under pressure; may explode if heated. H380 - May displace oxygen and cause rapid suffocation.	In the event of emergency depressurisation of a section of the process being required, the gas would be vented at a safe location where it would be dispersed by natural ventilation. However, in the event of accidental damage to the natural gas pipeline or other gas pipework at the Proposed Development, there is the potential for a release of a significant quantity of gas, which if ignited, can result in a flash fire or jet fire, which has the potential to cause harm to people via thermal radiation and inhalation of smoke. The impact of a flash fire or jet fire would likely be restricted to the immediate area, but such fires could result in ignition of offsite surface material i.e. peat, which can cause the heat to propagate underground and spread to the remaining pipework. A plume of smoke generated by a major fire would contain harmful substances such as particulate matter, however as the natural gas pipework is located in a well-ventilated area if there were an impact to the pipeline the smoke would likely surface where it can then disperse into air, and as such it is unlikely that this would have an impact beyond the immediate area. If a release of natural gas does not ignite immediately it may form a cloud, which could enter an area of confinement and contact an active source of ignition, causing a Vapour Cloud Explosion, which could generate potentially harmful overpressures. However, an impact to the pipeline would likely create an opening to the surface for natural gas to escape and as the area is well-ventilated it is unlikely for such a vapour cloud to form. Because of these hazards, there is the potential for a major accident scenario(s) associated with a significant loss of containment of natural gas, therefore this scenario is considered further in this assessment.	Y Risk Event 1

Substance	Description of use	CLP Hazard Classification	Screening and Identification of Potential Major Accident Hazard	Further Assessment Required (Y/ N)
Lithium and other metal ions and chemicals in BESS	Lithium ions and other metal ions are used within the Proposed Developments BESS, as well as organic substances which may include fluoride and chloride. There are 27 battery containers, each with a capacity of 4.5 MWh and dimensions 6.5 m x 2.4 m x 2.5 m (L x W x H)	These substances are non-classified by the CLP regulations, when cell enclosure and seals remains intact and the battery is operated in accordance with manufacturer recommendations.	In the event of accidental damage or malfunction of the batteries at the Proposed Development, there is the potential for the battery to ignite, which can lead to a thermal runaway, where the battery / batteries would self-generate more heat than can be dissipated. This can in turn affect surrounding batteries and result in a fire and or explosion. Accidental damage to the BESS may also result in the release of electrolyte and other gaseous toxic substances, such as carbon monoxide (CO), hydrogen chloride (HCl), hydrogen fluoride (HF), hydrogen cyanide (HCN), benzene, and toluene. The use of firefighting foam / firewater could then entrain these toxic substances in firewater, which could be hazardous to human health and the environment. The risk of propagating thermal runaway can be mitigated through appropriate separation of the individual cells within each battery container, and the use of warning sensors (e.g. temperature and carbon monoxide sensors) which could be used to isolate systems to minimise the risk of thermal runaway occurring. The battery containers themselves will also be appropriately separated within a 33.9 m by 163 m area to further minimise risk of fire spreading between containers. There is the potential for a major accident scenario associated with significant damage to the BESS, therefore this scenario is considered further in this assessment.	Y Risk Event 2

Substance	Description of use	CLP Hazard Classification	Screening and Identification of Potential Major Accident Hazard	Further Assessment Required (Y/ N)
Distillate oil	Distillate oil will be present at the Proposed site as a secondary fuel source in case of inability to supply natural gas to the Site. This is proposed to have a storage capacity of 16,000 m³ across five tanks.	H226 - Class 3 flammable liquid and vapour. H304 - May be fatal if swallowed and enters airways. H315 – Causes skin irritation. H332 - Harmful if inhaled. H350 - May cause cancer. H361d - Suspected of damaging the unborn child. H373 - May cause damage to organs through prolonged or repeated exposure. H411 – Toxic to aquatic life with long lasting effects	The credible scenarios which could result in a release of Distillate oil include the failure of or accidental damage to pipework, flexible hoses, storage tanks and transfer pumps, which could cause significant quantities of Distillate oil to be released. This scenario could also include the failure of containment systems within delivery vehicles (double skins) whilst on/travelling to Site. The maximum quantity of Distillate oil which could be released may be up to several tonnes, depending on the type of incident. In the event of accidental damage to the storage tank, HGV tankers or associated pipework, there is the potential for a release of Distillate oil to the surrounding environment. If it is released Distillate oil has the potential to cause a major accident, as it can cause major disturbances to the soil, groundwater and River Shannon, . If Distillate oil vapour is ignited, this can result in a pool fire, which has the potential to cause harm to people via thermal radiation and inhalation of smoke. The impact of a pool fire within a storage tank bund would be likely to be restricted to the Site, as high levels of thermal radiation would be unlikely at offsite receptors. A plume of smoke generated by a major fire would contain harmful substances such as particulate matter and potentially Sulphur Dioxide, however due to the size of the Distillate oil tanks, in the worst-case pool fire scenario the plume would be unlikely to extend for a significant extent offsite. Consequently, there is the potential for a major accident scenario(s) associated with a significant loss of containment of Distillate oil to the environment, therefore this scenario is considered further in this assessment as two risk events.	Y Risk Event 3 (Distillate spill) Risk Event 4 (Distillate Fire)

Substance	Description of use	CLP Hazard Classification	Screening and Identification of Potential Major Accident Hazard	Further Assessment Required (Y/ N)
Firewater – effluent generated during fire-fighting	In the event of a major fire, the application of firewater would be used to extinguish a fire and potentially to provide cooling to adjacent structures, preventing escalation of the incident. A foam concentrate additive would typically be used in a fuel pool fire scenario, which involved distillate.	Non-classified in accordance with CLP.	Firewater runoff would contain foam and other substances used for fire suppression along with products of combustion and un-combusted hydrocarbons. Modern foam concentrates do not contain substances classed as harmful to the environment; however, the firewater could contain products of combustion and un-combusted fuel. This material has the potential to cause harm if released to the environment. A firewater retention pond is included in the Proposed Development and sized according to the EPA Guidance on Retention Requirements for Firewater Runoff (2019), as the most effective and suitable measure for retaining firewater. The retention pond will be rendered impermeable by use of an appropriate liner, and integrity-tested in line with the requirements of the Site's licence. All drainage will pass through the retention pond. An automatic shut-off valve linked to the site's fire detection system will be installed on the drainage outlet point. Contaminated firewater would be collected for testing, treatment and disposal offsite at a suitable facility. There is the potential for a major accident scenario which involves the application of firewater and subsequent release to the environment due to the presence of the BESS. Although there are secondary and tertiary containment systems which will be installed at the Proposed Development, these may be insufficient to cope with the potentially large volume of water which may be needed to actively contain a thermal runaway event associated with the BESS. Additional fire suppression systems such as gas purging systems linked to temperature / carbon monoxide sensors may minimise the extent of a thermal runaway event and reduce the requirement for fire water. Water used in managing a thermal runaway event may contain other heavy metal ions and toxic substances such as hydrogen fluoride, which have potential to cause harm to human health and the environment. As such, there is potential for a major accident scenario involving a release of firewater which will be considered further in this assessment.	Y Risk Event 5 (Firewater from BESS)

Substance	Description of use	CLP Hazard Classification	Screening and Identification of Potential Major Accident Hazard	Further Assessment Required (Y/ N)
Gas Oil (Diesel)	Gas Oil (Diesel) will be used in the Sites Containerised Fire Water Module, which will contain a diesel fire pump and associated storage tank. In addition, there will be stand-by electrical generator(s) for secondary power supply to the CCGTs electrical and control equipment.	H226 - Flammable liquid and vapour. H304 - May be fatal if swallowed and enters airways. H315 - Causes skin irritation. H332 - Harmful if inhaled. H350 – May cause cancer. H373 - May cause damage to organs H410 - Very toxic to aquatic life with long lasting effects.	In the event of accidental damage to a diesel storage tank, or associated pipework, there is the potential for a release of gas oil (diesel) to the surrounding environment. If it is released, gas oil (diesel) has the potential to cause a major accident, as it can cause major disturbances to the soil, groundwater, and River Shannon, due to its high toxicity. If gas oil (diesel) vapour is ignited, this can result in a pool fire which has the potential to cause harm to people via thermal radiation and inhalation of smoke, this fire may also spread to nearby equipment containing flammable material such as natural gas and distillate oil, this may cause subsequent fires / explosions. The impact of a pool fire within a storage tank bund would be restricted to the Site, as high levels of thermal radiation would be unlikely at offsite receptors. A plume of smoke generated by a major fire would contain harmful substances such as particulate matter, however due to the size of the gas oil (diesel) tanks, in the worst-case pool fire scenario, the plume would not extend for a significant extent offsite. Although there is the potential for major accident scenarios to occur upon accidental release of Diesel, this is not considered a credible major accident scenario, as the quantities to be stored are relatively low. The containment systems which will be installed at the Proposed Development should be sufficient to prevent this material from reaching the environment or allowing an escalation to occur with neighbouring plant and equipment. Therefore, no specific scenarios involving a release of gas oil (diesel) are considered further in this assessment.	N
Nitrogen	Nitrogen is an inert gas. A small quantity of nitrogen will be continuously injected into the natural gas pipeline in accordance with the GNI gas specification requirements. Nitrogen will also be used during commissioning and maintenance operations to purge equipment and pipework.	Nitrogen is not classified as dangerous but can be harmful to people if a release occurs within confined, unventilated areas. It is a potential asphyxiant.	Nitrogen gas generation systems will be located in external, well-ventilated areas and therefore an accidental release would disperse readily. There is a potential asphyxiation risk, which may be brought about from accidental damage to pipework during commissioning and maintenance activities, however this is unlikely to cause any harm beyond the immediate area. As commissioning and maintenance activities will follow strict procedures laid out in documents such as the commissioning report and will only last a short time frame, it is unlikely that this substance will cause harm to people or the environment, and therefore a loss of nitrogen containment is not considered as a MAH.	N

Substance	Description of use	CLP Hazard Classification	Screening and Identification of Potential Major Accident Hazard	Further Assessment Required (Y/ N)
Concrete	Liquid concrete will be used in the construction of new facilities at the Proposed Development including buildings, surfacing and containment systems. Temporary storage systems will be present during construction of the Proposed Development and standard techniques will be used to pour cement onto prepared areas, for example, during the creation of tank bunds.	Typically non-classified in accordance with CLP.	Concrete is not classified hazardous in accordance with CLP; however, concrete paste is alkaline (pH 10-14) and therefore harmful to people if in contact with the skin or eyes. If concrete enters the environment via a release to water, it can raise the pH causing harm to aquatic ecosystems. Concrete released to the environment can also cause sedimentation on aquatic beds, which could harm flora and fauna. In the event of an accidental release occurring during construction, concrete/cement can raise the pH if released to water. Mitigation measures to prevent concrete reaching the Shannon Estuary are described in the Construction Environmental Management Plan (CEMP) and will be developed further in the Contractor's CEMP. This scenario is therefore not considered further in this assessment.	N
Lubrication and Hydraulic Fluids	Mineral and synthetic oils are typically used within equipment such as generators and compressors to provide lubrication for moving parts. These materials are typically delivered and stored in small containers such as drums, with a 210 litre capacity. Maintenance areas will be established for the storage of these substances, within fixed containment bunds.	Typically non-classified in accordance with CLP.	Lubrication and hydraulic fluids will be present on site in relatively small quantities and stored in suitable containment systems; to prevent accidental damage and to collect spilt materials should a failure of the storage vessel occur. In the event of failure of the storage vessel and secondary containment systems, there is the potential for a release of fluid; however the quantity would not be sufficient to reach environmental receptors or cause significant harm to people, and therefore would not result in a major accident. This scenario is therefore not considered further in this assessment.	N

Substance	Description of use	CLP Hazard Classification	Screening and Identification of Potential Major Accident Hazard	Further Assessment Required (Y/ N)
Compressed Gas Cylinders Typically including: Hydrogen Acetylene Propane	A small number of compressed gas cylinders containing hydrogen may be present on-site during operation as part of the power generator cooling systems. During construction and maintenance activities, welding may be carried out using compressed gases such as acetylene and oxygen.	H220 - Extremely flammable gas (Acetylene, hydrogen, propane). H280 – Gas under pressure (all gas cylinders).	The number of cylinders (and inherent gas volume) containing extremely flammable gas used on Site will be relatively low. In the event of accidental damage to a gas cylinder, pressure regulator or associated pipework, there is the potential for a release of gas. If the gas released is ignited, this could result in a fire / explosion. In the event of a fire onsite which escalates to areas where gas cylinders are stored, there is the potential for an explosion if the cylinders are exposed to thermal radiation. The consequences of a fire/ explosion could include harm to people if present in the vicinity of the cylinder(s) and damage to assets, potentially interrupting operation of the Proposed Development. Industry standard procedures will be used for the storage and use of gas cylinders, which reduces the risk associated with these systems to a low level. When not in use, cylinders will be stored in external, well-ventilated areas and when in use, appropriately certified equipment will reduce the potential for ignition if a flammable gas is accidentally released. Taking into consideration the small quantities of flammable gas stored in cylinders, which will be present on-site and the safety and security measures which will be in place to store and use them safely, it is considered that no credible major accident scenarios exist for these substances and are therefore not considered further in this assessment.	N
Compressed Gas Cylinders (non-flammable) Including Nitrogen CO_2.	A small number of compressed gas cylinders containing CO_2 will be installed to provide fire protection in enclosed areas of the turbine and generator. Nitrogen would typically be used during construction and maintenance activities to purge pipework and other uses.	H280 – contains gas under pressure	The number of cylinders containing nitrogen and CO_2 gas present on Site will be relatively low. In the event of accidental damage to a gas cylinder, pressure regulator or associated pipework, there is the potential for a release of gas. If gas is released within an enclosed area, this can cause harm to people present, potentially causing asphyxiation. The control measures for these substances are as described previously. Taking these into consideration along with the low numbers of cylinders which will be present, it is considered that no credible major accident scenarios exist for these substances and are therefore not considered further in this assessment.	N

Substance	Description of use	CLP Hazard Classification	Screening and Identification of Potential Major Accident Hazard	Further Assessment Required (Y/ N)
Power Plant Chemicals – Boiler Water (Steam) Treatment Plant	Substances are used to treat the boiler water systems within the Power Plant to control biological growth, prevent scale build up and to limit corrosion. In addition, any effluent discharges (boiler blowdown) will be pH adjusted using appropriate substances.	The substances used in these applications will be specified prior to operation and may include sodium hypochlorite (biocide), which is classified by CLP as harmful to the environment. Substances present in the Power Plant could include acids and alkalis for pH adjustment of liquids. These substances are typically classified as corrosive. Acids and alkalis are incompatible and shall be stored separately to avoid the potential of hazards caused by mixing.	The quantities of these substances will be typically a maximum of a few tonnes, stored in dedicated, bunded, storage tanks. In the event of an accidental release, this material will be contained in tank bunds and quickly detected by site personnel. If, however, the secondary containment systems (i.e. bunds) and tertiary containment systems (i.e. isolatable drains) both failed simultaneously, there will be minimal impact on people or the environment, primarily due to the small volumes of chemicals stored onsite. Consequently, no credible MAH/ MATTE scenarios for Power Plant (water treatment) chemicals have been identified.	N

14.7 Identification of Potential Disasters

The vulnerability of the Proposed Development to natural disasters such as flooding, earthquakes and the impact of climate change is substantially dependant on location. For example, highly unlikely events such as seismic events at the location of the Proposed Development have the potential to cause significant damage to assets and infrastructure such as the natural gas pipeline. These events can result in a loss of containment of natural gas leading to fires and / or explosions.

The design life of the Proposed Development is expected to be 25 years; therefore, adverse impacts associated with climate change, such as increased ambient temperatures, flooding and wind speeds, are pertinent and are also considered in this Section.

The Proposed Development is located close to the following facilities; the decommissioned SSE Tarbert HFO Power Station (5 km east of site) and NORA operated Tank Farm (also 5 km east of site) as well as the Moneypoint Power Plant (3 km north of the site). As such, there is the low risk of adverse events occurring at these facilities which escalates to have an impact at the Proposed Development. These scenarios are referred to in the COMAH Regulations as 'Domino Events' and are also considered in this section, along with accidents which are not directly related to the dangerous substances identified in **Table 14.1**.

Disasters such as major storms and significant seismic events have a low probability of occurrence, however the potential consequences can reach the highest level of significance as defined in **Section 14.3.4**.

The potential disaster scenarios which have been assessed for the Proposed Development are described in **Table 14.2**.

The potential impacts of disasters are well understood by engineers involved with all aspects of the design, construction, and operation of power stations such as the Proposed Development. These impacts are mitigated during the engineering design phase, for example, by the use of industry standard mechanical and structural design codes used for pipework, process equipment, supports and structural assets.

Taking into consideration the likelihood and consequences following the inclusion of mitigating measures, the overall risk of disasters occurring at the Proposed Development is considered to be very low but cannot be entirely eliminated. Consequently, additional measures associated with management of the Site such as operating procedures, accident prevention plans, and emergency response procedures will be in place prior to operation. These measures further reduce the risk and the consequences of disasters and are summarised in Section **14.9**.

Table 14.2: Screening Assessment of Potential Disaster Scenarios

Category	Description	Screening and Identification of Potential Major Accident / Disaster Hazard	Further Assessment Required (Y/ N)
'Domino Event' Accident - Industrial accident at NORA tank farm which escalates to new facility (and vice versa)	The Site is located approximately 5 km West of the NORA Tank Farm. An incident such as a fire at the Mainland Tank Farm could potentially impact the facilities associated with the Proposed Development and conversely, an event at the Proposed Development could reach the Mainland Tank Farm. This could result in an event which takes more resources to manage and has the potential to cause harm to people on Site, damage to property and assets. An explosion at the Mainland Tank Farm could generate overpressures. A plume of smoke generated by a fire on the Mainland Tank Farm could reach the air intake system of the CCGT, causing asset damage and has the potential to interrupt operations on site.	The scenarios which are associated with a major fire and / or explosion occurring at the Mainland Tank Farm would be initiated via a loss of containment of Heavy Fuel Oil via the same mechanisms as described for Distillate Oil at the Proposed Development in **Table 14.1** An incident at this facility such as a fire could result in significant damage at that location but would be unlikely to have a significant impact at the Proposed Development due to the separation distance of the sites. The impact of thermal radiation and explosion overpressure generated by an event at the NORA Tank Farm would not be considered to have a sufficient magnitude at the Proposed Development, therefore it would be unlikely to cause significant harm to people or assets at the Proposed Development. Consequently, whilst this scenario would be considered a potential disaster at the NORA tank Farm, is not considered further for the Proposed Development. The QRA prepared for Land Use Planning (LUP) for the Proposed Development, which includes consequence modelling, demonstrates that a fire and explosion at the Proposed Development will not impact the NORA Tank Farm and cause a Domino Effect at the NORA assets.	N

Category	Description	Screening and Identification of Potential Major Accident / Disaster Hazard	Further Assessment Required (Y/ N)
'Domino Event' Accident - Industrial accident at Tarbert SSE which escalates to new facility (and vice versa)	An incident such as a fire occurring at a neighbouring industrial site (not associated with the Proposed Development) such as Tarbert SSE to the east of site (at 5km) along the River Shannon could potentially impact the Proposed Development via the same mechanisms as described in the previous disaster scenario for the NORA Tank Farm.	There are several industrial sites located in the vicinity of the Proposed Development, including the upper tier COMAH site at Tarbert SSE. An incident at this facility such as a fire could result in significant damage at that location but would be unlikely to have an impact at the Proposed Development due to the separation distance of the sites (@5 km). The impact of thermal radiation and explosion overpressure generated by an event at Tarbert SSE would not be considered to have a sufficient magnitude at the Proposed Development, therefore it would be unlikely to cause significant harm to people or assets. Consequently, whilst this scenario would be considered a potential disaster at the Tarbert SSE, is not considered further for the Proposed Development. The QRA prepared for Land Use Planning (LUP) for the Proposed Development, which includes consequence modelling, demonstrates that a fire and explosion at the Proposed Development will not impact the Tarbert SSE site and cause a Domino Effect at the SSE assets.	N

Category	Description	Screening and Identification of Potential Major Accident / Disaster Hazard	Further Assessment Required (Y/ N)
'Domino Event' **Accident – Industrial accident at Moneypoint which escalates to the Proposed Development (and vice versa)**	An incident such as a fire occurring at a neighbouring industrial site (not associated with the Proposed Development) such as the Moneypoint ESB site on the northern bank of the River Shannon could potentially impact the Proposed Development via the same mechanisms as described in the first disaster scenario.	There are several industrial sites located in the vicinity of the Proposed Development, including the upper tier COMAH site at Moneypoint ESB. An incident at this facility such as a fire could result in significant damage at that location but would be unlikely to have an impact at the Proposed Development due to the separation distance of the sites (@3km). The impact of thermal radiation and explosion overpressure generated by an event at Moneypoint ESB would not be considered to have a sufficient magnitude at the Proposed Development, therefore it would be unlikely to cause significant harm to people or assets. Consequently, whilst this scenario would be considered a potential disaster at the Moneypoint ESB, is not considered further for the Proposed Development. The QRA prepared for Land Use Planning (LUP) for the Proposed Development, which includes consequence modelling, demonstrates that a fire and explosion at the Proposed Development will not impact the Moneypoint ESB site and cause a Domino Effect at the Moneypoint assets.	N
Structural Failure / Building Collapse during demolition / construction	An Incident such as a building collapsing during a demolition activity (e.g., falls in wrong direction or off schedule) or during construction. This could result in an event which has the potential to cause harm to people on Site, damage to property and assets.	Demolition / construction activities conducted at the Site will be subject to the CEMP, which will consider the potential for collapses to occur and identify appropriate mitigation measures and safe systems of work to be adopted to reduce the risk to a very low level. The risk of a disaster occurring is considered to be low and localised to site and is not considered further.	N

Category	Description	Screening and Identification of Potential Major Accident / Disaster Hazard	Further Assessment Required (Y/ N)
Accident - High Voltage (HV) Electrical equipment	Electrical power will be generated at high voltage levels at the Proposed Development. Accidental contact with high voltage systems can be immediately fatal to people and accidents involving electricity have occurred, particularly during construction activities, for example, where cranes have come into contact with overhead power lines. Malfunction of high voltage electrical systems can result in events such as arc flash incidents, which could create high levels of thermal radiation. People exposed to arc flash events can suffer fatal or life changing injuries. Damage to high voltage electrical infrastructure could restrict the ability of the facility to operate and compromise electrical supply to the local area.	There is the potential for a disaster to occur at the Proposed Development, which involves accidental damage or malfunction of high voltage electrical equipment. During construction, activities will be carried out to install new electrical connections including a connection to Eirgrid. This work will be very carefully controlled via the CEMP and specific work plans supported by risk assessments. Only suitably qualified and experienced electrical engineers will be allowed to work on high voltage systems, and industry standard safety procedures will be used. Engineers and technicians will manage this work to reduce the risk to a very low level. The risk of a disaster occurring is considered to be low and localised to site and is not considered further.	N
Accident - Vandalism / Arson / Terrorism / Cyber Attack	There is the potential for hostile acts against the Proposed Development, for example by people opposed to power generation using hydrocarbon fuels. In most instances, these acts would be limited to the potential interruption to operation, minor damage or vandalism. The potential for a significant terrorist incident would be considered as unlikely as the Proposed Development would not be considered as a high-risk target. Cyber security breaches, where electronic process control systems are remotely accessed for a variety of purposes, is an increasing threat, which the Power Generation industry is aware of and takes very seriously by putting systems in place to prevent such breaches. There is also the potential for accidental damage to be done to underground pipework should people not be aware of their presence	Vandalism, arson and terrorist activities could cause harm to people on Site, damage to assets and interruption to power generation operations at the Proposed Development. This will be mitigated by implementing security measures including appropriate fencing, closed-circuit television (CCTV), access control and guards etc. Cyber security systems are designed by expert engineers to prevent unauthorised access to computers on site, which provide essential functions for safe operation. Standard procedures include delineating areas where underground pipe works are present as well as routine walkovers to check for intruder intervention. The measures described above will reduce the risk associated with vandalism, arson, terrorism and / or cyber-attacks to a low level. Consequently, this scenario is not considered further.	N

Category	Description	Screening and Identification of Potential Major Accident / Disaster Hazard	Further Assessment Required (Y/ N)
Accident - Aircraft / Drone Strike	There is the potential for accidental damage to taller infrastructure due to aircrafts and drones passing over the Proposed Development. This could result in significant damage to infrastructure with the potential for subsequent fires and explosions from potentially released natural gas and distillate oil.	The nearest airport is Shannon, located approximately 50 km in an easterly direction. The flight path to and from this airport is to the north of the Proposed Development. Personnel vigilance and security systems are the key mitigation measures to prevent drones being used in the area of the Proposed Development. Therefore, the risk of a disaster occurring is considered to be low and is not considered further.	N
Climate Change / Natural Event – Surface Water Flooding	The frequency of storms experienced in the location of the Proposed Development could increase during the lifecycle of the facility as a result of climate change. This could result in flash flooding due to rainfall, pluvial flooding from surface water and fluvial flooding from rivers. Flooding could result in damage to site assets such as storage tanks and pipework, with the potential for subsequent loss of containment of distillate oil or other substances. There is also the potential for flooding to increase the buoyancy of the natural gas pipeline, such that the underground pipeline rises, causing structural damage to the pipework. There is the potential for fires and/ or explosion, if distillate oil releases were ignited, which could have an impact on and off-site.	A Site-Specific Flood Risk Assessment (FRA) Report has been prepared, refer to EIAR Volume 4 Appendix 6-3. The purpose of the FRA is to identify whether a potential risk of flooding exists at the Proposed Development, and if so, to what extent. The conclusion of the FRA is that there is a limited risk of fluvial flooding in the location of the Proposed Development. This conclusion will inform the engineering and environmental design of the Proposed Development, such as the installation of non-return valves on surface water drains and anchors along the 26 km pipeline. The design and installation of these systems will reduce the risk of an impact caused by flooding to a level which is considered to be ALARP. Consequently, whilst pluvial / fluvial flooding presents a credible risk to the Proposed Development, it will be mitigated by the Proposed Development design, to reduce the risk of a disaster and therefore this scenario is not considered further within this chapter.	N

Category	Description	Screening and Identification of Potential Major Accident / Disaster Hazard	Further Assessment Required (Y/ N)
Climate Change / Natural Event – Coastal Flooding	The frequency of storms experienced in the location of the Proposed Development could increase during the lifecycle of the facility as a result of climate change. This could result in storm surges from the Atlantic Ocean, and increased risk of coastal flooding. Coastal flooding could result in damage to site assets such as storage tanks and pipework, with the potential for subsequent loss of containment of distillate oil or other substances. There is also the potential for flooding to increase the buoyancy of the natural gas pipeline, such that the underground pipeline rises causing structural damage to the pipeline. There is the potential for fires and / or explosion if distillate oil releases were ignited, which could have an impact on and off-site.	A Site-Specific Flood Risk Assessment (FRA) Report has been prepared, refer to EIAR Volume 4 Appendix 6-3. The purpose of the FRA is to identify whether a potential risk of coastal flooding exists at the Proposed Development, and if so, to what extent. The conclusion of the FRA is that there is a risk of coastal flooding in the location of the Proposed Development. This conclusion will inform the engineering and environmental design of the Proposed Development, such as the installation of a concrete coastal flood defence wall. The design and installation of these systems will reduce the risk of an impact caused by coastal flooding to a level which is considered to be ALARP. Consequently, whilst flooding presents a credible risk to the Proposed Development, it will be mitigated by the Proposed Development design to reduce the risk of a disaster and therefore this scenario is not considered further within this chapter.	N
Climate Change / Natural Event – Increased Ambient Temperatures	The ambient temperatures experienced in the location of the Proposed Development could increase during the lifecycle of the facility as a result of climate change. Increasing atmospheric temperatures could potentially result in the operational instability of equipment such as cooling systems and electrical apparatus, such as switchgear, which is sensitive to temperature and humidity. Failure of these systems due to high temperatures could result in operational interruptions at the Proposed Development but would be unlikely to result in harm to people or the environment.	A potential increase in ambient temperatures has the potential to impact the operation and efficiency of the Proposed Development but would be unlikely to cause an incident which has the potential to result in a major accident or disaster. The engineering design of the facilities will take operation at future climatic conditions into account; therefore, this scenario is not considered further within this chapter.	N

Category	Description	Screening and Identification of Potential Major Accident / Disaster Hazard	Further Assessment Required (Y/ N)
Climate Change / Natural Event – Extreme Cold Weather Conditions	The weather conditions experienced in the location of the Proposed Development could drastically change during the lifecycle of the facility as a result of climate change. Extreme weather conditions such as ice storms can result in the freezing and subsequent damage of pipework within the Site. Failure of the pipework would result in operational interruptions at the Proposed Development and potentially the release of distillate oil to the environment. There is the potential for fires and/ or explosion if distillate oil releases were ignited, which could have an impact on and off-site.	A potential increase in ice storms has the potential to impact the operation and efficiency of the Proposed Development and has the potential to cause damage to assets and harm to people. The engineering design of the facilities, including de-icing equipment on the air intake structures, will take operation at future climatic conditions into account; therefore, this scenario is not considered further within this chapter.	N
Climate Change / Natural Event – Increased Wind Speeds	The wind speeds experienced during storms in the location of the Proposed Development could potentially increase during the lifecycle of the facility as a result of climate change. Increasing atmospheric wind speeds could cause tall structures, such as chimneys and exhaust vent stacks, to become unstable. In a worst-case event, these structures could collapse resulting in harm to people on site, damage to assets and an interruption to operation.	A potential increase in the maximum wind speeds, caused by climate change, has the potential to cause damage to assets and harm to people. The structural engineering design of the facilities will calculate wind loading and other requirements based on industry standard guidance and methods. Structural design standards incorporate factors to account for uncertainty, therefore operation at future conditions, which include higher wind speeds, will be considered. Consequently, a potential disaster involving high winds is not considered further within this chapter.	N
Natural Event – Earthquakes and seismic events	Low magnitude seismic events, which are not perceptible to humans, occur quite regularly throughout the island of Ireland. The probability for a major event with the potential to cause significant harm however is very low. If a major seismic event were to occur at the Proposed Development, there is the potential to cause harm to people, damage to assets and infrastructure and interrupt power generation operations.	The Irish National Seismic Network records earthquakes on the island of Ireland, however these are predominantly low magnitude events. For example, on 6th May 2010 a magnitude M2.9 earthquake occurred off the west coast of Ireland, approximately 50 km north of Ralappane. This event would not have been particularly noticeable on land. The structural engineering design of the facilities will calculate the appropriate loading requirements for seismic factors. Standard practice for monitoring of underground pipe works also include fitting them with seismometers and response signals to site in case alarms are triggered. This is considered to be suitable mitigation and therefore this scenario is not considered further.	N

Category	Description	Screening and Identification of Potential Major Accident / Disaster Hazard	Further Assessment Required (Y/ N)
Natural Event - Lightning strike	A direct lightning strike to the Proposed Development could cause damage to assets and equipment and has the potential to cause harm to people struck by falling objects. There is also the potential that lightning may ignite flammable substances. This could result in a fire causing damage to assets and potentially harm to people on Site.	The engineering design of the Proposed Development will incorporate lightning mitigation. This will be assessed in accordance with recognised industry standards such as EN/IEC 62305. An explosion risk assessment will also be carried out in accordance with ATEX Directive 1999/ 92/ EC (EC, 1999) which establishes the required standards to protect people, which will also consider the potential for lightning to be a source of ignition to flammable gases and vapours. It is expected that this assessment will specify the installation of an appropriate lightning arrestor to be fitted at the highest point on buildings such as the turbine building. The exhaust stack would also be expected to be fitted with lightning protection to safely conduct the electrical current to earth in the event of a storm. Consequently, these mitigation measures are considered to be sufficient to reduce risk and this scenario is not considered further.	N

14.8 Assessment of Major Accidents and Disasters

Identification of potential MAH / MATTE scenarios in this assessment has been based on the application of an industry standard qualitative risk assessment methodology, which considers the substances that could be present on the Proposed Development and their properties, including potential health, safety and environmental hazards.

The results of the accidents and disasters identification exercise has resulted in identifying potential MAH / MATTE scenarios for the Proposed Development, which are presented in **Table 14.3.** These represent 'worst-case' events which, although they have the potential for significant consequences, have a very low probability of occurrence.

A Quantitative Risk Assessment (QRA) will be carried out to support the COMAH reporting to the HSA for these potential MAH / MATTE scenarios and it will provide a detailed analysis of these hazards, including calculations of individual and societal risk.

A Quantitative Risk Assessment (QRA), including consequence modelling, was carried out for the Proposed Development in 2021 and updated in 2024, with regards to offsite impacts related to land use planning. This involved the impact assessment on offsite receptors of natural gas and diesel fuel fires and explosions, through pipeline and vessel storage losses. The QRA employed HSA guidance for credible release scenarios and the embedded data on frequency of loss and probability of ignition. The consequence modelling involved the use of proprietary modelling software (DNV SAFETI – version 8.9) to identify impact contours that are consistent with the three Land Use Planning (LUP) contours, used to assess developments relative to offsite receptors. The results showed that there were no incompatible land uses near the site for the three LUP zones and that the individual risk at nearby residential properties is negligible. There were no populated areas within any of the LUP risk curves and so the societal risk was not calculated but is considered negligible. No lethality is expected in populated areas near to the site.

Table 14.3: Assessment of Major Accidents

Scenario Ref.	Substance	Major Accident Scenario	Risks/ Effects	Prevention/ Mitigation Measures	Residual Effects
1	Natural Gas	Major fire / explosion at the Proposed Development Site including gas receiving and conditioning area, AGI and the Power Plant	A significant release of flammable gas at the onshore facilities could be caused by mechanical failure of equipment or impact damage such as a vehicle collision with exposed aboveground pipework. Immediate ignition of natural gas would result in a fire, delayed ignition could result in an explosion and / or fire. There is the potential for harm to people working at these facilities, however it is considered unlikely that a fire / explosion would have an impact offsite at residential areas or environmental receptors due to the distances involved. The gas pipeline is underground between the grid connection and the site.	Initial Consequence Analysis of the previous design of the Proposed Development concluded that a fire is a credible MAH scenario, however explosion overpressures were calculated to be negligible as a result of the open, unconfined areas of the onshore facilities. The design of the natural gas equipment and pipework will be to industry codes and standards to reduce the potential for a loss of containment, including the use of fully welded connections to avoid potential flanged leak sources. Pipework at the AGI will be predominantly routed below ground, further reducing the potential for a loss of containment. Pipeline safety systems and gas / liquid pressure regulation is to be installed along with operational controls and monitoring. Instrumentation and control systems will monitor the process and detect leaks. ATEX compliant equipment to be installed as required by Explosives Atmosphere Risk Assessment, to be carried out during the detailed engineering design of the Proposed Development. In the event of a major fire, damage to process equipment could occur, which may release potentially harmful materials such as fuel, lubrication or hydraulic oils, which would be contained within firewater runoff. A fuel interceptor will be installed within the drainage systems on the Proposed Development, which will contain any spilt oil or hydrocarbon material within drainage. This can then be collected and disposed of safely offsite. The onshore facility will be designed to contain firewater runoff within a retention area, which would prevent this material reaching unmade ground or other environmental receptors. Fire and gas detection and fire protection systems will be installed throughout the Proposed Development as appropriate, including passive and active fire suppression systems. The firewater system located onshore consists of storage tanks, emergency standalone diesel firewater pumps and a	Extensive and robust mitigation measures will be incorporated throughout the design of the Proposed Development to reduce the likelihood of an accidental release of natural gas. The residual low risk will be managed by inherent safe design, standard operating procedures, safety and environmental management measures to level commensurate with ALARP. The QRA for LUP shows that the consequences of this scenario are predominantly contained onsite. The individual risk at the nearest residential properties is negligible. There were no populated areas within any of the LUP risk curves and so the societal risk is considered negligible. No lethality is expected in populated areas near to the site.

Scenario Ref.	Substance	Major Accident Scenario	Risks/ Effects	Prevention/ Mitigation Measures	Residual Effects
				ring main with a diesel pump to maintain pressure within the ringmain. In the event of a major fire, products of combustion could be generated, therefore there is the potential for emissions to air (smoke etc.). However, natural gas is likely to achieve high levels of combustion, reducing the quantity of hydrocarbons and particulate matter which could be generated. Implementation of the preventative and mitigation measures as described above reduce the risk associated with this MAH scenario.	
2	Lithium and other metal ions / organic and chemical materials in BESS	Major Fire and / or Explosion at the BESS	A fire or explosion could occur at the BESS due to accidental damage to the systems or an operator error resulting in malfunction of the equipment (e.g., over charging, poor maintenance etc.). Ignition of the BESS system could result in a thermal runway and can result in an explosion with further knock-on effects to surrounding equipment at the Proposed Development.	The design of the BESS will be to current best practice to ensure that thermal runaway risks are minimised. This may include measures such as the introduction of insulation boards between cells within a battery container and additional cooling / suppression systems linked to sensors inside the enclosure to prevent fire from spreading between cells. The BESS containers may also have gaseous suppression systems to minimise the need for the application of water for cooling / fire-fighting. Cells will be appropriately spaced within the battery containers and the containers will also be evenly distributed across the dedicated BESS working area. A comprehensive fire detection and firefighting system will be provided for the Proposed Development as appropriate for the level of fire risk in each part of the Site. A fire protection design basis document, containing a fire risk assessment, will be developed by the appointed Contractor and this will inform the design of the firefighting systems, cell monitoring systems, fire and smoke detection systems etc. In the event of a power cut to the rest of equipment the control systems in place will automatically default to fail safe mode.	Extensive and robust mitigation measures will be incorporated throughout the design of the Proposed Development to reduce the likelihood of accidental damage to the BESS. The residual low risk will be managed by inherent safe design, standard operating procedures, safety and environmental management measures to level commensurate with ALARP.
3	Distillate Oil	Major Release to the Environment	A release of distillate oil from equipment or pipework could be caused by mechanical failure, impact damage or an operator error, resulting in a loss of containment.	The Proposed Development will include the following mitigation measures which will prevent and minimise the consequences of a release to the environment caused by the accidental loss of containment of distillate oil. - The design will be subject to numerous formal process safety studies to identify and mitigate	Extensive and robust mitigation measures will be incorporated throughout the design of the Proposed Development to reduce the likelihood of a release of Distillate Oil to the environment.

Scenario Ref.	Substance	Major Accident Scenario	Risks/ Effects	Prevention/ Mitigation Measures	Residual Effects
			The most likely impacts resulting from a major loss of containment of distillate oil are on the environment, should a catastrophic simultaneous failure of primary, secondary and tertiary containment measures occur. In such an event, distillate oil could enter soil, groundwater and the Shannon Estuary via local surface water drains. Distillate oil is toxic to aquatic life with long lasting effects, and as such a major release to the environment could cause death to the aquatic life in the Shannon Estuary.	hazards, such Hazard and Operability (HAZOP) studies. - Distillate oil will be stored in fixed steel tanks (primary containment) which are located within impermeable bunded areas with weather protection (secondary containment sized to contain greater than 110% of the largest tank volume or 25% of the total stored substances). The tanks and bunds will be subject to a formal risk-based inspection programme conducted by specialist accredited contractors. - The Proposed Development will have an attenuation system (tertiary containment), complete with class 1 hydrocarbon interceptors and measures to isolate the surface water to prevent discharge to the environment (also used for fire water containment). This will contain distillate oil in the event of a failure of primary and secondary containment. - During distillate oil offloading operations, protective systems will be in place to prevent a loss of containment such as dry-break hose couplings and vehicle chocks to prevent 'drive-away' incidents. - The design equipment and pipework will be to industry codes and standards to reduce the potential for a loss of containment, including the use of welded connections to avoid potential leak sources (flanges). - Fuel pipework safety systems such as cathodic protection will be installed along with operational controls and monitoring. - Instrumentation and control systems will continuously monitor the process and leaks causing a loss of pressure would be rapidly detected. - Alarms, both audible and visual, would be raised in the event of a deviation from set points such as pressure levels, vessel levels, etc. alerting site operators.	The residual low risk will be managed by inherent safe design, standard operating procedures, safety and environmental management measures to level commensurate with ALARP.

Scenario Ref.	Substance	Major Accident Scenario	Risks/ Effects	Prevention/ Mitigation Measures	Residual Effects
				- During commissioning, when distillate oil will be introduced to the site, detailed method statements, plans and assessments will be produced to carry out these activities safety. - The Proposed Development will be operated and managed by experienced, highly trained personnel in accordance with all Regulatory requirements, including COMAH. - A firewater retention pond is included in the Proposed Development and sized according to the EPA Guidance on Retention Requirements for Firewater Runoff (2019), as the most effective and suitable measure for retaining firewater. The retention pond will be rendered impermeable by use of an appropriate liner, and integrity-tested in line with the requirements of the Site's licence. All drainage will pass through the retention pond. An automatic shut-off valve linked to the site's fire detection system will be installed on the drainage outlet point. This tertiary system could be used for the containment of any distillate that is not contained by the secondary containment system.	
4	Distillate Oil	Major Fire and / or Explosion	A release of distillate oil could potentially arise from the same mechanisms previously described in risk event 3. Ignition of distillate oil could lead to a major fire. If initiated in one area of the Proposed Development this could have the potential to escalate to other areas. Ignition of distillate oil could also lead to an explosion, which could cause harm to people and assets such as equipment and buildings (pressure wave).	The mitigation measures which will prevent the accidental release of distillate oil have been laid out in the mitigation measures for risk event 3. To prevent and minimise the consequences of a major fire/explosion, the installed electrical and mechanical equipment will be compliant to ensure chances of ignition upon contact with distillate oil are minimized / eliminated. Equipment will be installed as required by an Explosives Atmosphere Risk Assessment, to be carried out during the detailed engineering design of the Proposed Development. A comprehensive fire detection and firefighting system will be provided for the Proposed Development as appropriate for the level of fire risk in each part of the Site. A fire protection design basis document, containing a fire risk assessment, will be developed by the appointed Contractor and this will inform the	The QRA for LUP shows that the consequences of this scenario are predominantly contained onsite. The individual risk at the nearest residential properties is negligible. There were no populated areas within any of the LUP risk curves and so the societal risk is considered negligible. No lethality is expected in populated areas near to the site. The residual low risk will be managed by inherent safe design, standard operating procedures, safety and environmental management measures to level commensurate with ALARP.

Scenario Ref.	Substance	Major Accident Scenario	Risks/ Effects	Prevention/ Mitigation Measures	Residual Effects
			The impact of a distillate oil fire and / or explosion could cause significant harm to personnel on Site, up to the potential for fatal injuries caused by thermal radiation and/or projected debris generated during an explosion. The distance to the nearest neighbours / residential receptors is such that an incident would be unlikely to have an impact offsite, other than potentially a recommendation by the emergency services to close windows and remain indoors temporarily.	design of the firefighting systems, the fire and smoke detection systems etc. In the event of a fire, or if distillate oil is detected within the CCGT enclosures, an alarm will be generated to alert operators. An inert gas (CO2) fire suppression and purging system will automatically operate to displace air from the enclosure and prevent or extinguish the fire. Fire safety evacuation drills and training is to be provided as appropriate. A firewater retention pond is included in the Proposed Development and sized according to the EPA Guidance on Retention Requirements for Firewater Runoff (2019), as the most effective and suitable measure for retaining firewater. The retention pond will be rendered impermeable by use of an appropriate liner, and integrity-tested in line with the requirements of the Site's licence. All drainage will pass through the retention pond. An automatic shut-off valve linked to the site's fire detection system will be installed on the drainage outlet point.	
5	Firewater	Major Release to the Environment of firewater containing toxic substances from BESS	In the event of a major fire and/or explosion at the BESS as described in risk event 2 firewater may be used to contain the fire and to mitigate thermal runaway, which may entrain toxic substances which could enter soil, groundwater and the Shannon Estuary via local surface water drains. The BESS could include substances such as heavy metal ions and fluoride, which are very toxic to aquatic life with long lasting effects, and as such a major release to the environment has the potential cause harm to the aquatic life in the Shannon Estuary.	BESS fire suppression systems will be designed according to best practice, which may involve the incorporation of gaseous fire suppression systems, as opposed to water-based systems, which have limited success with battery fires owing to their self-sustaining properties. Firefighting procedures may include controlled burn-out of the BESS to minimise the potential for contaminated firewater runoff. The onshore facility will be designed to contain firewater runoff within a retention area, which would prevent this material reaching unmade ground or other environmental receptors. A firewater retention pond is included in the Proposed Development and sized according to the EPA Guidance on Retention Requirements for Firewater Runoff (2019), as the most effective and suitable measure for retaining firewater. The retention pond will be rendered impermeable by use of an appropriate liner, and integrity-tested in line with the requirements of the Site's licence. All drainage will pass	The residual low risk will be managed by inherent safe design, standard operating procedures, safety and environmental management measures to level commensurate with ALARP.

Scenario Ref.	Substance	Major Accident Scenario	Risks/ Effects	Prevention/ Mitigation Measures	Residual Effects
				through the retention pond. An automatic shut-off valve linked to the site's fire detection system will be installed on the drainage outlet point. The firewater retention pond has been sized for all other plant operations, excluding the BESS. A firefighting strategy for the BESS will be developed so as to protect the integrity of the retention pond.	

14.9 Mitigation Measures

The following section contains a summary of the key measures which will be implemented to prevent major accidents and disasters at the Proposed Development.

- The CEMP (**Appendix A2.3**) will be updated by the Contractor in accordance with any conditions of planning, and similar plans developed for eventual demolition activities.
- The design, construction, and operation of the Proposed Development will be in accordance with international, national and established industry codes, standards and practice, such as the specification of pipework materials, design of structures etc.
- A detailed chemical inventory and risk assessments for all materials handled on-site will be produced in accordance with the requirements of the Chemical Agents legislation.
- All fuels and chemicals stored on-site will be subject to the Safety, Health and Welfare at Work (Chemical Agents) Regulations, as amended by *S.I. No. 231/2021* as well as compliance with the requirements of Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).
- The Proposed Development will comply with the requirements of all relevant health, safety and environmental legislation including COMAH, which requires operators to take all measures necessary to prevent major accidents and to ensure risks are minimised to ALARP.
- Regular maintenance and inspection of all facilities will be carried out to reduce the potential for equipment failures which could lead to a loss of containment, e.g. tanks will be on a formal inspection register.
- A firewater retention pond is included in the Proposed Development and sized according to the EPA *Guidance on Retention Requirements for Firewater Runoff (2019)*, as the most effective and suitable measure for retaining firewater. The retention pond will be rendered impermeable by use of an appropriate liner, and integrity-tested in line with the requirements of the Site's licence. All drainage will pass through the retention pond. An automatic shut-off valve linked to the site's fire detection system will be installed on the drainage outlet point. The firewater retention pond has been sized for all other plant operations, excluding the BESS. A firefighting strategy for the BESS will be developed so as to protect the integrity of the retention pond.
- Secondary fuel (distillate oil) will be stored with tertiary containment. Bunding and associated pipework will be designed in accordance with EPA Guidance Note on Storage and Transfer of Materials for Scheduled Activities. The secondary containment (primary bund) design will allow the greater of 110% of the largest tank within the bund or 25% of the total volume of substance within the bund, whichever is the larger. A second bund (tertiary containment) will be built around the primary bund and will contain any spillage should the primary bund fail or be over-topped by a spillage.
- The Environment Management System (EMS) for the Proposed Development will set out the requirements and procedures required to ensure that the Proposed Development is operating to appropriate standards. Such Procedures include:

- Hazardous and polluting liquids such as transformer oils will be stored in tanks located in bunds.
- Distillate Oil unloading bays will be designed to contain spillages.
- Storage tank level indicators and oil detection sensors in bunds will be provided with alarms.
- Class 1 hydrocarbon interceptors will be provided in the surface water drainage system.
- Measures to isolate the surface water drainage system will be provided to prevent discharge of contaminated water.

14.10 Emergency Management

A Site Emergency Response Plan (ERP) will be developed in relation to the Proposed Development in accordance with legislative requirements including COMAH and the IE licence, which will include a fire strategy and appropriate training procedures.

Procedures will be in place to clearly detail the responsibilities, actions and communication channels for operational staff and personnel on how to deal with emergencies should they occur. Staff will also receive the level of training required for their role and position. This will include dealing with events such as fires, spillages, flooding etc. Such measures will be included in the site operating and management system and regulated by the EPA through the IE licence.

The ERP will contain detailed plans for the response to emergencies such as loss of containment of Distillate oil, fires and severe weather events. A stock of emergency equipment such as spill kits will be maintained on Site in particular around the chemical storage areas.

The local Fire and Rescue Service and other key stakeholders will be consulted to provide an input to the development of emergency plans and potentially engage with desktop and live emergency training exercises.

The Emergency Response plans and systems are required as part of COMAH for the Site, to the satisfaction of the HSA.

14.11 Cumulative Impacts and Effects

Cumulative impacts or effects are defined as the addition of many minor or insignificant effects, including other projects, to create larger more significant effects. The purpose of the MA&Ds assessment is to determine significant credible major accident or disaster scenarios for the Proposed Development, taking into consideration the multiple, cumulative failures which would have to happen, as a single isolated failure would not result in a major accident. The impact assessment, which has been carried out for the Proposed Development, as detailed in **Section 14.5** takes into consideration these multiple, cumulative failures, an example of which is described below.

For a major fire to occur, a mechanical system such as an item of process equipment or a section of pipe would be required to fail, releasing flammable gas. For this failure to occur, a metal or weld defect would be required to be created and undetected during the manufacturing and installation process. Once installed, testing and routine visual inspection would have to fail to identify the presence of this

defect, which over time could deteriorate via mechanisms such as fatigue caused by pressure cycling, until a catastrophic failure occurs. This results in a release of flammable gas, which ignites in contact with a source of ignition such as non-ATEX compliant electrical systems, resulting in a fire.

Other failure mechanisms and sources of ignition exist which could result in a loss of containment and a subsequent fire. These include for example instrumentation, operational and human factors related failures.

There are multiple layers of prevention and mitigation measures in place for the Proposed Development, to prevent major accidents such as the fire scenario described above from occurring, which are described in **Section 14.8**. These include, for example, the emergency shutdown system which can be initiated by a number of systems including automatic fire and gas detection and manual activation.

Inherent safety principals have been adopted in the Proposed Development, principally reduction of the quantities of flammable materials present onshore and the location of systems / equipment.

Facilities such as the Power Plant and major electrical equipment to be installed as part of this Proposed Development will be designed to incorporate a separation distance, to prevent major accidents such as fires and explosions originating in one area from spreading to another area or escalating via domino effects. This separation distance is based on established engineering guidance for industrial site layout.

Inherent safe design measures to prevent defects include mechanical design codes for equipment and pipework, and quality assurance testing prior to installation using techniques such as x-ray examination and dye penetration. Once installed, regular inspection as required by Statutory Regulations will be carried out to identify defects. The equipment and pipework will be fitted with instrumentation to monitor the pressure and flowrate of gas, alerting operators to deviations from set points, preventing fatigue. If a failure was to occur even after all these design and operating measures were in place, mitigation measures to prevent ignition of gas include measures like the specification of installed ATEX compliant mechanical and electrical equipment. Process Safety ATEX specialists will be involved at all stages of the Proposed Development to assure compliance with these Directives and providing input to the layout of the facilities.

Cumulative effects also require the consideration of other projects and developments at the Site and in the surrounding area, which include potential new facilities, e.g., an LNG terminal at the site[1], as well as existing industrial infrastructure nearby; such as the Tarbert and Moneypoint power plants, scheduled for refurbishment, as described in **Section 14.4.2**.

The Proposed Development is a Lower tier COMAH site, based on gas fired plant, with backup distillate oil fuel. Any further developments at the Site, such as the introduction of an LNG Terminal will also be required by law to take 'all measures necessary' to prevent major accidents, such as those set out in **Table 14.3**.The introduction of new facilities at the Proposed Development or in the locality of the Proposed Development or changes to nearby establishments that could influence the site will fall under a robust Management of Change (MoC) regime, which is part of the SMS under COMAH. This will

[1] ABP Ref No. ABP-311233-21 – Application for a 10-year permission for a Strategic Infrastructure Development (SID) comprising a power plant, battery energy storage system, regasification unit, jetty and onshore receiving facilities, and an AGI, which was refused by the Board on 15th September 2023, and is currently subject to Judicial Review proceedings.

ensure that the appropriate actions and remedial measures are implemented so that 'all measures necessary' are undertaken to prevent major accidents.

The Tarbert and Moneypoint facilities are located at a distance which, should a major accident such as a fire or explosion occur, would not have an effect on the Proposed Development. The location of current planning applications will be considered collectively to ensure that these are at appropriate location, such that they would not have the potential to initiate or escalate major accidents or disasters at the Proposed Development.

The risk of cumulative effects leading to potential MA&D at the Proposed Development is therefore considered to be **low** and detailed safety studies and QRA will be prepared / updated as the detailed design of the Proposed Development progresses, to identify where risks can be further reduced.

14.12 Residual Impacts and Effects

Residual effects are defined as those impacts that remain following the implementation of mitigation measures. As per the EPA draft guidelines, the effects from the residual impacts that remain after all assessment and mitigation are referred to as 'Residual Effects' (EPA, 2022). This assessment of MA&Ds has identified the potential for major hazards to occur at sensitive environmental receptors, such as a fire caused by damage or failure of systems containing gas. These events have significant consequences; however, the likelihood will be extremely low due to measures such as the engineering design of assets and protective systems.

Hazardous events such as these have been demonstrated to be extremely unlikely, however the risk cannot be entirely eliminated, and therefore will be reduced to ALARP, as required under COMAH. Further analysis of mitigation measures and residual effects will be undertaken as the detailed design of the Proposed Development progresses.

14.13 Summary

The assessment has reviewed the potential MA&D scenarios applicable to the Proposed Development, associated with the substances present and the operation of the Proposed Development. The most likely scenarios which could occur at the Proposed Development that could result in an impact representing a major accident and / or disaster are:

- A loss of containment and subsequent fire and/or explosion caused by accidental damage or failure of the pipework and equipment containing Natural Gas (Risk Event 1).
- Fire and/or explosion caused by accidental damage or failure of the BESS (Risk Event 2).
- A loss of containment and subsequent release to the environment caused by accidental damage or failure of the pipework and equipment containing Distillate Oil (Risk Event 3).
- A loss of containment and subsequent fire and/or explosion caused by accidental damage or failure of the pipework and equipment containing Distillate Oil (Risk Event 4). This event also includes firewater impacts.
- A loss of containment and subsequent release to the environment of Firewater used to extinguish the BESS (Risk Event 5).

These incidents have an extremely low probability of occurrence but have the potential for effects on people and the environment.

A QRA has been undertaken for Land Use Planning (LUP) for individual and societal risk, associated with natural gas and distillate fuel loss of containment and fires / explosions. The QRA concludes that:

- There are no land uses in the surrounding area of the Proposed Development that are against the land use planning criteria, for example residential housing.
- The individual risk at the nearest residential receptors is negligible.
- There were no populated areas within any of the LUP risk curves and so the societal risk was not calculated but is considered negligible.
- No lethality is expected in populated areas near to the site for members of the public.

Similar facilities have been in operation for many years across the world and the power generation has a very good safety record.

The engineering design of the Proposed Development will incorporate all of the appropriate standards and mitigation measures necessary to reduce the risks of accidents and disasters to an acceptable level, *i.e*. ALARP.

It is not possible to completely eliminate the risks associated with the use of materials such as Distillate Oil. Consequently, the Site will comply with all applicable safety legislation, national and international design standards, industry guidance and other control measures, including those set out in **Table 14.3**, which will be adopted at the Proposed Development.

Overall the construction, operation and decommissioning of the Proposed Development is considered **'Not Significant**' for Major Accidents and Disasters as all risk events will be mitigated to a level commensurate with ALARP.

14.14 References

Chemicals and Downstream Oil Industries Forum (CDOIF) (2017). *Guideline, Environmental Risk Tolerability for COMAH Establishments.* Available at: https://www.sepa.org.uk/media/219154/cdoif_guideline__environmental_risk_assessment_v2.pdf

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