Land Use Planning Risk Assessment at SSE Platin

***Prepared for*:**

SSE Thermal

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Contents

1 Introduction

SSE are applying to Meath County Council for planning permission for the development of an Open Cycle Gas Turbine Generating Plant (OCGT) at Platin, County Meath (the Proposed Development). The Proposed Development qualifies as an establishment under the scope of the *Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations*, 2015 (the COMAH Regulations[1]) due to the quantities of HVO product stored at the site, which will be in excess of the lower tier thresholds from Schedule 1 of the Regulations.

To support the planning application in the context of the COMAH Regulations, SSE requested Byrne Ó Cléirigh (BÓC) to carry out a COMAH land use planning assessment of the Proposed Development. This report describes our assessment of the major accident risks and our conclusions as to the change in on-site and off-site risk between the existing site and Proposed Development. The Site is anywhere shown within the red boundary in the site drawings.

This assessment has been carried out by Thomas Leonard BE MEngSc CEng MIEI. Thomas Leonard is a Partner at BÓC, with over 25 years' experience in providing consultancy support in the areas of environmental protection and in safety & risk management.

2 Planning Context

2.1 Planning and Development Regulations

Part 11 of the *Planning and Development Regulations*, as amended, sets out the requirements for planning applications relating to developments subject to the COMAH legislation. Section 137(1) of the Planning and Development Regulations requires that a planning authority notifies the Health & Safety Authority (HSA) where:

> *(a) a planning authority receives a planning application relating to the provision of, or modifications to, an establishment, and, in the authority's opinion, the development would be relevant to the risk or consequences of a major accident*

As the Site qualifies as a lower-tier COMAH establishment, the Proposed Development falls within the scope of Section 137(1)(a) of the Planning and Development Regulations.

2.2 Control of Major Accident Hazard Regulations

The COMAH Regulations place an obligation on operators of establishments that store, handle or process dangerous substances above certain thresholds to *take all necessary measures to prevent major accidents and to limit the consequences for human health and the environment*. Under the COMAH Regulations, an establishment can qualify as upper tier or lower tier, depending on the inventory of dangerous substances; sites that store, handle or process dangerous substances below a certain threshold do not qualify as establishments under the COMAH Regulations.

The types of dangerous substance that contribute to an establishment's inventory include flammable substances, toxic substances, and substances that are hazardous to the aquatic environment. The types of establishment that may fall within the scope of the COMAH Regulations (depending on their inventories) include oil storage & distribution sites, liquefied petroleum gas

[1] The COMAH Regulations implemented 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 in Ireland

storage & distribution sites, pharmaceutical plants, and sites that manufacture and / or store certain types of fertiliser.

Under Part 7 of the COMAH Regulations, the HSA, as the Central Competent Authority, can provide technical advice to a planning authority on developments of, or in the vicinity of, COMAH establishments, as follows:

> *24(2) The Central Competent Authority shall provide technical advice in response to a notice sent by a planning authority under Part 11 of the Planning and Development Regulations 2001 (SI No. 600 of 2001), requesting technical advice on the effects of a proposed development on the risk or consequences of a major accident in relation to the following types of developments…*
>
> *(a) the siting and development of new establishments;*
>
> *(b) modifications to establishments…* [which could have significant consequences for major accident hazards…]*;*
>
> *(c) new developments including transport routes, locations of public use and residential areas in the vicinity of establishments, where the siting, modifications or developments may be the source of, or increase the risk or consequences of, a major accident*.

Based upon the examination of the Proposed Development and the requirements of both the Planning and Development Regulations and the COMAH Regulations, we understand that Meath County Council may request advice from the HSA in its consideration of the planning application. This report is prepared to assist the authorities in their consideration of this development.

To assist operators and developers in understanding the process and criteria that the HSA uses with respect to land use planning decision making, the HSA has produced guidance for land use planning (LUP) risk assessments[2]. This includes guidance on the types of major accident that could arise at a variety of establishments, as well as the risk-based criteria that the HSA uses to determine the acceptability or otherwise of the risks. The risk assessment in this report has been conducted in accordance with the LUP Guidance, to ensure that the approach reflects the good practice expectations of the HSA.

3 PROPOSED DEVELOPMENT

The Site is currently a greenfield site of approximate size of 8.7ha. It is located approximately 3 km north of Duleek. The predominant land use in the area is agricultural, primarily high-grade/arable agriculture. However, a large cement manufacturing plant and its associated quarry (Irish Cement Ltd) is located just to the north of the Site. In addition, Indaver Waste to Energy facility lies immediately northwest of the Site across the R152 road. Directly adjacent to the Proposed Development is a cluster of commercial and residential buildings including a service station and a Commercial Vehicle Roadworthiness Test (CVRT) centre. Residential development in the vicinity of the Site is scattered, typical of the rural location.

The Proposed Development is for a 170 Megawatt (MWe) OCGT Generating Plant. The plant will only operate when demand on the electricity system is high or when there is a shortage of supply on

[2] *Guidance on Technical Land Use Planning Advice for Planning Authorities and COMAH Establishment Operators.*

the grid. Generating Plants such as the one proposed, help facilitate the increasing amount of renewable energy on the electrical grid system as they can respond quickly to the intermittent nature of renewable energy due to their rapid response time.

The layout of the Proposed Development is shown in Appendix 1.

The closest COMAH establishment to the Proposed Development is the Flogas LPG facility in Drogheda which is approximately 10 km away. Because of the large separation distance between the sites there is no risk of domino effects from Flogas to the Proposed Development at Platin.

4 METHODOLOGY

4.1 Context

To assist Meath County Council and the HSA in their consideration of the Proposed Development, BÓC carried out this COMAH land use planning assessment of the Proposed Development in accordance with the HSA's LUP Guidance. The policy and approach to conducting land use planning assessments is set out in the LUP Guidance, which is to adopt a conservative and consistent risk assessment methodology.

4.2 Assessment Criteria

4.2.1 Individual Risk

The criterion against which the level of individual risk is assessed is based on the LUP Guidance and the use of a three-zone system shown in Table 1.

Table 1: Risk Based Contour Zones for Individual Risk

Zone	Description
Inner zone	Risk of fatality of 1×10^{-5} per year, (1 in 100,000 years)
Middle zone	Risk of fatality of 1×10^{-6} per year (1 in 1 million years)
Outer zone	Risk of fatality of 1×10^{-7} per year (1 in 10 million years)

These three zones have been determined for the Proposed Development based on the probabilities of the scenarios arising and on the results from the consequence modelling.

4.2.2 Societal Risk

The societal risk has been assessed by means of the Expectation Value (EV) for the establishment and the surrounding environment. The EV aggregates the risks from all scenarios covered in this assessment, based on the total population at the Site and in the surrounding area, and aggregates them to calculate a single value to represent the overall risk level. It is defined as:

$$EV = \Delta R_{cpm} \times N$$

Where ΔR is the increase in risk presented to people by the Proposed Development (expressed as chances per million) and N is the number of people exposed to this increase in risk.

4.3 Development Sensitivity Levels

The HSA provides advice to the planning authorities, in accordance with the COMAH Regulations, using a similar system to that applied by the Health & Safety Executive in the UK (UK HSE). Different types of development are categorised under one of four sensitivity levels (Level 1 to Level 4). The HSA provides its advice to planning authorities in the form 'advises against' or 'does not advise against' depending on which zone the development lies within, as shown in Table 2 (a tick indicating 'do not advise against' and a cross indicating 'advise against').

Table 2: HSA Matrix for Land Use Planning Advice

Sensitivity Level	Individual Risk Zone		
	Inner Zone	Middle Zone	Outer Zone
Level 1	✓	✓	✓
Level 2	×	✓	✓
Level 3	×	×	✓
Level 4	×	×	×

The levels shown in this table refer to Sensitivity Levels for populations at, or in the vicinity of a COMAH establishment. Depending on the nature of a development, and on the numbers of people present, the HSA will classify the Sensitivity Level using a scale of 1 to 4. As the Sensitivity Level increases, so too do the levels of restrictions that would be placed on where they would be permitted. For example, if a development is classed as Sensitivity Level 2, then the HSA would advise against its development in the Inner Zone but would not advise against its development in the Middle or Outer Zone, whereas for a development which is Sensitivity Level 4 the HSA would advise against its development in any of the LUP zones.

Appendix 2 of the LUP Guidance sets out the approach in more detail but, in outline, the criteria are shown below.

Sensitivity Level 1: People at work; car parks

Developments in this category can be accommodated inside any of the LUP zones around a COMAH establishment. Examples in the LUP Guidance include offices, factories, warehouses, haulage depots, farm buildings, non-retail markets, builders' yards, car parks, lock-up garages.

Workplaces may be classed as Sensitivity Level 2 if they are high density developments. They may be classed as level 3 where they are specifically for people with disabilities.

Sensitivity Level 2: Developments for use by the general public

Developments in this category can be accommodated inside the middle zone or the outer zone. The categories of development which fall under this heading are housing, hotel / holiday accommodation, transport links, indoor use by the public and outdoor use by the public.

As with workplaces, there is scope for developments to have a different sensitivity level on the basis of the density of development. For example, a small housing development consisting of one or two dwelling units would be Sensitivity Level 1, while a high density development with more than 40 dwelling units per hectare would be Sensitivity Level 3.

Similarly, while a transport link is Sensitivity Level 2, estate roads and access roads are Sensitivity Level 1.

Sensitivity Level 3: Developments for use by vulnerable people

Developments in this category can be accommodated inside the outer zone. Examples in the LUP Guidance include hospitals, nursing homes, schools and creches.

In each case there is a size threshold and so if a school, hospital, creche etc. exceeds a certain size level then it is classed as Sensitivity Level 4.

Sensitivity Level 4: Very large and sensitive developments

Developments in this category cannot be accommodated inside any of the LUP zones. Examples in the LUP Guidance include institutional accommodation and very large outdoor use by the general public (e.g. theme parks, sports stadia, markets etc where there could be more than 1,000 people present).

4.4 Consequence Modelling

This section of the report sets out the conditions under which each of the major accident scenarios identified in this report has been modelled. Further details of how these scenarios were identified in accordance with the LUP guidance are provided in Section 5 of this report.

4.4.1 Wind speed

For toxic releases, a wind speed of 5 m/s was used to model scenarios under average atmospheric conditions (Pasquill Stability Category D), while a wind speed of 2 m/s was used to model scenarios under calm conditions (Pasquill Stability Category F). These two combinations are used to determine the hazard distances for any release scenario resulting in hazardous gas or vapour being released to atmosphere. They represent typical conditions (D5) and worst-case conditions (F2), in accordance with the LUP Guidance.

For fire scenarios, the heat radiation to the surrounding area was modelled using 5 m/s and 10 m/s wind speeds. The higher wind speed will give rise to a greater degree of flame tilt and so will result in higher heat fluxes in the immediate vicinity of the fire.

4.4.2 Ambient temperature

An ambient temperature of 20°C was selected for all consequence modelling runs. All materials will be stored and handled at ambient temperatures, unless stated otherwise.

4.4.3 Height of release

Unless otherwise stated, all releases occur at ground level.

5 Major Accident Scenarios

5.1 Summary

The LUP Guidance sets out the types of scenario to be considered as part of a COMAH land use planning assessment. The installations at the Site which are identified as having the potential to give rise to major accident scenarios are as follows:

- Loss of containment of HVO from bulk storage tank
- Loss of containment during road tanker delivery
- Loss of containment from pipelines
- Fire / explosion at OCGT
- Loss of containment of aqueous sodium hypochlorite
- Loss of containment of aqueous ammonia

5.2 Bulk Storage

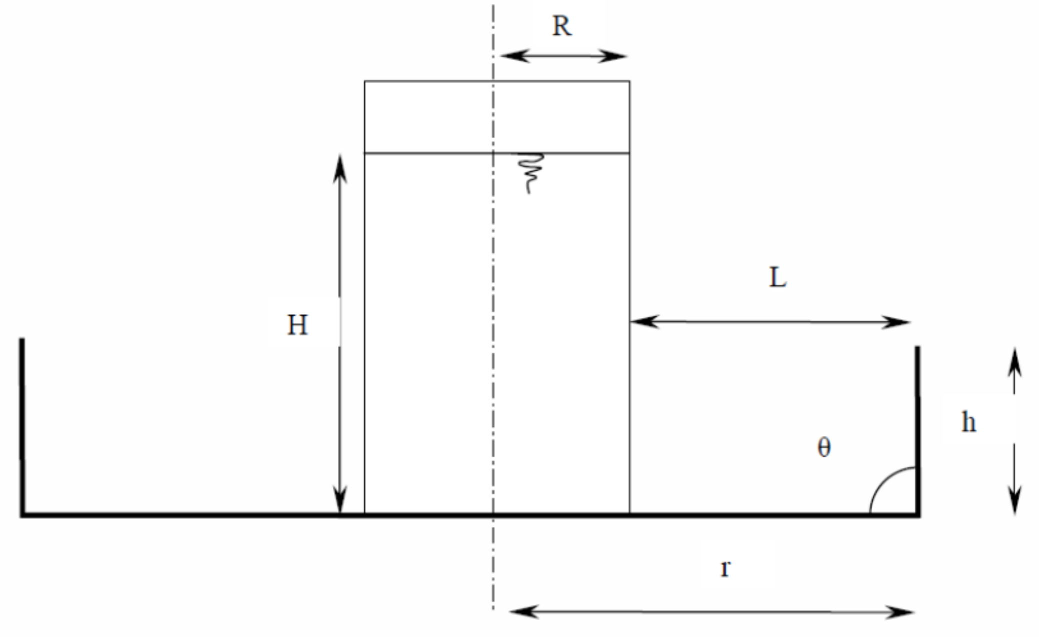
The HSA's guidance advises that for bulk storage of flammable liquids, the risk assessment should consider three levels of loss of containment event:

- Instantaneous failure of storage tank: 5×10^{-6} per tank per year. In this scenario the full contents of the tank are released immediately.
- Failure over 10 minutes: 5×10^{-6} per tank per year. In this scenario the full contents of the tank are released over a period of 10 minutes.
- 10 mm pipe leak over 30 minutes: 1×10^{-4} per tank per year. In this scenario a portion of the tank's contents are released.

For the second and third of these scenarios, the released material would be retained in the bund. However, for the first scenario (instantaneous failure), the momentum of the released material can result in overtopping of the bund wall. The worst-case overtopping event is calculated using the equation from the UK HSE Research Report RR755, "*Validation of the Shallow Water model "SPLOT" against experimental data on bund overtopping*".

The fraction of material that could overtop a bund wall in the event of catastrophic tank failure was calculated by reference to the OVERTOP routine, developed by the UK HSE. The main dimensions used for this calculation are illustrated in Figure 1.

Figure 1: Key tank and bund dimensions for calculation of bund overtopping fraction



The OVERTOP routine is summarised using the following correlation, which has been derived by Liverpool John Moores University (LJMU) on behalf of the UK HSE as a best-fit to a range of laboratory scale tests.

Overtopping Fraction = 1.0255 – 0.1886 (r/H) – 2.9951 (h/H) + 0.3842 (R/H)
+ 0.0140 (r/H)2 + 2.7535 (h/H)2 – 0.0637 (R/H)2
–0.0005 (r/H)3 – 0.8595 (h/H)3

The equation calculates the amount of material that could overtop the bund wall based on worst case conditions, i.e. that the tank is full at the time, failure is instantaneous and the direction of failure is such that the released material impacts the closest bund wall at right angles.

The results of this calculation are shown in Table 3.

Table 3: Calculation of maximum overtopping fraction for catastrophic tank failure

Incident tank	Max operating level	Tank Diameter	Shell – Bund distance	Bund height	Overtopping	Overtopping
Tank 1	13 m	15 m	5 m	1.5 m	75%	1,716 m^3
Tank 2	13 m	15 m	5 m	1.5 m	75%	1,716 m^3

The results show that, in the worst-case catastrophic event, up to 1,716 m^3 of HVO could overtop the bund wall.

The severity of environmental impact from such a release is dependent on whether the overtopping material can find a pathway to escape offsite. For this assessment we have examined the impacts for the various directions in which a release can occur separately.

The Site will be protected by the provision of 3 no. full retention separators (Klargester NSFA050 or equivalent) and a further 2 no. full retention separators in the fuelling area and adjacent to the transformers (Klargester NSFA080 type or equivalent). For releases outside of the bund area, the

Site will be designed with a drainage system which will protect against the release escaping offsite. The separators will be installed with an automatic closure device which will prevent flow passing through the separator when the quantity of HVO in the separator exceeds the storage volume. The separator will also feature an automatic warning device to provide a visual and audible warning when the level reaches 90 per cent of the storage volume under static liquid level conditions. However, the possibility of a release to the environment following catastrophic tank failure and overtopping cannot be ruled out.

There are no protected sites in the vicinity of the Proposed Development. The closest such sites are the River Boyne SAC/SPA, which is located at a distance of approximately 3.6 km from the Site, and the Duleek Commons pNHA, which is at a distance of approximately 2.1 km from the Site. There are also no groundwater wells or springs or drinking water protection areas in the vicinity of the Site.

Referring to the Chemical and Downstream Oil Industry Forum (CDOIF)[3] Guidance, a spill to ground, resulting in contamination of less than 10 hectares of non-designated land is assigned a rating of 1 (out of 4) for severity of harm. As such it would not constitute a major accident to the environment (MATTE).

For "non-designated land" (described as land/water used for agriculture, forestry, fishing or aquaculture), if the release results in contamination of more than 10 hectares of land, it is considered to be a major accident to the environment. Where the release results in contamination to between 10 and 100 hectares, this is rated 2 (Severe) in the CDOIF Guidance. For a release of up to 1,716 m^2, it is conservatively considered that this level of damage could arise.

For a release to non-designated water, where the release results in contamination of aquatic habitat which prevents fishing or aquaculture or renders it inaccessible to the public, it is rated 2 (Severe) on the CDOIF scale.

Based on the above criteria, the scenario involving an overtopping event combined with failure of the drainage system to retain the release, is rated 2 (Severe) on the CDOIF scale.

The CDOIF guidance also takes consideration of the duration of harm following a release. When assessing the potential duration of a release to the environment, it is noted that where the spill is to land, the potential duration can be affected by the type of habitat that is exposed; the International Tanker Owners Pollution Federation (ITOPF) Technical Information Paper 13[4] provides an indication of the recovery periods for different habitats, where recovery is defined as the point at which the habitat is functioning normally. The indicative recovery times for various habitats are shown in Table 4.

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

[4] Effects of Oil Pollution on the Marine Environment

Table 4: Indicative recovery periods for oiled habitats

Habitat	Recovery period
Plankton	Weeks / months
Sand beaches	1 – 2 years
Exposed rocky shores	1 – 3 years
Sheltered rocky shores	1 – 5 years
Saltmarsh	3 – 5 years
Mangroves	10 years and greater

This data is for a release of oil. It is conservatively assumed that a HVO release would have a similar level of persistence. For a release to land, if it results in damage for more than 3 years, it is classed as 2 (medium term) under the CDOIF system. This rating is conservatively applied to this scenario.

Figure 2: CDOIF risk assessment criteria

Severity of Harm					
	4		C	D	D
	3		B	C	D
	2		A	B	C
	1	Sub-MATTE Harm			
		1	2	3	4
		Harm Duration Category			

Frequency at which the CDOIF consequence level is reached or exceeded	Frequency per receptor per establishment per year	
	Intolerable (greater than)	Broadly Acceptable (less than)
A	1.0 E-02	1.0 E-04
B	1.0 E-03	1.0 E-05
C	1.0 E-04	1.0 E-06
D	1.0 E-05	1.0 E-07

Figure 2 illustrates the CDOIF criteria. For a scenario with Severity of (2) and a Duration of (2) it is a level A MATTE on the CDOIF scale. Applying the HSA's criteria, the risk associated with this release is considered to be broadly acceptable, provided the probability of occurrence is less than 1×10^{-4} per annum. For the two HVO tanks at the Proposed Development, the probability of an unbunded release as a result of catastrophic failure and bund overtopping is $2 \times 5 \times 10^{-6}$, or 1×10^{-5} per annum – without even taking account of the additional protection provided by the Site drainage.

Based on the above, the HVO storage at the Proposed Development is not likely to present an environmental impact. Based on the CDOIF criteria, the environmental risk is broadly acceptable. This is also Broadly Acceptable in accordance with the LUP Guidance.

5.3 Road Tanker Deliveries

The HVO supply to the Site will be via road tanker deliveries. Again, referring to the LUP Guidance, we have identified the following loss of containment events:

- Instantaneous failure: 1×10^{-5} per annum.
- Failure over 10 minutes: 5×10^{-7} per annum.
- Rupture of loading / unloading hose: 3×10^{-8} per hour of activity.
- Leak from loading / unloading hose (10%): 3×10^{-7} per hour of activity.

The first two of these scenarios are expressed on a per annum basis. As road tankers will only be present on site some of the time, these must be adjusted downwards to reflect the activity level at the Site. The second two of these scenarios are expressed on a per hour basis. These figures must be adjusted upwards to reflect the actual number of hours per annum that transfers will take place.

In all of the above scenarios, the loss of containment event would only have the potential to give rise to environmental damage if the release could also find a pathway to escape off site. However, in each case the release would be to a dedicated kerbed area, designed to retain the spill. As such the release would only escape off site if there was a further failure of the operator to correctly manage the drainage system and to discharge the release.

The worst-case scenario of this type would involve a catastrophic failure event of a tanker when making a delivery. We note that tankers are typically compartmented tankers, where each compartment contains approx. 6 to 7 m^3. If it is conservatively assumed that the catastrophic failure event involves the full tanker contents of 36 m^3, this would still be a minor event when compared with the overtopping event and would not be sufficient to give rise to a MATTE on the CDOIF scale. Furthermore we note that the drainage from the road tanker area will be routed via a drainage channel to a separator, to protect against the release escaping offsite.

Based on the above considerations, the road tanker unloading area does not present a risk of a MATTE, based on the CDOIF scale, and the associated environmental risk from a major accident is broadly acceptable, based on the HSA's criteria.

5.4 HVO Pipeline

HVO will be transferred at the Site, e.g. from the road loading area to the tank farm, and from the tank farm to the OCGT, via pipelines. There will be approximately 30 m of 4" diameter lines. The loss of containment events for these lines are as follows:

- Rupture of pipeline
- Leak from pipeline, with an effective diameter of 10% of the nominal diameter

In the event of a loss of containment from a pipeline section with HVO in it but where the pumps are not operating and a transfer is not taking place, the quantity released is taken as the capacity of that pipeline. The pipeline will be fitted with a control valve to ensure that it is only the volume in the line that is released. This approach is conservatively applied for leaks as well as for guillotine failures. The maximum volume that would be released from a pipeline in these scenarios would be up to 0.24 m^3.

In the event of a loss of containment while a transfer is taking place, the quantity released would be larger. The volume in this case would be equal to the quantity in the line, plus the quantity released during the transfer.

The normal flowrate in the line is approx. 55 m^3/hr, at a pressure of 4 bar. In the event of a leak in the line (10% diameter) the release rate is calculated to be 0.0014 m^3/s, or 5 m^3/hr. In the event of line rupture, the release rate is taken to be 82.5 m^3/hr. A 20-minute response time is applied in these cases.

- Leak from pipeline, when product is in the line but the pumps are not operating. The total quantity released is the volume of liquid released is the volume of the pipeline, i.e. 0.24 m^3.
- Rupture of pipeline, when product is in the line but the pumps are not operating. The total quantity released is the volume of liquid released is the volume of the pipeline, i.e. 0.24 m^3.

- Leak from pipeline, when pump is operating. The total quantity released is the volume of liquid released is the volume lost over 20 minutes of pumping plus the volume in the line, i.e. 1.93 m^3.
- Rupture of pipeline, when pump is operating. The total quantity released is the volume of liquid released is the volume lost over 20 minutes of pumping plus the volume in the line, i.e. 28 m^3.

As with the scenarios identified at the tanker unloading area, the volumes released are too small to give rise to a MATTE, based on the CDOIF criteria. Considering also the provision of the controls on the drainage system, to prevent a release escaping offsite, the off-site environmental risk from the pipelines is negligible and the overall risks are broadly acceptable based on the HSA criteria.

5.5 OCGT

The worst-case event at the OCGT would involve a pressurised release of HVO inside one of the three turbine enclosures. This could give rise to a flammable vapour : air mixture inside this space. If ignited, this could result in the generation of overpressures.

As a representative worst case scenario to cover this area of the Site, we have modelled the impacts based on a major spray release inside one of the OCGT enclosures, resulting in a stochiometric air-fuel mixture.

The enclosures in which the OCGT will be housed each have a volume of approximately 480 m^3. This space could therefore contain up to 578 kg of air. Referring to the literature, the stochiometric ratio for diesel with air is 14.5:1 and the quantity of diesel that could be confined within the turbine enclosure resulting in an explosion would be 39.9 kg. This is also taken to be representative for HVO. The impacts of this scenario are modelled as a vapour cloud explosion (VCE) using Curve 10 from the multi-energy method.

The consequence modelling results are set out in Table 5.

Table 5: Consequence modelling results for explosion at OCGT (VCE of 39.9 kg in turbine enclosure)

Distance	Overpressure
22 m	600 mbar
51 m	168 mbar (1% lethality)
59 m	140 mbar
102 m	70 mbar
217 m	30 mbar

The scenario involves a release from a fitting inside the turbine. The probability of a major release is conservatively taken as 10^{-4} per annum. This is equivalent to the probability of a 10 mm pipe leak over 30 minutes from the guidance. It is conservatively assumed that this release would ignite. We also note that there will be an automatic fire suppression (inert gas) and detection in the enclosure. The specification for this system will be subject to detailed design phase but, for the purposes of this assessment, we have conservative assumed that it will provide a probability of failure on demand of 0.1 or better.

Based on the above, the probability of occurrence for this scenario is 10^{-5} per annum.

5.6 Sodium Hypochlorite

Storage of Sodium Hypochlorite solution will be in a bunded 1 m^3 IBC. This material will be an aqueous solution (10-12% concentration). The primary concern for this LUP assessment is that a loss of containment of this material would present an environmental hazard (H400, H410 material).

The most likely loss of containment event is a leak or damage to the IBC, resulting in a release to the bund. There is no adverse environmental impact in this scenario.

In the event of a catastrophic release, material could escape to an unbunded area. As with the HVO release scenarios, this would be collected in the drainage system. In this case the release would not be sufficient to give rise to a MATTE.

5.7 Ammonia

Ammonia will be stored in a horizontal tank, with a capacity of 10 tonnes. This will be an aqueous solution at a concentration of 24.5%.

The aqueous ammonia solution, at a concentration of 24.5%, its not classed as acutely toxic to human health under Regulation (EC) No 1272/2008 on the classification, labelling and packaging of substances and mixtures ('CLP Regulation'). However, in the event of a loss of containment to the bund, the resulting pool of liquid could evaporate, resulting in a release of ammonia to atmosphere. We have therefore included this as a scenario in the risk assessment.

The ammonia storage tank will be a horizontal vessel, within a bund of cross-sectional area 12.5 m^2. The following representative loss of containment events are identified, from the LUP guidance:

- Instantaneous failure: 5×10^{-6} per annum
- Failure over 10 minutes: 5×10^{-6} per annum
- 10 mm pipe leak over 10 minutes: 1×10^{-4} per annum

For a major release (loss of full tank contents within 10 minutes or catastrophic failure), the release would fill the bund. Although a portion of the tank would still jut above the liquid surface, it is conservatively assumed that the full bund area of 12.5 m^2 would be available for evaporation.

In the event of a leak, the resulting pool of liquid would accumulate in the base of the bund. The area for evaporation would be reduced in this case, as the horizontal tank occupies much of the bund and would sit above the liquid. The tank will have a diameter of 1.8 m and a length of 3.5 m and so the area for evaporation in this case is taken to be 6.2 m^2.

The consequence modelling results are summarised in Table 6.

Table 6: Consequence modelling of ammonia releases

	Leak from tank, normal atmospheric conditions	Leak from tank, calm atmospheric conditions	Major release from tank, normal atmospheric conditions	Major release from tank, calm atmospheric conditions
Material	Ammonia (24.5%)	Ammonia (24.5%)	Ammonia (24.5%)	Ammonia (24.5%)
Area	6.2 m^2	6.2 m^2	12.5 m^2	12.5 m^2
Weather	D5	F2	D5	F2
Evaporation rate	4.06 kg/min	1.64 kg/min	2.21 kg/min	0.88 kg/min
Dist. to 1% lethality	22 m	79 m	17 m	57 m

The table shows the distance to a potential 1% lethal dose, based on exposure to someone located outdoors and based on an exposure time of 30 minutes. The modelling shows that the Service Building is within this hazard range for some of the loss of containment events modelled.

The risk to personnel in this building can be mitigated by minimising the potential for ingress of gas into the building by this scenario. Referring to the Green Book[5], where the doors and windows on a building are closed, this can reduce the rate of air exchange to the surroundings, typically to between 0 and 0.5 air changes per hour (ach). We also note that the rate of air exchange will vary depending on the atmospheric conditions, with a higher rate of air exchange in normal conditions (D5) than in calm conditions (F2).

The model applies a figure of 0.61 ach for a release in normal operating conditions and 0.28 ach for a release in calm conditions, which is taken as representative for an unsheltered building and is conservative when compared with the Green Book guidance.

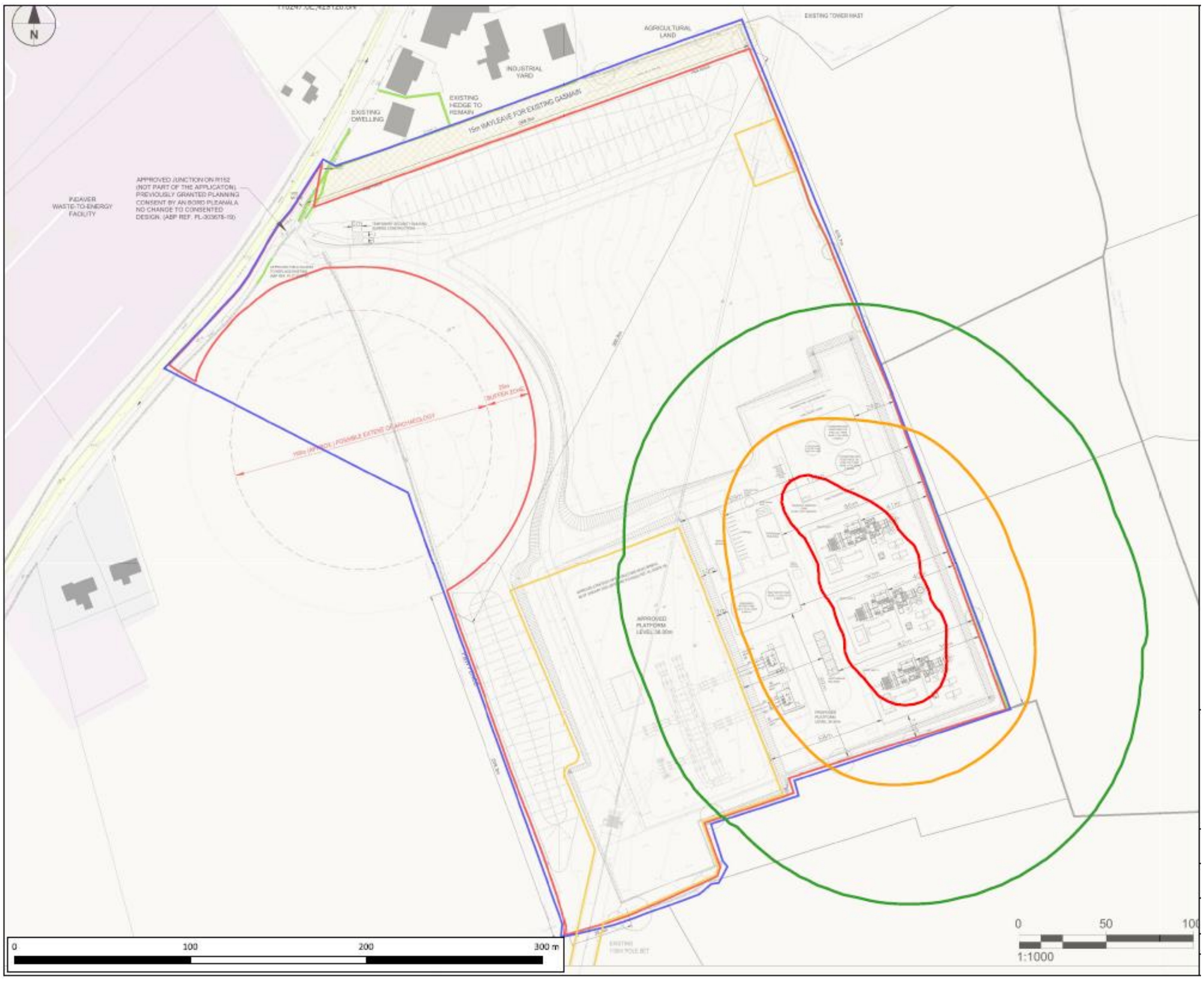
6 Risk Assessment Findings

6.1 Individual Risk

Based on the findings of this risk assessment, a risk contour plot was drawn up, to show the extents of the LUP risk zones around the development. This is shown in Figure 3.

[5] Methods for the determination of possible damage to people and objects resulting from release of hazardous materials (CPR 16E)

Figure 3: LUP Risk Contour Plot



The plot is also included in Appendix 1 to this report. It shows the extents of the Inner, Middle and Outer Zones, in accordance with the LUP Guidance. The contours are primarily confined within the Site footprint. The highest level of individual risk presented to any habitually occupied building is to the Service Building. The location-based risk at this building is calculated to be 9.2×10^{-7} per annum.

The location-based risk represents the major accident risk that would be presented to an occupant if they were present in the building on a 24/7 basis. For an employee on site, their occupancy will be no higher than 10 hours per day, an occupancy of up to 0.3. This means that the highest level of individual risk to any operator at the Site will be 2.75×10^{-7} per annum. This is less than one in one million per annum and it broadly acceptable based on the HSA's criteria.

The plot also shows that some contours extend offsite, in the vicinity of the OCGT itself. There are no occupied buildings or other developments within these zones. The area to the west of the OCGT comprises strategic infrastructural power development, also by SSE. This is shown to lie within the Outer Zone for the OCGT. There are no occupied areas associated with this Proposed Development and there are no significant implications associated with the findings of this assessment at this area. The contours also extend offsite to the east and to the south of the OCGT. There are no populations inside any of these zones. The closest offsite dwellings are located to the north of the Site. The contour plot shows that none of the risk zones extend to the northern Site boundary and so all off-site buildings are outside of these zones. The location-based level of individual risk at the northern boundary is calculated to be 2.3×10^{-9} per annum. This level of risk is broadly acceptable, based on the HSA's criteria.

6.2 Societal Risk

In addition to assessing the implications against the HSA's criteria for Individual Risk, we have also examined the Societal Risk implications using the EV, as described in Section 4.2.2.

As noted above, there are no significant risks to any offsite populations. The nearest residences are all beyond the north Site boundary and are exposed to levels of Individual Risk of the order of 10^{-9} per annum. As such the only population on Site that could make any meaningful contribution to the EV calculation is the population on Site. To ensure that a conservative approach is adopted it is assumed that there could be up to 4 staff present at all times during normal operating hours, with an occupancy of 0.3. In addition, there will be other personnel on Site on occasions, e.g. for maintenance works, or visitors to the Site. It is conservatively assumed that there could be up to 10 additional people present at one time, with a maximum occupancy of 1 hr per week.

The levels of risk presented at these locations is shown in Table 7.

Table 7: Calculation of Risk Integral

Occupied Buildings	Building type	Individual risk (cpm)	No. people	Occupancy	IR	EV
On-site office building	Office	0.92	4	0.3	0.275	1.1
Onsite, visitors and other personnel	Office	0.9	10	0.006	0.0055	0.055

The combined EV for this development is slightly greater than 1. This figure represents the overall Societal Risk presented by SSE's activities at Platin to all people in the surrounding area. This level of risk is comfortably within the broadly acceptable range, based on the HSA's criteria for societal risk.

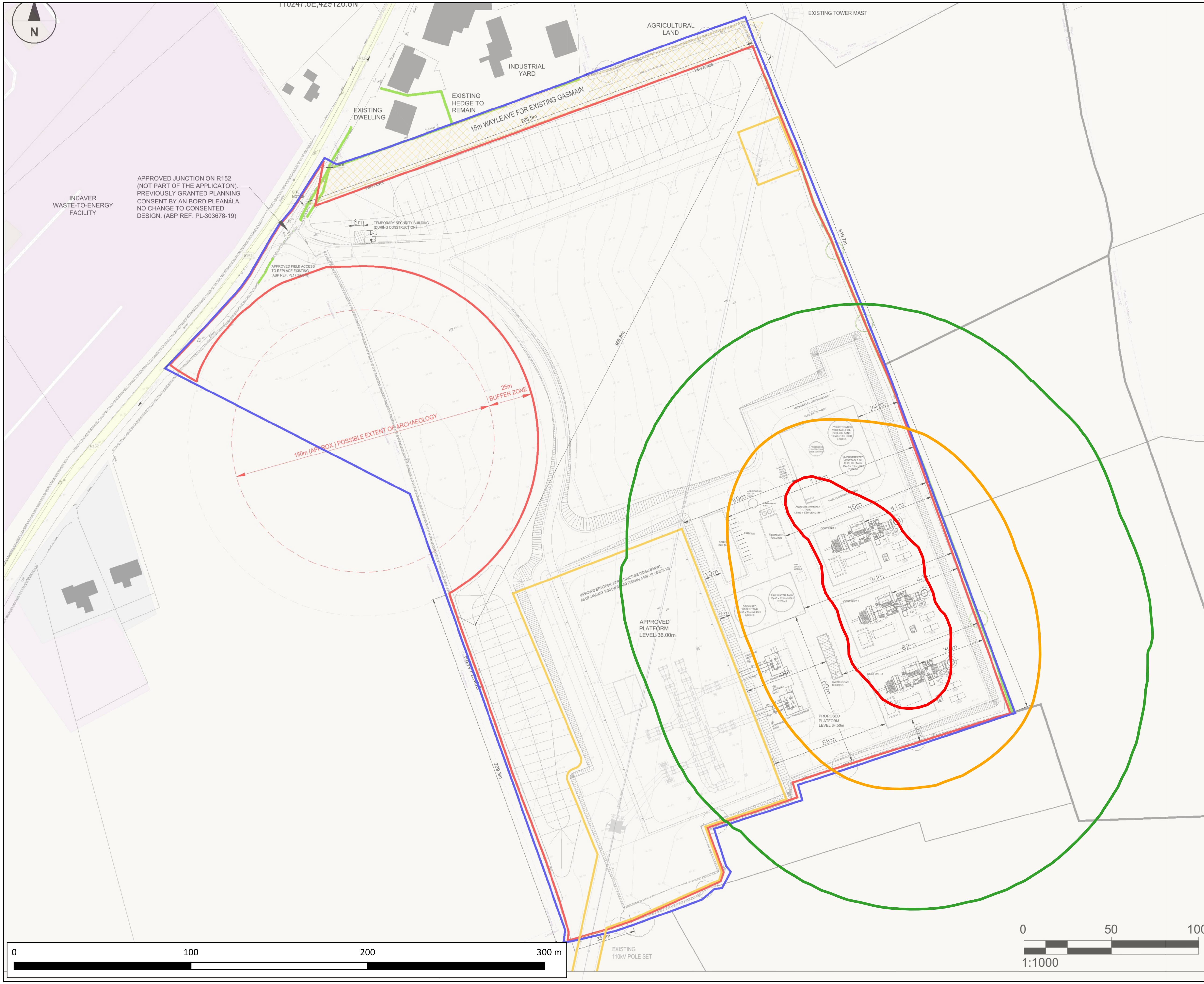
7 CONCLUSIONS

The Proposed Development involves the construction of an OCGT Generating Plant at Platin, Co. Meath, which will qualify as a lower tier COMAH establishment due to the quantity of HVO that will be stored at the Site.

The levels of individual risk presented to the surroundings are in line with the HSA's criteria for individual risk. There are no developments on Site or off site which are presented with a level of individual risk which exceeds the HSA's LUP criteria, as set out in the LUP guidance.

The levels of societal risk presented by the activities on Site are also in accordance with the HSA's criteria. Aggregating the risks to all persons exposed to risks from the development, the EV is calculated to be much less than the threshold for broadly acceptable risk. Referring to the guidance, in cases like this, the HSA's approach is not to advise against the development, but the HSA would advise of this risk so that the planning authority could take it into account in the planning decision.

Appendix 1: LUP Risk Contours



Legend
Risk contours
1 x 10-7
1 x 10-6
1 x 10-5

N

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Client	SSE		
Project	COMAH Land Use Planning Assessment for SSE Platin OCGT		
Title	Individual Risk Case 2: 3no. OCGTs		
Scale	1:2,000	544-23X0154 Appendix 1	R0
FBS	07.01.05		