Air I Noise I Water I Soil I Environmental Consultancy
www.axisenv.ie

Unit 5 Caherdavin Business Centre,
Ennis Road,
Limerick.
info@axisenv.ie
00353 61 324587

SSE Generation Ireland Limited

Campile, New Ross, Co. Wexford

Environmental Liabilities Risk Assessment

2020

Report Reference Number:	**4320-20-02**
Version:	**Version 2**
Date of Issue:	**27-03-2020**
Report Compiled by:	**Niamh McMahon**

Table of Contents

Report Date	27-03-2020	**Site Contact:**	Jonathan Storey
Report Issued By	Mark Mc Garry	**Version No:**	2
Report Complete By	Niamh McMahon	**Client:**	SSE Generation Ltd
Notes:			

1.0 Introduction

AXIS environmental services were commissioned to carry out a review of the Environmental Liabilities Risk Assessment (ELRA) to comply with Conditions 12 of Industrial Emissions (IE) Licence No. P0606-03.

The last ELRA was completed in 2016 by CMSE consultancy. This was agreed and approved with the Agency on the 12th July 2017. This report represents the first full external review of the ELRA by an independent consultant since the initial approved report in 2017.

A review of the ELRA is required every three years in accordance with condition 12.3.2 of Industrial Emissions No. P0606-03 in order to take account of any significant changes on site and also to reflect changes to legislation, guidance and inflation.

The following EPA Guidance were used as the primary guidance documents in conducting this review;

- EPA Approach to Environmental Liabilities and Financial Provision (2019);
- Guidance on the Financial Provisions for Environmental Liabilities (2015);
- Guidance on assessing and costing environmental liabilities - Unit cost rates for verification (2014);
- Guidance on assessing and costing environmental liabilities (2014).

The nature of activities, layout of the plant, systems, raw materials and type of risks have not changed with any degree of significance since the previous ELRA was carried out. Therefore, the same risk rating and approach was applied to the development of this report.

1.1 Scope of the Environmental Liabilities Risk Assessment Report

The IE licence P0606-03 outlines in Condition 12.3 that an Environmental Liabilities Risk Assessment Report for the site must be carried out. The text of the licence reads as follows:

12.3.1 The licensee shall as part of the AER. provide an annual statement as to the measures taken or adopted at the site in relation to the prevention of environmental damage, and the financial provisions in place in relation to the underwriting of costs for remedial actions following anticipated events or accidents /incidents, as may he associated with the carrying on of the activity.

12.3.2 The ELRA shall be reviewed as necessary to reflect any significant change on site. and in any case every three years following initial agreement. The results of the review shall be notified as part of the AER.

12.3.3 As part of the measures identified in Condition 12.3.1 the licensee shall, to the satisfaction of the Agency, make financial provision to cover any liabilities identified in Condition 12.3.2. The amount of indemnity held shall be reviewed and revised as necessary but at least annually. Proof of renewal or revision of such financial indemnity shall be included in the annual 'Statement of Measures' report identified in Condition 12.3.1. The licensee shall have regard to the Environmental Protection Agency Guidance on Environmental Liability Risk Assessment, Decommissioning Management Plans and Financial Provision when implementing Conditions 12.3.2 and 12.3.3 above

The requirement for such a report is to ensure the facility has implemented satisfactory measures to protect the environment and is financially aware and prepared to make secure financial provisions to cover the cost of potential environmental impairment associated with activities on site.

A desktop study of available information for the site was reviewed including:

- IE licence application;
- IE licence;
- Register of Aspects and Impacts;
- Communications between the EPA and SSE Great Island;
- ELRA;
- Residuals management plan;
- EMS Procedures;
- Annual Environmental Reports;
- Incidents and complaints files;
- In House Environmental Audit reports on site;
- ISO 14001 Environmental Audit Reports;
- Hydrogeological Assessment;
- Fire water retention plans;
- GSI online etc.

A site visit to SSE Generation Ltd. was undertaken by Mark Mc Garry. This involved a comprehensive walkthrough of all process, operations, storage areas and treatment capabilities on site as well as a detailed review of developments and changes to operations on the site with management on-site.

1.2 Disclaimer

This report is based on information supplied by SSE Generation Ltd. to AXIS environmental services and the Environmental Protection Agency (EPA) in their Environmental Reports. The report is based on current uses of the site. The assessment does not deal with any future projects that may occur on site after the date of completion of this report. Costings are also based on current market values and are open to variation and change.

1.3 Comparison with Previous Environmental Liabilities Risk Assessments

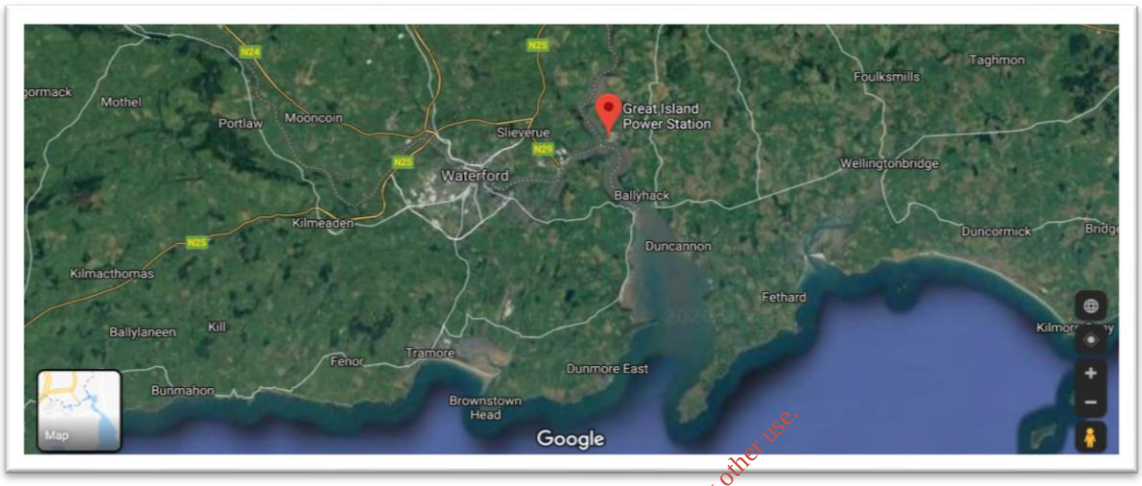
Year	Plausible Worst Case Scenario	Financial Provision	Expiry date of Financial Provision
2020	€12,492,200	Insurance	-
2017	*€12,807,830	Insurance	-
-	€14,626.25	Insurance	-

**Based on revised EPA ELRA guidance titled "EPA Guidance on Assessing and Costing Environmental Liabilities 2014" which moved the costing structure from a median risk based methodology to a plausible worst case scenario model.*

2.0 Site Evaluation

The SSE Generation Ltd., Great Island (SSE, Great Island) combined cycle gas turbine (CCGT) plant which was commissioned in 2014 is located on the shores of Waterford Harbour at the meeting point of the Rivers Suir and Barrow at Great Island, Co. Wexford.

Fig. 2.1 Location map of SSE Generation Ltd., Great Island (Google, 2020)



The Great Island site commenced energy production operations in 1967. The station was originally constructed on lands that were formerly in agricultural use and some lands were reclaimed from the estuary during development of the site. The total area of the site is approximately 143 acres.

In 2009, Endesa Ireland Ltd. acquired the Great Island facility from Electricity Supply Board (ESB). SSE Generation Ltd. subsequently acquired Endesa Ireland Ltd. in 2012 thereby taking ownership of the Great Island site. The construction of the 460 MW CCGT was completed by SSE in 2014 and vastly improved the previous infrastructure of two 6MW and 120MW oil fired turbines on-site while significantly reducing carbon emissions from the site.

The CCGT power plant is based on the premise of optimising energy efficiency. The latter is achieved at the Great Island plant by the burning of natural gas supplied by the Gas Networks Ireland in the Gas Turbine on-site. Electricity is generated primarily from the burning of the gas however the waste heat from the burning process is used to make super-heated steam via a heat recovery steam generator (HRSG) which further creates electricity by driving a steam turbine. The steam is then condensed back to water where it is recirculated back to the HRSG for reuse. This condenser is cooled by the once through cooling water system. Waste gas is emitted through a licenced stack emission point referenced A2-1 where it is monitored primarily for combustion parameters and dust. Emission limit values are subject to change depending on whether the plant is running on natural gas or oil. The Electricity generated from the site is exported to the grid via the switchyard on-site.

There were historical waste disposal activities carried out at the site by previous operators. There are two areas on the site which were used between the 1960's and mid 90's for deposition of excess rock fill, building materials and spoil. Certain parts of a northern segment of Cell 1 was used for deposition of general waste during the operation of the generation station. The CCGT does not impact on these areas in any way, however by IE Licence is required to monitor groundwater quality in the vicinity of these cells.

The site can operate 24 hours a day, 7 days a weeks and employees 48 full time personnel. The plant operated for 6236 hours in 2019.

The main processes undertaken on site remain the same since the last ELRA issued in 2016.

The facility, comprises of the following infrastructure;

- Security Building;
- Office buildings & canteen;
- Control room;
- Gas storage;
- Above Ground Gas Installation (including gas compressor, gas metering, pressure reducing, heating and filtering skids);
- Gas Turbine and Steam Turbine Building;
- Heat Recovery Steam Generator (HRSG) Building;
- Incoming Water Storage Tanks;
- Water & wastewater Treatment systems;
- Cooling water system;
- Bulk chemical storage (Sulphuric Acid and Sodium Hydroxide);
- Jetty including marine oil offload station;
- Oil Storage;
- Workshops;
- Water treatment systems.

A graphic of the site layout and licenced emission points can be found in Appendix A.

2.1 Emissions

The site has been licenced (P0606) by the EPA under Class 2.1 Energy, since 22/01/2003. The licence has undergone a full review twice, with the current version of the licence being P0606-03. There have been 3 x Technical amendments since the inception of this licence on 16/03/2011, they are summarised below;

Final Licence Determination	Issued 16/03/2011
Technical Amendment A	Issued 04/09/2012 amended section Schedule B.2 of the licence for Emission Point SW13 & associated ELV's and schedule C.5 on Groundwater Monitoring Requirements.
Technical Amendment B	Issued 24/02/2014 amended Schedule B.2 of the original licence to include emission points SW-2 & SW-3a and Schedule C.2.3 for points SW1, SW3b, SW4 & SW12 and associated ELV's
Technical Amendment C	Issued 31/12/2015 amended Schedule B.1 of the licence to add emission point A2-1 and associated ELV's

A graphic of the site layout and licenced emission points can be found in Appendix A.

2.2 Licenced Emission Points

2.2.1 Emissions to Air

There is 1 main stack emission on-site, A2-1 which discharges at a height of 60m above ground level and is monitored using a continuous emissions monitoring system (CEMS). A2-1 is associated with the Heat Recovery Steam Generator (HRSG) and is licenced for under Technical Amendment C, Schedule B.1 for both gas and gas oil use. Emission Limit Values (ELV's) for A2-1, include continuous monitoring of flow, pressure, temperature, oxygen, water vapour, nitrogen oxides and carbon monoxide with biannual monitoring of particulates and sulphur dioxide.

2.2.2 Emissions to Surface Water

Surface water from the facility's roofs and hardstand areas drain directly to underground surface water drains which discharge via an oil interceptor to the estuary.

Surface water is monitored primarily in line with licence Technical Amendments A & B of the Licence, as well as schedule C of the main licence. Daily checks include Visual inspection, Total petroleum hydrocarbon (TPH) and pH with monthly checks on suspended solids on SW1, SW3b, SW4 & SW12. Additional monitoring is required for monitoring points namely SW-2, SW3a and SW-13.

2.2.3 Process Water

There are no process effluent emissions to sewer.

2.2.4 Groundwater

There are 13 licenced groundwater monitoring points on-site. There are no unlicensed emissions to ground at the installation. There was however, historical waste disposal activities carried out at the site from previous operators. There are two areas at the installation which were used between the 1960's and mid 90's for deposition of excess rock fill, building materials and spoil. Certain parts of a northern segment of Cell 1 was used for deposition of general waste during the operation of the generation station. The CCGT does not impact on these areas in any way, however in line with Industrial Emissions (IE) Licence conditions there is a requirement to monitor groundwater quality in the area.

The Industrial Emissions Licence requires that these ten listed wells are monitored as follows:

Table 2.2-1: EPA Licence Requirements (Condition C.5)

Location: BH2, BH13, MW101, MW102, MW103, MW106, MW107, MW200, MW202

Parameter	Monitoring Frequency	Analysis Method / Techniques
pH	Annually	Standard Method
Coliforms	Annually	Standard Method
Vanadium	Annually	Standard Method
Ammonia Note 1	Annually	Standard Method
Mineral Oil	Annually	Standard Method
Arsenic	Annually	Standard Method
Total Petroleum Hydrocarbons	Annually	Standard Method
Aluminium	Annually	Standard Method
Polyromantic hydrocarbons	Annually	Standard Method

Note 1: Only relates to BH2, BH3, MW106, MW20, MW202

Location: BH5, BH7, BH19, BH10

Parameter	Monitoring Frequency	Analysis Method / Techniques
pH	Biennially	Standard Method
Ammonia	Biennially	Standard Method
Vanadium	Annually	Standard Method
Lead	Biennially	Standard Method
Chromium	Biennially	Standard Method
Total Petroleum Hydrocarbons	Biennially	Standard Method
Polyromantic hydrocarbons	Biennially	Standard Method

A recent groundwater assessment report for the monitoring period 2009-2019, completed in September 2019, concluded that:

- *SSE would be required to maintain its testing schedule in line with the specifications of its Industrial Emissions Licence;*
- *The frequency and extent of sampling is sufficient to meet the requirements of this licence;*
- *There are areas of contamination determined from the groundwater wells, most likely due to historical practices and waste deposition in close proximity to these sample wells;*
- *The site does not require remediation currently as the concentrations detected in the wells do not make this site unsuitable for industrial purposes. Should the future requirements for this site change from industrial purposes, then further investigations and potential remediation measures may be required;*
- *There is Total Petroleum Hydrocarbon contamination in all but one groundwater well tested. The concentrations are very variable. At times, TPH has not been detected in some wells, followed by a rebound in concentration some years later;*
- *PAHs were largely below the laboratories limit of detection, with no exceedances determined in any well since 2015;*
- *Concentrations of arsenic were variable and found in 6 different wells at elevated concentrations over the 10-year sampling programme. The levels are relatively stable and decreasing.*

The facility implements strict procedures on the storage and bunding of oil and chemicals in order to protect the groundwater in the area.

2.2.5 Receiving Water

Under schedule C.5 of the Licence P0606-03, SSE Great Island must monitor for Trichloro-methane at ASW1 on a quarterly basis. A review of the 2017 & 2018 results for ASW1 illustrated results are <1µg/l.

2.2.6 Noise Emissions

SSE generation station is located in the townland of Great Island, 3.5km west of Campile village and approximately 15km south of New Ross, Co. Wexford. It is located on the confluence of the River Suir and the River Barrow estuary.

The nearest neighbour is approximately 550m to the northwest of the facility, with the nearest area of settlement is at Cheekpoint, County Waterford, located approximately 700 metres to the south of the site. In Wexford, the nearest significant area of settlement is Campile, and is situated approximately 3.75 kilometres to the east.

Noise monitoring is completed annually by independent consultants in line with AG4 Guidance as issued by the EPA. A review of the noise monitoring results was undertaken for previous years. The site is monitored at 2 noise sensitive locations NSL1 and NSL2. Noise monitoring results for monitoring locations NSL1 and NSL2 are all compliant with emission limits values specified within the licence for both day and night time monitoring.

2.2.7 Geology/ Hydrogeology

The generation station was constructed on man-made ground, surrounded by an area of estuarine sediments of silt and clays, with a gravelly texture. The aquifer below is classified as regionally important fissured bedrock (Aquifer Code Rf) with extreme vulnerability. The installation is surrounded by areas of medium to high vulnerability and areas with rock very close or at the surface of the ground. Groundwater was classified under the water framework Directive with "good" status between 2010 and 2015.

2.2.8 Environmental and Ecological Designations

The facility is situated adjacent to the River Barrow and River Nore Special Area of Conservation (SAC), site number 002162. A Natura Impact Statement (NIS) was recently undertaken by an independent consultant, Aquafact International Services Ltd. on foot of an EPA audit query in relation to the impact of emissions from a chlorinated cooling water point which is emitting into the estuary at SW8. The report concluded that '*conservation objectives and integrity of the SAC will not be adversely affected by the discharge'*

The Barrow River Estuary is also a proposed Natural Heritage Area (pNHA).

2.2.9 Human Receptors

SSE generation station is located in the townland of Great Island, 3.5km west of Campile village and approximately 15km south of New Ross, Co. Wexford. It is located on the confluence of the River Suir and the River Barrow estuary.

The nearest neighbour is approximately 550m to the northwest of the facility, with the nearest area of settlement is at Cheekpoint, County Waterford, located approximately 700 metres to the south of the site. In Wexford, the nearest significant area of settlement is Campile, and is situated approximately 3.75 kilometres to the east.

2.2.10 Waste

Waste materials are generated at different locations within the building. Waste materials generated at the SSE Great Island can be classified as either hazardous or non-hazardous in accordance with the EU *European Waste Catalogue (EWC)* and *Hazardous Waste List*.

Non-hazardous waste from the facility is removed by approved waste contractors. Waste typically comprise of the following material types;

General	200301
Wood	170201
Scrap Metal	170407
Dry Mixed	150106
Sewage	200304
Oil Filters	160107
Non-hazardous waste	161002

Hazardous waste materials such as fluorescent lamps, waste oil, oily rags, aerosol cans, waste electrical and electronic equipment and other miscellaneous hazardous waste are managed by appropriately licensed

contractors. Hazardous waste materials are temporarily stored externally within a designated bunded area prior to collection via returns policy with the suppliers or disposal by licenced contractors.

2.3 Compliance Record

Overall the site has an excellent compliance record, with incidents being managed and reported in an effective and timely manner. All incidents have been fully closed out to the satisfaction of the Agency.

There were 5 complaints in 2019, 4 of which related to foaming and overall water quality in the estuary. The 5th complaint related to a noise. All complaints have been managed and closed out to the satisfaction of the Agency.

2.4 Inventory of Materials On-site

Table 2.4-1 Material Inventory

Substance	Stored in (tank, cylinder)	Maximum Quantity (Tons)
Distillate Oil	Tank	1200
Ammonia (20%)	Tank	0.5
Sulphuric Acid 96%	Tank	0.3
Caustic Soda Liquor	Tank	0.3
Sodium Bisulphite (30%)	Tank	0.3
Sodium Hypochlorite (12%)	Tank	44
Trisodium Phosphate	Tank	0.5
Molydate Corrosion inhibitor	Tank	0.1
Gensys Antiscalant	Tank	n/a
Propane	Tank	5
Hydrogen	Tank	1

3.0 Risk Identification

The site was visited to assess all internal and external operations, stores, bunds, procedures and services provided. Through a combination of information gathered on the walkover and that provided by the Client, a comprehensive list of hazards and risks were identified for the company. Risk classification tables were required to evaluate and rank the risks compared with each other. They form the basis of assigning a rate of Likelihood (the probability of an event occurring) and Consequence (the magnitude of the impact).

Table 3-1: Risk Classification Table –Likelihood

Rating	Category	Description	Likelihood of Occurrence (%)
1	Very Low	Very low chance of hazard occurring	0-5
2	Low	Low chance of hazard occurring	5-10
3	Medium	Medium chance of hazard occurring	10-20
4	High	High chance of hazard occurring	20-50
5	Very High	Very high chance of hazard occurring	>50

Table 3-2: Risk Classification Table – Consequence

Rating	Category	Description
1	Trivial	No damage or negligible change to the environment
2	Minor	Minor impact/ localised or nuisance
3	Moderate	Moderate Impact to the Environment
4	Major	Severe Impact to the local environment
5	Massive	Massive Impact to a large area, irreversible in medium term

3.1 Risk Assessment

Risk ID	Process	Potential Risks	Environmental Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Likelihood x Consequence)
1	Bulk Delivery/ transfer & Storage of Gas oil	Spill of materials on delivery to site or in transfer via pipework on site	Contamination of surface water / SAC	2	Strict controls are in place in the event of offloading of oil or bulk chemicals including strong procedural controls in relation to trained personnel being present at all times, spill kits being available etc. Pipe work and bunds are checked daily. Historical data illustrate there has never been an incident that has impacted surface water during off-loading/ transfer or storage.	3	Gas oil is held in a tank farm where the maximum tank size holds 1200 tonnes. Were failure to occur during the offloading procedure, the emergency response would be initiated and the spill would be captured in the bund and associated containment units. Smaller spills can be cleaned up with the spill kits. All bunds are regularly checked and tested.	6
2	Bulk Delivery/ transfer & Storage of Gas Oil	Spill of materials on delivery to site or in transfer via pipework on site water system	Contamination of groundwater and soils	2	Strict controls are in place for the offloading of chemicals for bulk chemicals including strong procedural controls in relation to trained personnel being present at all times, spill kits being available etc. Pipe work and bunds are checked daily. Historical data illustrate there has never been an incident that has impacted ground water during off-loading. Area's throughout the site are hardstand. There are strict controls on reporting and personnel are trained in spill clean-up. Spill kits are readily available throughout the site. Daily checks are completed on bunds and drainage network.	3	All bunds are regularly checked and tested. Any spills during the offloading procedure or during storage would mean the spill response procedure would be initiated and the spill cleaned up.	6

Risk ID	Process	Potential Risks	Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Likelihood x Consequence)
3	Bulk Delivery/ transfer & Storage of Gas Oil	Fire in Gas Oil Storage Area	Contamination of Surface/ groundwater & air emissions	2	The site is a registered second tier Seveso site due to the quantities of gas oil held on-site. Given the controls and management of the site, the likelihood of a fire in this area is very low.	4	Were a fire to occur in this area, the impact could potentially be major with air emissions, firewater overflow to surface and groundwater systems	8
4	Delivery/ transfer & Storage of Dangerous Substances	Failure of over ground chemical storage associated with chemical/ raw material/ delivery & Transfer	Contamination of groundwater and soils	2	Other chemicals are stored in tanks throughout the site, with spill kits and fully trained spill response team available.	3	Chemicals are held in various quantities. The highest risk is posed by liquid chemicals e.g. sodium hypochlorite which is held at a maximum of 44 tons. Chemicals are stored in tanks in hardstand bunded areas with spill kits readily available. There is a trained spill response team in place. The consequence would be contained, localised and rated minor.	6
5	Delivery/ transfer & Storage of Dangerous Substances	Failure of over ground chemical associated with raw material/ final product/ waste storage leading to surface water contamination	Contamination of surface water & receiving water	2	In order for this to occur, a tank would have to fail or be damaged. Areas throughout the site are hardstand, with spill kits and fully trained spill response team available	3	Chemicals are held in various quantities. The highest risk is posed by liquid chemicals e.g. sodium hypochlorite which is held at 44 tons. Chemicals are stored in tanks in hardstand areas with spill kits readily available. There is a trained spill response team in place. The consequence would be contained, localised and rated minor.	6
6	Gas Turbine operations	Breach in ELV's	Emissions to air	2	Likelihood of occurrence is low given a review of non-compliances to date for the facility	2	Automated controls in place, non-compliance would be notify and mitigations measures could be put in place	4

Risk ID	Process	Potential Risks	Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Likelihood x Consequence)
7	Gas Turbine operations	Fire risk at connections of oil system	Emissions to local area with potential for fire	2	Low likelihood due to work procedural controls including preventative maintenance systems, automated controls, permitted work systems	3	Potential for fire & fire water generation	**6**
8	Steam Turbine Operations	Leaks and improper disposal of wash waters	Contamination of surface water & receiving water	2	Low likelihood due to work procedural controls including automated controls, permitted work systems	2	A trained spill team is in place and spill kits are available in the area. The impact would be localised.	**4**
9	Steam Turbine Operations	Critical Failure of the steam turbine	Air Emissions release	2	Low likelihood due to work procedural controls including preventative maintenance systems, automated controls, permitted work systems	2	The failure of the steam turbine would result in an emergency shutdown. During the shutdown process some localised emissions to air may occur	**4**
10	Heat Recovery Steam Generator Operations	Loss of generator capacity	Air Emissions release	2	Low likelihood due to work procedural controls including preventative maintenance systems, automated controls, permitted work systems	2	The impact would be localised.	**4**
11	Equipment Maintenance	Loss of oil, coolant, water treatment chemicals due to maintenance work	Release to surface and ground waters	2	Low likelihood due to work procedural controls including preventative maintenance systems, automated controls, permitted work systems	2	A trained spill team is in place and spill kits are available in the area. The impact would be localised.	**4**

Risk ID	Process	Potential Risks	Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Likelihood x Consequence)
12	Failure of bunds/ tanks	Uncontrolled release to surface water, following bund failure	Contamination of surface water & receiving waters	2	All bunds are on a register which is controlled by the Environmental Manager. The bunds act as a secondary containment structure. All bunds are integrity tested every 3 years in line with licence requirements.	4	The highest risk is posed by oil / liquid chemicals stored in outdoor bulk storage. The tanks and bunds are regularly checked for faults. The extent of the incident will depend on a number of factors including the substance, quantity lost, the speed of loss, the volume in the tanks and the extent of the incident.	8
13	Failure of bunds/ Tanks	Uncontrolled release to groundwater and soils due to leaking bund	Contamination of groundwater and soils	2	All bunds are on a register which is controlled by the Environmental Manager. The bunds act as a secondary containment structure. All bunds are integrity tested every 3 years in line with licence requirements..	4	Bunds are checked weekly as are drainage systems. This means leaks can be detected early and will mean large volumes of chemicals/ oil cannot be lost to ground. Failure of tanks will be picked up by visual inspection.	8
14	Drainage network	Failure of drainage network	Soil/ Groundwater contamination	2	Drains are checked daily by visual inspection and integrity tested every 3 years. Highest risk is associated with a wastewater line, volumes are low	3	There is a possibility of a leak going undetected. Materials will be diluted however remediation could be extensive dependant on the volumes lost prior to discovery	6
15	Water Treatment	Failure of water treatment system & release to SAC	Environmental damage to SAC due to contaminated release	2	Low likelihood due to work procedural controls including preventative maintenance systems, automated controls, permitted work systems	2	Shut-off system in place at the chemical store to cease chlorine treatment at any stage. All other chemicals used in water treatment are stored and managed in line with procedure and containment policies for environmental security.	4

Risk ID	Process	Potential Risks	Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Likelihood x Consequence)
16	Water Treatment	Exceedance of ELV's due to failure of monitoring equipment	Environmental damage to SAC due to contaminated release	2	Low likelihood due to work procedural controls including preventative maintenance systems, automated controls, permitted work systems	2	Localised impact, some historical breaches. Parameters withing SW13 systems are not heavy pollutants.	4
17	Surface water and storm water	Failure of oil/ silt interceptor	Environmental damage to SAC due to contaminated release	2	Low likelihood due to work procedural controls including preventative maintenance systems, automated controls, permitted work systems	2	Localised impact, some historical breaches.	4
18	Boiler Operations	Leak from boiler leading to emergency steam release/ hot water leakage	Air pollution	2	The potential for a complete loss from the boiler is low	2	The impact could be localised as these are small boilers that can be readily isolated and turned off.	4
19	Transformer & oil system	Leaks at connections of oil system	Emissions to local area with potential for fire / soil and GW pollution	2	Low likelihood due to work procedural controls including preventative maintenance systems, automated controls, permitted work systems	2	Given the controls in place, the impact is assumed to be minor and relatively localised.	4
20	Waste Management	Improper recovery / disposal due to improper segregation/ use of un-regulated contractor etc.	Environmental damage due to contaminated run-off/ Regulatory prosecution/ Damage to reputation	2	Low chance of this occurring, strong controls in place around waste management & contractors	2	Given the controls in place, the impact is assumed to be minor and relatively localised	4

Risk ID	Process	Potential Risks	Effect	Likelihood Rating	Basis of Likelihood	Consequence Rating	Basis of Consequence	Risk Score (Likelihood x Consequence)
21	Weather impacts	Flooding/ Electricity cut off	Loss of process controls leading to spills etc.	3	Weather episodes are increasing	2	The site has no history of flooding and has adequate controls in place in the event of power failure	6
22	Fire/ explosion	Uncontrolled air emissions	Air pollution	2	A large scale fire has never occurred on-site. The site has a detailed emergency response plan in conjunction with the following fire prevention and control systems; Alarms, Firewalls & fire doors, Fire hydrants, Hose reels, Fire extinguishers. The local fire officer has reviewed the facility.	3	Plumes would be visible to the local environment for a short period of time until the fire is brought under control.	6
23	Fire/ explosion	Uncontrolled emissions to surface water/ ground water for fire water run-off	Groundwater/ Surface water and receiving water contamination	2	A large scale fire has never occurred on-site. The site has a detailed emergency response plan in conjunction with the following fire prevention and control systems; Alarms, Firewalls & fire doors, Fire hydrants, Hose reels, Fire extinguishers. The local fire officer has reviewed the facility.	4	In the event of a fire, fire water will be diverted to the fire water retention tank.	8
24	Terrorist/ vandalism activities	Potential for fire/ explosion or other damage	Groundwater/ Surface water and receiving water contamination	1	Worst case scenario would be an explosion/ fire. Likelihood is low	4	The consequence would be major	4
25	Landfill	Uncontrolled emissions to surface water/ ground water	Groundwater/ Surface water and receiving water contamination	-	-	-	-	Known risk- Accounted for in the CRAMP

3.2 Risk Evaluation Table

Risk Id	Process	Potential Risks	Likelihood Rating	Consequence Rating	Risk Score
R1	Bulk Delivery/ transfer & Storage of Gas oil	Spill of materials on delivery to site or in transfer via pipework on site which could make way to the surface water system	2	3	6
R2	Bulk Delivery/ transfer & Storage of Gas oil	Spill of materials on delivery to site or in transfer via pipework on site which could make way to the soil/ ground water system	2	3	6
R3	Bulk Delivery/ transfer & Storage of Gas oil	Fire in Gas Oil Storage Area	2	4	8
R4	Delivery/ transfer & Storage of Dangerous Substances	Failure of over ground chemical storage associated with chemical/ raw material/ delivery & Transfer	2	3	6
R5	Delivery/ transfer & Storage of Dangerous Substances	Failure of over ground chemical associated with raw material/ final product/ waste storage leading to surface water contamination	2	3	6
R6	Gas Turbine operations	Breach in ELV's	2	2	4
R7	Gas Turbine operations	Fire risk at connections of oil system	2	3	6
R8	Steam Turbine Operations	Leaks and improper disposal of wash waters	2	2	4
R9	Steam Turbine Operations	Critical Failure of the steam turbine	2	2	4
R10	Heat Recovery Steam Generator Operations	Loss of steam/water to ground and drains Loss of generator capacity	2	2	4
R11	Equipment Maintenance	Loss of oil, coolant, water treatment chemicals due to maintenance work	2	2	4
R12	Failure of bunds/ tanks	Uncontrolled release to surface water, following bund failure	2	4	8
R13	Failure of bunds/ Tanks	Uncontrolled release to groundwater and soils due to leaking bund	2	4	8
R14	Drainage network	Failure of drainage network	2	3	6
R15	Water Treatment	Failure of wastewater treatment system & release to SAC	2	2	4
R16	Water Treatment	Exceedance of ELV's due to failure of monitoring equipment	2	2	4
R17	Water Treatment	Failure of oil/ silt interceptor	2	2	4

Risk Id	Process	Potential Risks	Likelihood Rating	Consequence Rating	Risk Score
R18	Boiler Operations	Leak from boiler leading to emergency steam release/ hot water leakage	2	2	4
R19	Transformer & oil system	Leaks at connections of oil system	2	2	4
R20	Waste Management	Improper recovery / disposal due to improper segregation/ use of un-regulated contractor etc.	2	2	4
R21	Weather impacts	Flooding/ Electricity cut off	3	2	6
R22	Fire/ explosion	Uncontrolled air emissions	2	3	6
R23	Fire/ explosion	Uncontrolled emissions to surface water/ ground water for fire water run-off	2	4	8
R24	Terrorist/ vandalism activities	Potential for fire/ explosion or other damage	1	4	4
R25	Landfill	Uncontrolled emissions to surface water/ ground water	-	-	-

R25 is a known risk and accounted for in the CRAMP

3.3 Risk Matrix

A Risk Matrix has been developed to display the risks visually with colour coding to give an indication of the critical nature of each risk. The risk scores of each of the identified risks from Table 3.1 and Table 3.2 above are presented on the risk matrix below.

LIKELIHOOD						
Very High	5					
High	4					
Medium	3		R21			
Low	2		R6,R8,R9,R10, R11, R15, R16, R17, R18, R19, R20	R1, R2, R4, R5, R7, R14,R22	R3, R12, R13, R23	
Very Low	1				R24	
		Trivial	Minor	Moderate	Major	Massive
		1	2	3	4	5
			CONSEQUENCE			

Risk matrix for SSE Great Island facility (numbers in shaded cells are Risk IDs). The risks have been colour coded to provide an indication of the critical nature of each risk. The colour code is as follows:

- Red is a high level risk and requires immediate action;
- Amber is a medium level risk;
- Green is a low level risk.

The risk matrix indicates that there are 4 potential risks in the amber zone. Two of the risks relate to fire/ explosion incidents in various areas of the site with ground and surface water contamination, while the remaining two risks are associated with bund failure leading also to ground and surface water contamination.

All other risks identified at SSE Great Island are in the green zone of the risk matrix. This is largely due to the fact that there are good controls and management systems in place to minimise risk from each of the target areas assessed.

The output of the risk treatment process is the development of a statement of measures to be taken to minimise the environmental risk of the activity. The statement of measures is presented in the table below.

3.4 Statement of Measures

Risk ID	Potential Risk	Risk Score	Mitigation Measures to be taken	Outcome	Action	Date for completion	Owner/ Contact Person
R3, R7, R22, R23 & R24	Fire/ Explosion	6- 8	Fire water retention plan for the site is in place and includes isolating the site during an emergency. The retention facility has been added to the bund register but requires testing for integrity. The emergency response procedure should be regularly tested and fire water retention physically checked for valve alignment to ensure the site is fully isolated and can be relied upon in an emergency. Underground sumps should be checked for integrity.	Improved protection of surface and groundwater systems	Update the Emergency procedure with requirement for physical check of the valves to ensure the site is being isolated in the event of an emergency. Ensure the fire water retention facility/ elements thereof are integrity tested.	Q2 2020	Environmental Manager
R1, R2, R4, R5	Bulk Chemical/ Oil gas Spill of materials on delivery to site or in transfer via pipework on site which could make way to the surface water & ground water system	6	Procedural controls and lack of historical incidents illustrate the off-loading procedure is tightly controlled and managed. It is recommended that the procedure for off-loading is reviewed and updated where necessary with the following; - Personnel present during offloading as per risk assessment-person must be trained in the use and operation of the firewater/ emergency response protection system -Ensure spill kit is in the vicinity -Ensure all connections and hosing are inside of the bund before off-loading commences	Improved protection of surface and groundwater systems	Review procedure for off-loading of tankers. Ensure the following is stipulated; -Personnel present during offloading as per risk assessment -Person must be trained in the use and operation of the firewater/ emergency response protection system -Ensure spill kit is in the vicinity -Ensure all connections and hosing are inside of the bund before off-loading commences -Ensure regular checks are completed on the hardstand areas throughout the site.	Q2 2020	Environmental Manager

Risk ID	Potential Risk	Risk Score	Mitigation Measures to be taken	Outcome	Action	Date for completion	Owner/ Contact Person
R12 & R13	Failure of Bunds	8	Bunds are checked hydrostatically, where possible, every 3 years in accordance with the licence. Where the above is impractical a structural survey is completed. A review of the age of the bulk containment should be undertaken and a schedule of protection should be implemented for bulk containers reaching their life span.	Improved protection of soil and groundwater from leaks	Ensure bund checks are scheduled. Take photographs for file where damage is noted, the latter will allow assessment of change over time. Review records of bund checks with a view to increasing frequency of checks based on age and where damage has been noted previously. Ensure a visual check is implemented on all bulk chemical storage tanks	Q2 2020	Environmental Manager
R14	Failure of Drainage Network	6	Underground drains are to be checked every 3 years- including surface water/ foul sewer etc.	Improved protection of soil and groundwater from leaks	Ensure underground drains are included on inspection schedule. Include all sumps, interceptors, sumps and effluent lines.	Q2 2020	Environmental Manager
R6, R8, R9, R10,R11 R18, R19	Equipment Maintenance & associated procedures	4	Ensure all equipment is on a preventative maintenance schedule. Review training and work permits to ensure spills and waste management following work is considered.	Improved plant operations with less downtime. Improved protection of surface and groundwaters..	Review PM schedule and ensure all critical equipment is included. Review training and work permits to ensure spills and waste management following work is considered. Ensure a check is completed on all hardstand areas for signs of cracks and damage.	Q2 2020	Environmental Manager
R15, R16 & R17	Water Treatment	4	Ensure any oil & silt interceptors are on a maintenance schedule. Ensure all treatment system monitoring instrumentation is on a calibration and service schedule.	Improved protection of surface waters and SAC	Ensure oil & silt interceptor are on a maintenance schedule. Ensure all monitoring instrumentation is on a calibration and service schedule.	Q2 2020	Environmental Manager

Risk ID	Potential Risk	Risk Score	Mitigation Measures to be taken	Outcome	Action	Date for completion	Owner/ Contact Person
R20	Waste Management	4	Review all waste management contractors and ensure permits, licences are up to date. Ensure waste companies provide an update on the materials collected at the end of each month, with details of end point.	Improved waste management & control.	Review all waste management contractors and ensure permits, licences are up to date. Ensure waste companies provide an update on the materials collected at the end of each month, with details of end point	Q2 2020	Environmental Manager
R21	Weather Impacts	6	Electricity cut-off. Back-up generator in place in any areas that would require energy for environmental security. Flood risk assessment to be generated.	Improved site integrity	Ensure weather and flooding is included in business continuity risk assessment.	Q2 2020	Environmental Manager

4.0 Identification of Worst Case Scenario

The ELRA for this activity identified a number of risks with a major consequence, therefore, further analysis was conducted to determine the plausible worst case scenario. It was determined that a fire/ explosion on site in combination with bund failure/ over topping causing ground and surface water contamination, would be the worst-case plausible scenario.

A fire in the turbine/oil storage area and subsequent firefighting procedures could lead to loss of firewater which could breach controls in place and enter the surface waters, soil or groundwater. In the event of failure of these systems a worst case scenario would be the loss of large volumes of fire water, which has been contaminated with both hazardous and non-hazardous compounds, infiltrating the surface and groundwaters, with the SAC potentially being impacted. The costing do not account for any remediation of the SAC although ecological monitoring programmes have been accounted for.

The above scenario is dependent on a number of breaches of procedures and controls and the likelihood of occurrence is exceptionally low however plausible. The plausible worst case scenario has been quantified and costed below.

4.1 Remediation Measures

In the event of loss of material to adjacent soil there would be an investigation required into the status of soil and groundwater which would be initiated by trial pits in the location and installation of groundwater well standpipes. Any soil which was deemed contaminated would be removed to a lined storage area and transported offsite for appropriate treatment. Replacement soil would be imported to fill the voids created. Any groundwater contamination would need to be investigated and the plume considered for remediation.

4.2 Firewater

The average fire response to site is less than 30 mins with the average fire being brought under control in a 60 minute period. A large scale fire at this site considering the volumes of fuel retained could last longer.

4.3 Monitoring Programme for Clean-up and Remediation

The following would be an indicative schedule of some of the proposed works to be completed. This is not definitive as the event is unknown and the impacts are estimated. More intensive works and investigations would be carried out immediately in the aftermath of the event. As the works are completed and the impacts are understood and being dealt with, there will be less intensive works involved on site. The greatest impact for this site is the potential to contaminate soil and groundwater below site which is difficult to manage, monitor and remediate.

	Week 1	Week 2	Week 3	Week 4	Month 2	Month 3	Month 4	Month 5
Building Clean up								
Removal of Firewater								
Disposal and Treatment of Firewater								
Soil and Groundwater Investigation								
Removal of Contaminated Soil								
Remediation of Contaminated Groundwater								
Environmental Consultants								
Surface Water Monitoring								
Groundwater Monitoring								
Air Monitoring								
Ecological Monitoring								
Soil Monitoring, Trail Holes								

More Intensive Work
Less Intensive Work

4.4 Sample Numbers and Monitoring Requirements

Soil – the number of soil samples will depend on the volumes of waste lost to ground and the extent of the plume. If the contaminated area is confined to one location groundwater wells, trial pits and soil samples will be largely concentrated in this area at different depths. It is estimated that the number of soil samples would be dependent on the location and extent of the fire, it has been estimated that 100 samples will be taken. The 100 will consist of soil samples at different depths and soil sampling of excavated soil to determine its status prior to treatment off site. The monitoring requirement would consist of samples taken to ensure all contaminated soil has been removed.

Groundwater sampling and monitoring would again be variable depending on if the groundwater is contaminated or not. Monitoring and treatment would be dependent on the degree of groundwater contamination. This could range from 20 samples initially to up to an estimated 5 months monitoring on a monthly basis to assess the natural remediation or results of treatment methodologies applied..

4.4.1 Air Emissions

The emissions from site would largely be during the fire only. Therefore there would be a requirement for a survey of the air quality both during and after the fire has been extinguished. This ELRA allows for 4 days of monitoring in the area.

4.4.2 Ecological Assessment

A cost has also been included to assess the impact of the incident on wildlife and habitats close by.

4.5 ELRA Costing

Task	Description	Quantity	Unit	Est. Unit Rate	Cost (€)	Source of Unit Cost
Risk ID 3, 7 & 23 Fire/ explosion with release to surface waters/ groundwaters	Fire Fighting	3	Units	20,000	60,000	Combination of EPA costs & Previous Quotes
	Transport of fire water	1200	m^3	25	30,000	Waste Management Quotes
	Disposal fee for fire water	1200	m^3	400	480,000	
	Excavation of contaminated soil	1000	Tonne	10	10,000	
	Transport of contaminated soil	1000	Tonne	30	30,000	
	Export fee for contaminated soil	1000	Tonne	150	150,000	
	Import new top soil	1000	Tonne	15	15,000	EPA Costs
	Decontamination of the building – contract team to dismantle/ clear/ clean damaged areas / Utilities / equipment	30	Day	5000	150,000	Previous ELRA
	Disposal fee for Hazardous waste	10,000	Tonne	395	3,950,000	Waste Management Quotes
	Transport of decontamination waste	10,000	Tonne	30	300,000	
	Groundwater Monitoring	200	Sample	400	80,000	Laboratory Quotes for range of parameters including hydrocarbons, VOC's etc.
	Trial Pits / Boreholes	10	Well	2,000	20,000	EPA Costs
	Soil Monitoring	100	Sample	400	40,000	Laboratory Quotes for range of parameters including hydrocarbons, VOC's etc.
	Air Monitoring	4	Days	2500	10,000	Accredited Air monitoring company quotation
	Surface water monitoring	40	Sample	200	8,000	In-house Quotes for range of parameters including hydrocarbons, VOC's etc
	Ecological Monitoring	4	Sample	2,000	10,000	Ecology Consultant Quote
	Monitoring ecology and habitats	4	Surveys	12,500	50,000	Ecology Consultant Quote

	Consultancy fees	30	Day	1000	30,000	Environmental Consultants Quote
	Structural engineer review & report of bunds, hardstand areas etc.	1	Report	30,000	30,000	Quotes on file
	Structural repairs & infrastructure	1	Site		2,500,000	Estimated figures for the replacement of bunds, hardstands
	Staffing and management costs	90	Days	10,000	900,000	Staffing costs
	Security – additional security while works ongoing - including installation of additional security fence and remote security monitoring for 3 months	3	Unit	20,000	60,000	EPA Guidance
	EPA Costs	1	Unit	10,000	10,000	EPA Costs
Sub Total		**-**	**€**	**-**	**8,923,000**	
Contingency @ 40%		**-**	**€**	**-**	**3,569,200**	
ELRA Total Including Contingency		**-**	**€**	**-**	**12,492,200**	

5.0 Conclusion

An environmental liabilities risk assessment has been carried out for the activity in accordance with EPA guidance.

The financial provision has been based on the combined risks that pose the plausible worst case scenario. This is an indication of the liability that may be incurred and as such, financial provision is calculated as €12,492,200 based on this event. An insurance policy, with a maximum liability of €12,807,830 is in place for the SSE Generation Ltd., Great Island site. The latter will be furnished to the EPA upon agreement of the ELRA.

Some of the other options available to the company include:

- On Demand Performance Bond;
- Secured fund;
- Charge on Property;
- Insurance;
- Other as agreed by the Agency.

The risk management at the activity is a dynamic process and will be updated through the addition of new risks or the omission of redundant risks. The financial provision will be reviewed in accordance with the requirements of Condition 12 to ensure that it continues to cover the environmental liabilities.

A statement of measures will be reported annually to the Agency in the Annual Environmental Report. The ELRA will be reviewed regularly and updated every three years in accordance with licence requirements.

Appendix A