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ENVIRONMENTAL LIABILITIES RISK ASSESSMENT (ELRA)

2021 REVIEW

IE LICENCE NO. W0167-03

Technical Report Prepared For

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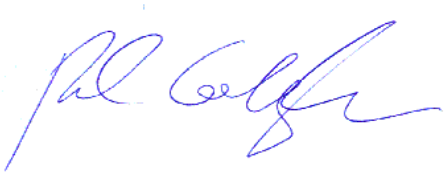
Signature		
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EXECUTIVE SUMMARY

Indaver Ireland Ltd. (Indaver) operate a Waste to Energy (WtE) facility, with approval to accept up to 235,000 tonnes per annum of waste, at Carranstown, Duleek, Co. Meath. The facility has been accepting waste since August 2011 and currently operates under an Industrial Emissions (IE) licence issued by the EPA (Ref. no. W0167-03). The current IE licence is granted with main activity Class No. 11.3.0 'Waste' and falls within the scope of the following Directive Annex I category:

Category 5.2: Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants:

(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour;

(b) for hazardous waste with a capacity exceeding 10 tonnes per day.

This document presents the Environmental Liability Risk Assessment (ELRA) required as part of Indaver's IE licence. This plan has been updated from the previous version submitted to the EPA in 2018 and has been prepared in accordance with the requirements of the EPA (2014) publication "*Guidance on Assessing and Costing Environmental Liabilities*".

A risk identification of all processes on site has been undertaken and all plausible risks identified. A statement of measures to be undertaken to minimise current environmental risks is provided. The plausible worst-case scenario has been quantified and predicted costings prepared to allow for calculation of a financial provision.

The assessment detailed in this report has determined that, taking the most plausible worst-case scenario (and including for a contingency), a provision of €4,081,489 will be required. The primary purpose of the financial provision is to ensure that sufficient financial resources are available to cover the most plausible worst-case scenario that may arise over the lifespan of the facility.

Indaver holds extensive Environmental Liability Insurance for the facility and separately it is proposed that a bond will act as financial provision for the identified unknown liabilities in this report. There is a bond in place currently and it will be updated to reflect this report once agreed with the Agency.

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1.0 INTRODUCTION

Indaver Ireland Ltd. (Indaver) commissioned AWN Consulting Ltd. (AWN) to undertake a review of their Environmental Liabilities Risk Assessment (ELRA) and Closure, Restoration and Aftercare Management Plan (CRAMP) for their Waste to Energy facility at Duleek, Co. Meath. This review is required to comply with licence condition 12.2.2, which stipulates that the ELRA must be reviewed every 3 years.

Indaver's facility is designed to incinerate and recover energy from the residual fraction of non-hazardous household, commercial and industrial waste, wastewater sludges and certain hazardous waste materials. The licensed activities are:

Category 5.2: Disposal or recovery of waste incineration plants or in waste co-incineration plants:

(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour,

(b) for hazardous waste with a capacity exceeding 10 tonnes per day.

The facility activities also fall within the Scope of Annex II of Council Directive 2008/98/EC on waste under

Operation D10 – Incineration on Land and

Operation R1 – Use of waste principally as a fuel or other means to generate energy.

The facility in Duleek was initially granted a Waste Licence (W0167-01) in November 2005. Applications for review of licence were submitted in March 2009 and April 2012 to allow for increased throughput, additional waste streams and operational changes (W0167-03). The facility commenced the acceptance of waste in August 2011.

Following on from the implementation of the Industrial Emissions Directive, the EPA (herein referred to as 'the Agency') determined in December 2013 that the facility's licence should now be deemed as an Industrial Emissions (IE) Licence and not a waste licence.

Indaver is currently licensed to accept up to 235,000 tonnes per annum (tpa) of waste for incineration of which up to 10,000 tpa may be suitable hazardous waste types.

This document presents the ELRA as required by the Agency. The CRAMP is presented under a separate cover (AWN Ref. CM/21/12126R01). Both documents are prepared in accordance with the 2014 EPA publication entitled *'Guidance on Assessing and Costing Environmental Liabilities'*. This review is required in order to update the existing ELRA for the facility, last completed in 2018. Facility operations have been assessed to determine whether circumstances or procedures have changed since the last report and what these changes may mean in terms of the environmental liabilities at the facility.

This risk assessment has been prepared by:

AWN Consulting Ltd.
The Tecpro Building,
Clonshaugh Business & Technology Park,
Dublin 17.

1.1 Scope of Work

The Agency requires an independent professional assessment and costing of potentially significant environmental liabilities that could arise during the life of the facility. The requirement for costing such liabilities is to ensure that the facility could make adequate financial provisions, via a financial instrument or other appropriate means, for remediating the potential environmental impairment associated with such liabilities.

The scope of the work for preparation of this ELRA includes the following:

- Review of IE licence files (Ref. W0167-03) and associated correspondence with the Agency,
- Review of existing ELRA produced in 2018,
- Risk identification,
- Risk assessment,
- Identification of risk mitigation measures and the development of a risk management programme; and
- Quantification of the plausible worst-case scenario.

1.2 Primary Changes Since the Previous Reports

A Mist-Air De-Mister was installed in 2019 to control dust and odour in three different 'zones' of the plant as outlined below:

- Bunker hopper
- Bunker
- Tipping Hall

TOC analyser units at the pond were replaced in 2020 with new units as the old equipment had reached end of life. Several large items of plant equipment underwent maintenance in 2020 including the steam turbine, the superheaters and the stack.

A new residue bagging plant is planned to be installed within the process building and is due to come into use by September 2021.

An additional storage tank for boiler blowdown water was due to be installed in 2021 but has been put on hold until Q1 2022.

1.3 Key Assumptions

There is a reasonable degree of uncertainty involved in environmental liability risk assessment and it is important to identify any assumptions at an early stage.

It is assumed that Indaver will maintain the Meath WtE site in accordance with the conditions of their licence. No provision has been made for costs associated with any legal proceedings that could arise, as firstly, there is goodwill and a strong desire by Indaver to remain compliant with relevant legislation and the Agency's requirements, and secondly, such costs are uninsurable and, therefore, cannot be underwritten by any third party or insurance organisation.

The ELRA has been based upon historic uses of the site and current operational activities. This report has not considered the potential environmental liabilities associated with significant changes in use of the site, such as redevelopment for other

commercial or industrial purposes by Indaver or any other party, as these would require a separate risk assessment exercise, should they arise.

It should also be noted that the risk assessment does not include a costing of the final clean-up of the site after closure. This is set out in the Closure, Restoration and Aftercare Management Plan (attached under separate cover).

1.4 Disclaimer

This report is based on information supplied by Indaver to AWN. This report has been prepared for the use of Indaver only and for submission to the Agency. Specified costs are based on best estimates within the marketplace at the time of submission and will vary with time.

2.0 SITE EVALUATION

The Meath WtE facility is located on the R152 Drogheda to Duleek road in the townland of Carranstown, approximately 3km north-east of Duleek in Co. Meath. The land use in the area is predominantly agricultural except for the Platin Cement Works, and its associated quarry, which is located approximately 300m to the north-west. The south-eastern boundary of the site runs along the R152 secondary road between Duleek and Drogheda and a commercial freight railway line runs close to the north-westerly boundary. The lands to the north-east and the south-west are agricultural. The closest businesses and residents are located across the R152 main road to the south-east and adjacent to the site to the north-east.

A site location map including the surrounding areas is presented in Figure 1 at the end of this report.

The topography of the area is generally quite flat with a slight increase in elevation towards the north and north-west. There is a high-pressure natural gas pipeline crossing the site underground from east to west and overhead 110kV power lines cross the site near the weighbridge. There is also a low-pressure gas main line which runs along the R152 road in front of the facility. The site lies in the catchment of the River Nanny which runs approximately 2km south of the facility and discharges into the Irish Sea at Laytown. There are a number of small drainage ditches in the area which flow into the River Nanny and these are typically dry in summer months.

Indaver Ireland is part of the Indaver Group which operates and manages waste facilities across Europe in more than 30 locations in Ireland, Belgium, Germany and the Netherlands. In Ireland, Indaver operates a hazardous waste disposal and recovery facility at Dublin Port as well as the Meath WtE facility to which this report relates.

The Meath WtE facility is currently licensed to accept up to 235,000 tpa of waste for incineration (of which 10,000 tpa may be hazardous waste) and can generate up to 21MW of electricity from heat generated by the process. The facility is also licensed to accept up to 2,000 tpa of waste in a residue solidification plant. The site was developed from a green field in August 2008 and occupies an area of approximately 10 hectares, of which, less than half is currently covered by buildings. There are currently 40 Indaver employees at the facility.

2.1 Description of Site Processes and Activities

An inventory of facility buildings/areas is presented below. Main process building, incorporating:

    - Waste processing areas
    - Control room
    - Flue Gas Treatment and Abatement
- Administration Offices,
- Building housing the air-cooled condenser,
- Contractors compound/building,
- Workshop area,
- Warehouse (formerly temporary now made permanent),
- Transformer compound and ESB substation with emergency generator,
- Security building with weighbridge,
- Aqueous unloading area,
- Water storage tank and pump house; and
- Solidification Plant.

The primary structure on site is the main process building where waste is received and incinerated. There are several ancillary structures around the main building to support the main site activities. The majority of the site is covered in concrete or tarmacadam hard standing with approximately 2 hectares of grass and/or vegetation cover. There is one main access road from the site entrance leading past the staff carpark and the weighbridge to the tipping hall at the western end of the main process building. There is also a one-way route which continues around the main building to facilitate access to the building and ancillary services.

The site layout is provided in Figure 2.

2.1.1 Main Process Building

The main process building is a large structure comprised of different elements in series to facilitate receiving and incineration of waste and manage the process by-products. The building is approximately 160m long, 40m wide at the widest point and 40m high at the highest point. There is a venting stack at the eastern end of the site which is 65m high.

Waste materials are transported to the site Monday to Saturday by waste contractors. On entering the site, waste contractors follow a route to the tipping hall where inspections of the waste are carried out on a routine basis by Indaver. In the tipping hall, waste is deposited into the waste bunker where it is mixed by a grab before being placed into the hopper that feeds the furnace. In the furnace, waste is incinerated at temperatures in excess of 850°C.

The combustion gases from the incineration process pass through a number of treatment stages. These include two stages of dosing for acid removal (lime milk and lime) and two stages of dosing for dioxin removal (expanded clay and activated carbon), before passing through filter bags and being discharged to atmosphere via the stack. The emissions to air are monitored continuously and the results are fed back to the control room for the facility where the levels of dosing can be adjusted accordingly.

A schematic of the waste incineration process is provided in Insert 2.1.

The primary facility processes and activities are summarised as follows:

Inputs:

- Waste material feed
- Chemicals
    - Quicklime
    - Hydrated Lime
    - Expanded Clay (dioxorb)
    - Activated Carbon
    - Ammonia Solution (25% v/v)
- Electricity (imported from national grid and on-site generation)
- Diesel
- Water

Unit Operations:

- Waste receiving, offloading and inspection
- Waste mixing
- Hopper feed to furnace
- Waste incineration
- Ash collection
- Metal recovery
- Ammonia solution injection
- Combustion gas treatment
- Turbine operation for electricity generation
- Direct injection of aqueous wastes
- Solidification of residues (boiler ash and flue gas residues)

Outputs:

- Waste disposal/recovery
    - Bottom Ash
    - Boiler Ash & FGR solidified blocks
    - Ferrous Metals
    - Non-Ferrous Metals
    - Aqueous liquid wastes
    - Electricity

- Waste for offsite treatment which is generated during operations
    - Septic tank sludge
    - WEEE
    - Wood (broken pallets)
    - C&D

The facility is licensed to accept waste materials from 07:00-18:30 Mon-Fri and 08:00-14:00 on Saturday, while the incineration plant is licensed to operate 24 hours per day, Monday to Sunday inclusive.

2.1.2 Ancillary Facilities

There is an office block located to the front of the main process building which comprises the main administration operations of the facility.

Storage Areas

Diesel (44m^3 with operating capacity of 40m^3) and ammonia solution (62m^3) are stored on site in above ground storage tanks at the rear of the facility next to the air-cooled condenser building. Both substances are stored in double skinned tanks with leak detection and over-fill protection in the form of level switches/interlocks. There is a drainage channel at the designated ammonia solution and diesel unloading area which leads to a 10,000-litre forecourt separator where spills can be contained. There is also a diversion to a 2.5m^3 holding tank which is engaged during filling operations. Smaller quantities of diesel are also stored in tanks for operation of fire water pumps (3 x 0.8m^3 tanks), emergency generator (9m^3 tank) and filling of the front loader (1.5m^3 Tank).

Hydrated lime (150m^3), quicklime (115m^3), activated carbon (80m^3) and expanded clay (80m^3) are stored in silos within the main process building.

All other hazardous materials on site are stored in small quantities (i.e. drums, IBCs etc.) in individual bunds on paved areas. Small quantities of hazardous liquids for maintenance and contractor use are stored in the spare parts warehouse in dedicated storage units with integrated bunding.

There are three different types of waste ash generated at the facility. Bottom ash is stored in a 1,600m^3 ash hall. Ash from the boiler is stored in a silo of 122m^3 capacity. Flue gas cleaning residue is stored in two silos which have capacity of 236m^3 each. (Storage time for each ash and residue stream is generally 7-10 days but variable). The boiler ash and FGR will be treated in the solidification plant and transported offsite for use in the stabilisation of salt mines.

Bottom ash is transported offsite for disposal or reuse in landfills.

There is a water storage tank on site, mainly used for fire water storage, with a total capacity of 2,185m^3. The tank is located at the north western corner of the main process building. The underground fire water retention tank has a capacity of 300m^3.

There are two underground recovery tanks (50m^3 capacity each) which collect water from the internal drainage system. The water collected in these can be removed for treatment, if required, or reused within the treatment process.

There are skips on site for the storage of waste from the process which may be moved to offsite treatment facilities e.g. WEEE, C&D, Timber. There are also curtain siders on the site which have the solidified material from the solidification plant prior to shipping off site. There is a double skinned tank for aqueous liquids awaiting injection and storage space for 3 road tankers for aqueous liquids also.

Utilities

Water for domestic use in the offices is provided from the local mains supply and consumption is estimated at 1m^3 per hour (based on facility water balance). Process water and firewater are supplied from two abstraction wells drilled on the site.

The plant uses diesel at start up and shut down to bring the furnaces to the required operating temperature. Diesel is also required, on occasion, as a supplementary fuel to maintain the temperature in the furnace, if waste of an exceptionally low calorific value is received. Diesel is also used to power the emergency back-up generator on site, the site fire water pumps and the waste loading machinery.

Electricity is generated on-site from the thermal energy produced by the combustion of waste. A small portion of this electricity is used to power the plant with the remainder

exported to the national grid. During short plant process shutdown periods, electricity is imported from the grid to power the site.

Spare Parts Warehouse

There is a warehouse at the eastern end of the main process building which is used to store maintenance equipment, spare parts and contractor equipment on-site. This warehouse is also used as a workshop as needed for general site maintenance.

Wastewater Treatment

All effluent generated from toilets, showers and utility areas is collected in a domestic type effluent collection system. All effluent is passed through a septic tank and secondary treatment system (Puraflo) before being discharged to the percolation area. The wastewater treatment area is located adjacent to the office block. A second smaller effluent collection and discharge system is provided at the site security building. Two effluent holding tanks are also utilised on site, one for the offices in the construction area and one for the temporary portacabins which are used during the annual maintenance shutdown.

2.2 Inventory of Raw Materials, Products and Waste

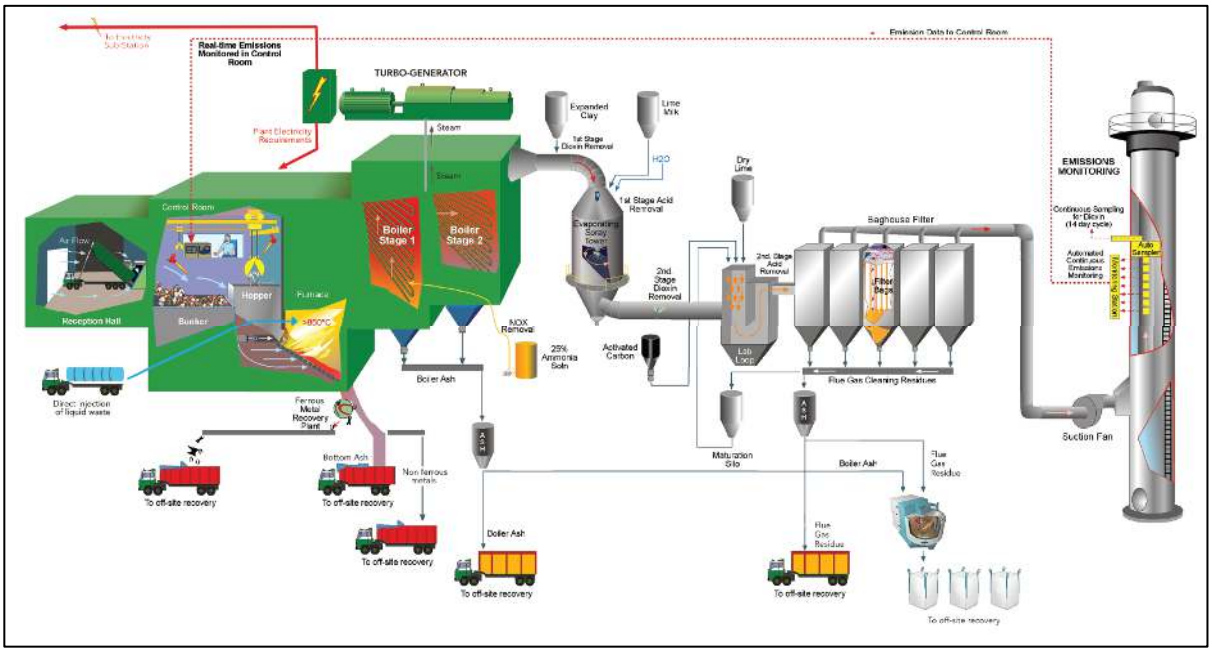
An inventory of the primary raw materials, products and wastes for the site along with storage capacities and details are provided in Appendix A.

2.2.1 Unit Operations

The WtE plant consists of a number of main processes and items of plant as follows:

- Waste Reception
- Moving Grate Incinerator
- NO_x – Ammonia Solution Injection
- Waste Heat Boiler
- Turbine
- Evaporating Spray Reactor
- Activated carbon
- Expanded Clay
- Baghouse Filter
- Ash Handling
- Emissions Monitoring Station
- Solidification plant
- Aqueous unloading area

A simplified schematic of the overall incineration process flow is shown below in Insert 2.1.



Insert 2.1 *Simplified Process Schematic*

Waste Reception

All trucks entering the site report to the weighbridge, where they present documentation to staff in the gatehouse and are weighed. Details on all waste entering the facility will be recorded in a tracking system. Deliveries are only accepted at the facility from authorised carriers holding relevant waste collection permits.

Trucks then drive to the enclosed waste acceptance hall and discharge loads into the bunker through one of the five discharge chutes. Liquid wastes are pumped directly into the furnace. Frequent inspections of waste take place in the reception hall to ensure all waste is in compliance with the facility's waste acceptance criteria. Any nonconforming waste is consigned to a waste quarantine area in the service yard where it is held until alternative disposal arrangements are made.

Operators located in the control room overlooking the bunker screen and mix the waste using overhead grab cranes. The blended waste is fed to the highest point in the furnace via hoppers and forms a plug that isolates the furnace from the bunker. The reception hall is enclosed and maintained under negative pressure to ensure there are no odour or litter emissions. The bunker has a typical maximum capacity of c.7,111 tonnes, which facilitates the storage of waste for a continuous feed of fuel to the furnace outside of waste acceptance hours. The average retention time of the waste in the bunker is approximately three days.

Moving Grate Furnace

The waste in the hoppers is fed to the furnace at a controlled rate by feeding rams. The furnace consists of a grate mechanism, which promotes the complete and efficient combustion of waste through slow and continuous movement, mechanical breakup and effective air distribution. The combustion of waste on the grate produces both gases and solid residues. The gases pass into a post-combustion chamber situated over the grate, where further combustion takes place. Bottom ash is discharged at the end of the grate into a water bath or 'wet de-slagger'.

The average residence time of waste in the furnace is approximately one hour. Oxides of nitrogen (NO_x) are treated using Selective Non-Catalytic Reduction (SNCR). This

involves injecting an SNCR reagent (ammonia solution) at different levels into the post-combustion chamber. The control system in the furnace monitors a range of parameters and makes adjustments to the process to ensure complete combustion and that emissions limits are met.

Boiler

The boiler immediately follows the furnace and has been designed to recover energy from hot flue gases to produce steam. In the process, the flue gases are cooled from about 950°C to about 190°C. The total residence time of gases in the boiler is approximately 30 seconds.

In order to comply with the Industrial Emissions Directive 2010/75/EU, the boiler is designed to ensure that flue gases are maintained at 850°C for at least two seconds after the last air/fuel injection. Auxiliary burners are used where necessary to ensure these conditions are met, for example during start-up. The burners are not required during normal operation. The velocity of gases in the boiler is controlled to minimise dioxin formation and promote the deposition of boiler ash into a hopper for removal.

Electricity generation and Steam Cycle

Steam from the boiler at 40 bar and 400°C is sent to the steam turbine, which drives a generator set to give an electrical output of approximately 21MW. Only about 2MW of this is required for use within the plant with the remaining 19MW available for export to the national grid.

To maximise energy recovery, steam leaving the turbine is maintained at extremely low pressure by an air-cooled condenser. Using air cooled condensers rather than cooling water reduces water consumption and avoids water discharge. The flow of steam through the cycle is approximately 82 tonnes per hour at 100% load. A small quantity of water is purged constantly from the steam cycle and replaced with fresh make-up water from a water purification (demineralisation) plant. This 'boiler blow-down' is recycled within the process plant.

Flue gas treatment system

The flue gas treatment system is designed to ensure emissions from the stack are well below limits set by the IED Directive 2010/75/EU. The system has been designed to produce no effluent and to minimise the consumption of water, reagents and energy. The key stages of the treatment system include:

- A first dioxin removal stage, where expanded clay (dioxorb) is injected into a duct at the outlet of the boiler. Any dioxins and heavy metals are adsorbed into the clay for removal in the bag-house filter downstream.
- A spray drier absorber, which cools flue gases and injects lime milk to react with acid gases such as HCl and SO_2. This forms reaction salts, which are also removed in the bag-house filter downstream.
- A second stage dioxin removal and acid gas treatment, which takes place in a reaction duct with the injection of activated carbon, recirculated and reactivated reagent from the bag-house filter and hydrated lime absorbent (where necessary). This ensures that any remaining pollutants are captured.
- A high-performance bag-house filter to trap dust and heavy metals. The residue is shaken off the filters into dust collection hoppers. As it still contains some unreacted lime, most of it can be reactivated and recycled into the maturation silo to minimise the amount of residue going for disposal.

- An induced draught fan and a stack equipped with continuous emissions monitoring systems. The fan maintains the flue gas system under constant pressure to ensure that all gases pass through the system. Treated gases will then leave the 65m high stack at a temperature of ~140°C. The flue gas treatment system will be controlled using parameters measured at the stack, and at the boiler exit.

Residues Handling

Solid residues are collected from three different process areas including:

- Bottom ash and grate siftings from the grate furnace. This constitutes the bulk of residue from the facility at circa 15.2% of waste input by weight or 34,700 tpa.
- Boiler ash from the boiler ash hopper. This constitutes about 0.8% of the waste input by weight or 1,900 tpa.
- Flue gas treatment residues from the spray drier absorber and bag-house filter hoppers. This constitutes about 4.3% of the waste input by weight or 9,800 tpa.

The bottom ash and grate siftings are passed over a sieve to separate out oversized ash particles (c.800 tonnes per annum or 0.35% of waste input). Approximately 3,840 tpa of ferrous metals and 720 tpa of non-ferrous metals are also separated out for recycling. The flue gas residues (FGR) and boiler ash are pre-treated in the solidification plant. The FGR and boiler ash is mixed with water and the mixture is bagged. It is then compressed in a mould to form solid blocks. The blocks are subject to hardness testing and then transported from site.

2.3 Emissions

A site layout map identifying the locations of all monitoring points is included in Figure 3.

2.3.1 Air Emissions

Main Emissions

There is only one-point source air emission, the discharge of treated flue gases through a 65m high stack (reference A1-1). The flue gases consist primarily of CO_2 and water vapour but may also contain a number of substances regulated by legislation. The parameters required to be monitored at the stack discharge are:

- Total dust,
- PM_{10} and $PM_{2.5}$,
- Gaseous and vaporous organic substances, expressed as total organic carbon (TOC),
- Hydrogen chloride (HCl),
- Hydrogen fluoride (HF),
- Sulphur dioxide (SO_2),
- Oxides of nitrogen (NO and NO_2 expressed as NO_2),
- Nitrous oxide (N_2O),
- Cadmium (as Cd) and thallium (as Tl) and their compounds,
- Mercury (as Hg) and its compounds,

- Antimony (as Sb), arsenic (as As), lead (as Pb), chromium (as Cr), cobalt (as Co), copper (as Cu), manganese (as Mn), nickel (as Ni) and vanadium (as V) and their compounds,
- Dioxins/furans; and
- Carbon monoxide (CO).

CO, Total dust, TOC, HCl, SO_2 and NOx are required to be monitored on a continuous basis with the remaining parameters monitored on a quarterly or biannual basis by an external contractor.

Minor Emissions

There are no minor emission parameters required to be monitored under the Waste Licence.

Fugitive Emissions

To limit fugitive emissions from the facility, the main process building is maintained under negative pressure. The storage, treatment and handling operations for waste, consumables and residues are carried out in enclosed environments with filters or closed loop loading systems fitted where necessary. The storage area for consumables, boiler ash and flue gas treatment residues are isolated from the main process building to contain any emissions that may arise from this area. There is also a fugitive emission management plan in place.

Odour Emissions

There are no significant odour emissions from the facility. An odour impact assessment found that all predicted ground level concentrations are lower than the recommended EPA limit even during a worst-case meteorological year. There is an odour management plan in place at the site also.

2.3.2 Emissions to Sewer

There are no emissions to sewer from the facility. All sanitary effluent from staff and visitor facilities is treated on-site in a combined septic tank and Puraflo treatment system, which discharges treated effluent to ground as described below. There is an effluent holding tank at the offices in the construction area of the site. This is tankered from the facility to an approved outlet.

2.3.3 Emissions to Ground

There are currently only minor emissions to ground of treated sanitary effluent from the foul drainage system. The Puraflo system (one at each of the main admin block and security buildings) provides a combination of physical, chemical and biological treatment of the wastewater in a biofibrous medium. The site is underlain by circa 8m of low permeability boulder clay and all underground and overground tanks are bunded and inspected as per the conditions of the licence.

There will be no fugitive or uncontrolled emissions to ground or groundwater.

2.3.4 Site Drainage

The drainage system for the site can be divided into three independent systems:

- Storm-water drainage system from roofs and outdoor hard-standing areas,
- Process building indoor drainage system; and

- Domestic type effluent system.

All storm-water collected in the storm-water drainage system is monitored continuously for pH, TOC and conductivity and passes through a Class 1 by-pass petrol interceptor before passing to the surface water attenuation pond or, in the case of an emergency, the firewater retention tank. From the surface water attenuation pond, water is pumped to the hydrobrake which flows to the outfall from the site. The drainage channel located at the delivery area for the ammonia solution tank and diesel tank leads to a 10,000 litre forecourt separator before joining the surface drainage system draining to the petrol interceptor. The monitoring points in the surface water drainage system are located in monitoring chambers after the petrol interceptor and before the outfall sump pump.

If, after passing through the petrol interceptor, any surface water levels (pH, conductivity or TOC) are outside the set parameters, the diversion valve to the firewater retention tank closes automatically. Water that is contained in the firewater retention tank is tested and depending on the results, tankered to the internal drainage recovery tanks for reuse in flue gas cleaning process or removed from site for treatment or disposal at an appropriately licensed facility.

The outfall pump for transferring the water from the surface water attenuation pond to the drainage ditch can be de-activated automatically if surface water levels are outside the set parameters or remotely from the control room if any contamination in the surface water is detected or the fire alarm is triggered. The firewater retention tank has a total capacity of 300m^3 and in the event of this capacity being exceeded, the system will overflow to the surface water attenuation pond and be contained there.

The process building indoor drainage system collects water from internal areas and drains to the internal drainage recovery tanks (2 X 50m^3) where the water can be removed for treatment or reused within the treatment process. The aqueous unloading area also drains to this area should there be any spills or leaks.

The domestic effluent system is described previously above.

2.3.5 Noise Emissions

There are six potential sources of continuous noise, all from process equipment at various points in the plant. The stack, air cooled condensers and turbine coolers are the most significant continuous sources of noise as they are located externally.

Traffic noise assessments have found site traffic to have little impact on overall noise in the locality and is therefore not considered to be a significant emission.

Annual noise monitoring is carried out at four locations outside the site boundary as identified in Figure 3. The 2018 - 2020 AERs concluded that noise emissions have a minimal impact on the local environment. The 2020 noise assessment was completed and was in line with previous years assessments. The 2021 noise assessment is planned for August 2021.

2.4 Waste

Waste materials are accepted at the facility as feedstock for the incineration and energy recovery processes. The facility is permitted to accept a maximum of 235,000 tonnes of industrial, commercial and household non-hazardous waste per annum, which may include up to 10,000 tpa of suitable hazardous wastes. There are a number of suitable hazardous waste streams which may be included in the process feedstock. The list of licensed waste types along with their corresponding European Waste Catalogue (EWC) numbers are presented in the facility IE licence.

A dedicated waste inspection area is provided in the reception hall to facilitate the regular inspection of waste loads from new and existing contractors. The inspection area drains to the bunker. Any non-conforming waste is loaded into suitable covered containers or trucks, which are consigned to a designated waste quarantine area. The quarantine area is located in the service yard away from the main activity areas. The trucks or containers are held in this area for a short period to allow the waste contractor time to make alternative disposal arrangements, if necessary. All refused loads of waste will be recorded.

Wood, iron, steel, soil and stones and mixed construction and demolition wastes are collected from the facility by suitably permitted and licensed operators for recovery at licensed facilities. Ferrous metals and non-ferrous metals taken from the bottom ash are recovered by suitably permitted and licensed operators.

Bottom ash generated at the facility has been classified as non-hazardous and consists mostly of inert materials such as glass, sand, metal pieces and stones. Approximately 3,840 tpa of ferrous metals and 720 tpa of non-ferrous metals are also separated out for recycling. Bottom ash is currently being sent to non-hazardous landfills.

Flue gas residues and boiler ash are classified as hazardous and are currently sent for re-use in the remediation of salt mines in Germany. Now that the Solidification plant is operational the flue gas residues and boiler ash are being processed on site prior to shipment off-site.

2.5 Nuisances

To limit nuisances such as vermin, dust emissions and litter, all deliveries, handling and storage activities take place in fully enclosed environments. The main process building is maintained under negative pressure and the facility is kept clean and tidy at all times. Specialist vermin control contractors are engaged to provide vermin management services. Roads, parking areas and service yards are paved and therefore minimise the potential for the generation of dust. Measures for limiting the impact of traffic movements on the road network include road widening, the provision of a ghost island junction to facilitate a turning lane and a 25km/h site speed limit.

2.6 Environmental Pathways and Sensitivity

2.6.1 Geology and Hydrogeology

The geology at the site has been determined primarily from boreholes and trial pits undertaken in 2001 by Project Management as part of the project Environmental Impact Statement (EIS). According to the report, the site is underlain by predominantly boulder clay type soils which are generally poorly drained in nature. The soil layer thickness varies across the site, ranging from 4m deep in the west of the site to 10m depth near the centre.

The hydrogeological study carried out for the EIS determined that the site is underlain by a thick deposit of low permeability brown silty clays. The limestones found beneath the site are part of the Platin Formation which has been classified by the GSI as a regionally important diffuse karst aquifer with good development potential.

The online GSI mapping database ranks the site as having moderate vulnerability due to the thickness and type of overburden cover present at the site. The EIS identified that the groundwater flow beneath the site is influenced by a cone of depression centred on the Platin Quarry excavation works located nearby. Prior to the quarry development, the groundwater flow beneath the WtE facility would have been towards the River Nanny and in a general south-easterly direction. The groundwater flow

beneath the site has been reversed and is now moving north-west towards the nearby quarry due to the lowering of the water table within the excavation.

The site lies within the River Nanny catchment basin. The River Nanny rises in the south-east of Co. Meath and flows through Duleek towards Laytown where it discharges to the sea. The River Nanny is located approximately 2km south of the site and surface water in the vicinity of the site drains naturally towards the river.

The EIS identified that groundwater is extensively used by the local community as a source of water supply with 22 recorded wells within 3km of the site.

2.6.2 Environmental and Ecological Designations

The River Boyne and river Blackwater Special Area of Conservation (SAC) (Site ref. 002299) is located, at its closest, approximately 5km to the north-west of the site. Duleek Commons (Site ref. 001578) is located approximately 2km to the south-west and is a proposed Natural Heritage Area (pNHA).

The Boyne Estuary Special Protected Areas (SPA) (Site ref. 004080), River Boyne and river Blackwater SPA (Site ref. 002299) and River Nanny Estuary and Shore SPA (Site ref. 004518) are located nearby and are designated for the protection of endangered species of wild birds. There are a variety of wintering bird species of identified in the area.

As part of the environmental assessments prepared in advance of the licensing and planning applications for the facility, mitigation measures to protect Bat species have been employed. Bat boxes are provided on suitable trees surrounding the site and these are checked and maintained regularly.

As outlined in the facility license, it has been determined *'that the facility does not have the potential for significant effects on any European site due to the nature and scale of the waste to energy plant operations and the distance between the installation and the designated sites'.*

Hibernica Ecology have been commissioned to undertake an assessment of the stormwater retention pond and develop a strategy to solve an algae problem that has occurred and to minimise the impacts to a recently discovered Newt population. At the time of writing this report, a report has just been received and is being evaluated. Further plans will develop in line with the recommendations of the report.

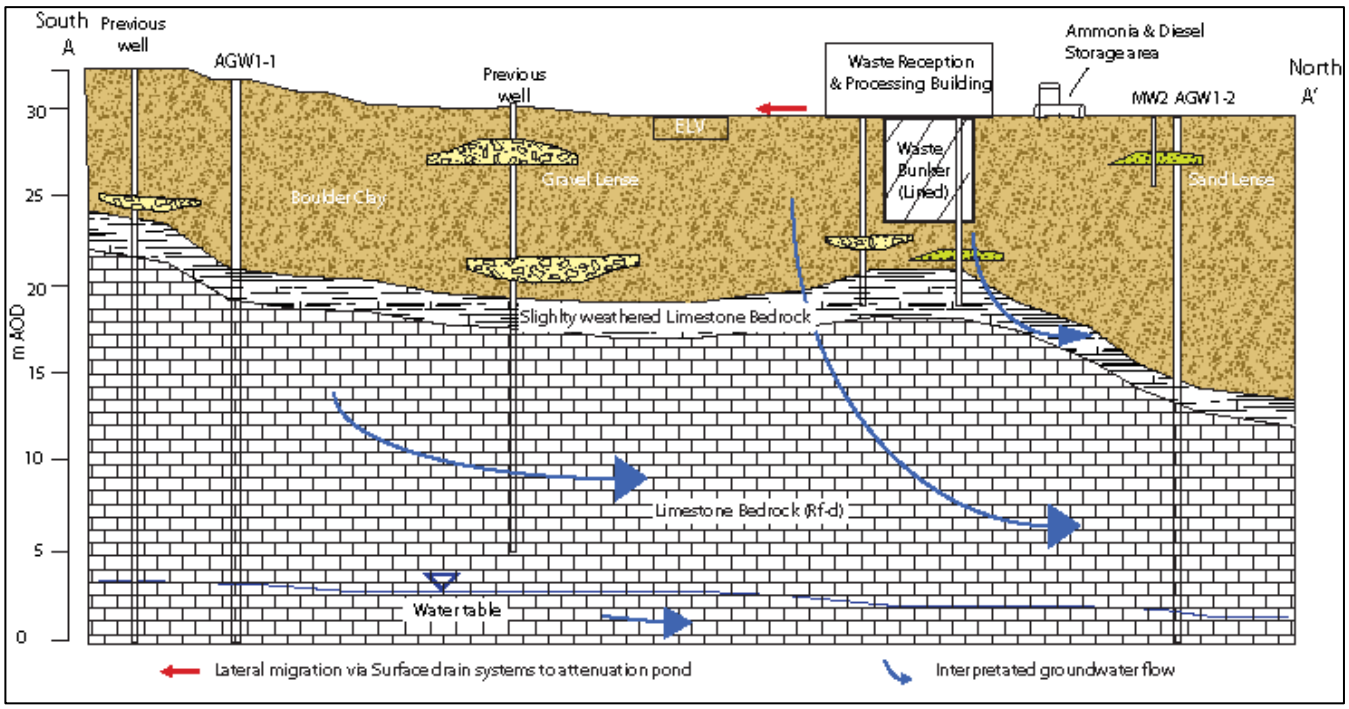
2.6.3 Source Pathway Receptor Assessment

As part of the 2014 Soil Water Baseline assessment detailed further under Section 2.7 below, a source pathway receptor assessment was conducted. The pollutant linkages based on the primary sources of possible contaminants on site are summarised in Table 7.1 (extracted from the baseline report below). This is presented on the basis that contamination following a leak/spill is not mitigated by the extensive mitigation measures operating at the site.

Source	Pathways	Receptor
Ammonia and/or Diesel Fuel Spill or leakage impacting lands outside containment area. Tanker leakage impacting area outside of site drainage area.	Vertical and lateral migration via fill and boulder clay to underlying limestone bedrock Lateral migration via groundwater within the bedrock aquifer Lateral migration via drainage system	Limestone Bedrock Aquifer Abstraction Wells at Platin Drainage ditch and Nanny tributaries.

Table 2.6 Extract from Soil Water Baseline Report - Pollutant Linkages

The Conceptual Site Model (CSM) from the report is also presented below.



Insert 2.6 Extract from 2014 Soil Water Baseline Report - Conceptual Site Model for Indaver (June 2014)

2.7 Operator Performance

2.7.1 Environmental Management System

Indaver have an integrated Quality, Environmental and Safety & Health (QESH) management system. In June and December 2020 Indaver Ireland/UK successfully passed a re-assessment audit to ISO 9001:2015, ISO 14001:2015 and completed a full upgrade to a new standard ISO 45001:2018. Both audits were passed with only positive comments, with no non-conformance, or observations, noted.

The objectives and targets for the facility are set out in the Indaver Goals and Plan Book Action (part of Indaver's Environmental Management Programme agreed with the Agency in 2012). Actions are added and closed on an ongoing basis and further details of these are included in the AER for the facility.

2.7.2 Compliance and Enforcement History

There were 5 environmental complaints registered in 2018, all were related to odour. Only 2 of these were attributable to our activities. A full site odour investigation was conducted in 2019 by an external consultancy and the report was submitted to the Agency.

There were 33 complaints received in 2019 regarding a sulphur type odour and 1 complaint was received regarding a waste odour. Following a full investigation by independent consultants, the sulphur type odour was found to not be attributable to Indaver's activities and is now closed (COM008710). The waste odour was found to be attributable to Indaver's activities, and a full root cause analysis was conducted internally and appropriate actions have been taken and this complaint is now closed (COMPASS ID 332). 2 complaints were received relating to noise, and following investigation, both were found to not be attributable to Indaver's activities and are now closed (COM009684). 1 complaint was in relation to a concern over local air quality, and following investigation, it was found to not be attributable to Indaver's activities and is now closed (COMPASS ID 324). 1 complaint was in relation to a sighting of a rat, and this was closed out as it was noted in the original environmental impact statement that there were rats inhabiting the area prior to the construction of the facility, as the surrounding landscape is rural and agricultural (COMPASS ID 169).

There were 11 odour complaints were received in 2020. Of the eleven-complaints received, four were not attributable to Indaver's activities. The seven which were attributable were investigated and measures were put in place to stop the odours. There is an engineering project underway at the facility trialling ventilation and odour suppression systems in the waste bunker. The sensitive neighbours and the EPA were made aware of the trials before they took place and the complaints were anticipated. Three waste odour complaints were received from neighbours during the trials, and the conditions under which the complaints were received were fully investigated. The root causes were identified and are being used by the project team to engineer permanent solutions to eliminate future odour complaints.

The EPA requested an odour investigation in response to an EPA request into an odour complaint. The complaint was fully investigated using dispersion modelling, odour surveys, olfactometry and emission analysis both inhouse and by three independent consultants – AWN, Katestone Environmental and Element Materials Technology – and was found not to be attributable to Indaver's activities and was closed out by the EPA in early 2020.

One noise complaint was received in 2020 which was not attributable to Indaver's activities.

One odour complaint, and one noise complaint were received in 2021, neither of which were attributable to Indaver's activities.

To date in 2021 there has been one incident and one non compliance issued by the EPA in 2021. It is concluded that the facility continues its good relationship with the local community as evidenced by the generally low number of complaints.

The numbers of non-compliances for the site over the previous years is shown below:

Year	No. Of Non-Compliances
2021	1
2020	0
2019	2
2018	2

Table 2.7 *Non-Compliances 2018-2021*

2.7.3 Soil and Water Baseline Study

In June 2014, AWN Consulting prepared a Soil and Water Baseline study for the facility in order to meet Indaver's licensing requirements under the Industrial Emissions Directive. The report concluded that the site is underlain by c. 8 meters of generally low permeability glacial till which provides a moderate amount of protection to the underlying regionally important karstified and fractured aquifer. Receptors include the aquifer, groundwater abstraction wells and drainage ditches which feed tributaries of the Nanny River. Dewatering for Platin Quarry controls the local groundwater flow direction.

A review of soil quality from the 2000 baseline and geotechnical assessment and additional data collated in 2014 confirm that there is no evidence of significant soil or groundwater contamination at the site. Compliance groundwater monitoring since the plant commenced operation in 2011 has also been reviewed and again there have been no exceedances that suggest soil or groundwater contamination has occurred due to the operation of the site. Chloride levels though not exceeding guidelines are elevated above typical background concentrations suggesting previous impact by the historical use of the site for agricultural grazing.

Ammonium Hydroxide (NH4OH) Solution, Diesel, FGR and Boiler Ash were identified as hazards present at the site which have the potential to impact soil and groundwater if not adequately mitigated during storage and operation at the plant. However, the risk prevention measures present at the Indaver facility significantly reduce the potential for an environmental impact to soil or water to occur. These measures include fire-fighting systems, drainage and containment systems and spill procedures.

Groundwater well AGW1-2 exhibited an upward trend for chloride in the period October 2016- August 2017, but levels remained below warning levels onsite. An investigation was conducted however, no onsite process activities were identified as a potential source of elevated chloride levels at well AGW1-2. The likely source was deemed to be a failure of the foul sewer line in close proximity to the well, which failed hydrostatic tests. Indaver prepared a work order (Ref. 5295928) to repair the foul water line. The chloride trend has now reduced.

A trend of elevated chloride concentrations was noted in three of the licenced groundwater monitoring points beginning in May 2016. The EPA requested that Indaver investigate the possible source of these elevated levels. Following investigation by AWN Consulting in 2019 including a desktop review of historical

chloride concentrations, a review of onsite storage and use of chemicals and an onside hydrogeological investigation, it was found that there were no plausible anthropological contaminant sources within the Indaver site boundary. It was recommended to continue monthly sampling onsite to monitor trends.

2.8 Tank, Drum, Pipeline and Bund Integrity Testing

Pipeline testing is carried out on a schedule as required by the licence.

Tank and bund integrity testing is carried out on a schedule as required by the licence. All tanks and bunds tested in the last three years have passed the integrity tests. A full list of the underground tanks with their use and size is included in Table 2.8. Testing on two bunds (one underground and one chemical storage cabinet) are scheduled for August 2021 in line with the testing schedule.

Pipeline testing is carried out on a schedule as required by the licence. Foul and process underground pipeline testing was due to take place in November 2020 but was rescheduled to 2021 as the annual maintenance shutdown had been delayed from May until November due to COVID19, and the testing could not take place while the maintenance shutdown was taking place. The pipeline testing was conducted in April 2021 by McBreen Environmental.

The process underground pipeline testing identified two failures; the pipeline from Manhole T6.00 to Manhole T4.02 and Manhole no. T4.02.

The foul underground pipeline testing identified five failures; one pipleline from Manhole AJ1 to Manhole AJ2 and four Manholes including F1.00, F1.01, F1.02 and F2.00.

A quotation for the repairs to the pipelines mentioned above has been accepted and repairs and retests have been scheduled for Quarter 3 2021.

	Tank	Description	Above/Under Ground	Indaver Bund Tag ID	Test Type	Tank Construction Detail	Contains	Use	Capacity	Pipe Leak detection system	Last Test Date	Next SAP Call(Audit)	Confirmed Certs
1	y	Main diesel tank	Above ground	UYA99-BB001	Visual + Leak Detection	Hot Rolled Steel BS EN 10025-2:2004	Diesel	Diesel Oil for Aux Burners	44m³	Welded Pipework with 1 Flange (12m Insp.)	25/10/2019	25/10/2022	ok
2	y	3 * diesel for pump house	Above ground	UYA99-BB002	Visual + Leak Detection	Steel HR15	Diesel	Diesel Oil fire pumps	68m³		25/10/2019	25/10/2022	ok
3	y	3 * diesel for pump house	Above ground	UYA99-BB003	Visual + Leak Detection	Steel HR15	Diesel	Diesel Oil fire pumps	68m³		25/10/2019	25/10/2022	ok
4	y	3 * diesel for pump house	Above ground	UYA99-BB004	Visual + Leak Detection	Steel HR15	Diesel	Diesel Oil fire pumps	68m³		25/10/2019	25/09/2022	ok
5	y	Back up diesel generator tank	Above ground	UYA99-BB005	Visual + Leak Detection	Mild Steel 42A	Diesel	Containment for Deisel Spill	7.5m³	N/A	27/02/2018	20/08/2021	
6	n	T1 bund under electrical rooms	N/A	UYA99-BB006	Water Test	Reinforced Mass Concrete	Empty	Containment for Oil from Transformer	.7m³		25/10/2019	25/09/2022	ok
7	n	T2 bund under electrical rooms	N/A	UYA99-BB007	Water Test	Reinforced Mass Concrete	Empty	Containment for Oil from Transformer	.7m³		25/10/2019	25/09/2022	ok
8	n	T3 bund under electrical rooms	N/A	UYA99-BB008	Water Test	Reinforced Mass Concrete	Empty	Containment for Oil from Transformer	.7m³		25/10/2019	25/09/2022	ok
9	y	Underground recovered water pit (Dirty Water Pit)	Underground	UYA99-BB009	Water Test	PreCast Concrete	Contaminated Water	Containment for washings from process area & secondary containment for tanker unloading Area	50m³	3 yr Hydrostatic testing	30/07/2020	01/06/2023	ok
10	y	Underground recovered water pit (Clean Water Pit)	Underground	UYA99-BB010	Water Test	PreCast Concrete	Boiler Blow Down Water	Containment for rejected Demin Water & boiler blow down	50m³	3 yr Hydrostatic testing	30/07/2020	01/06/2023	ok
11	y	Underground retetion tank beside the pond/Fire Water Retention tank	Underground	UYA99-BB011	Water Test\Hydrostatic Testing	PreCast Concrete	Surface Water	Fire Water Retention Tank & Diverted Surface Water	3000m³	3 yr Hydrostatic testing	30/07/2020	01/06/2023	ok
12	n	Nitric acid spill containment	N/A	UYA99-BB012	Water Test	Mild Steel	Empty	Containment for Nitric Acid	1.2m³		25/10/2019	25/09/2022	ok
13	y	Ammonia solution Tank	Above ground	UYA99-BB013	Visual + Leak Detection	Stainless Steel ASTM-A240-304	Ammonia	Containment for Nitric Acid	66m³	Welded Pipework with 1 Flange (12m Insp.)	25/10/2019	25/09/2022	ok
14	n	Bund Tray in Chemstore Unit for Warehouse	N/A	UYA99-BB014	Water Test	Chemstore	Empty	Contrainment for Chemical Liquids	1m³		01/07/2020	01/06/2023	ok
16	y	2.5m3 Storage tank Ammonia Slab area	Underground	UYA99-BB016	Visual + Leak Detection	Reinforced Mass Concrete	Empty (Spill Containment Only)	Contrainment for Chemical Liquids	2.5m³		01/07/2020	01/06/2023	ok
17	n	T41 Transformer Compound in Sub Station	N/A	UYA99-BB017	Water Test	Reinforced Mass Concrete	Empty	Containment for Oil from Transformer	8m³		25/10/2019	25/09/2022	ok
18	n	New Chemstore-2nd Unit for Maintenance	N/A	UYA99-BB018	Water Test	Mild Steel	Empty	Contrainment for Chemical Liquids	1m³		17/08/2018	20/08/2021	
19	n	T4 Bund at Warehouse	N/A	UYA99-BB019	Water Test	Reinforced Mass Concrete	Empty	Containment for Oil from Transformer	.3m³		25/10/2019	25/09/2022	ok
20	n	New Chemstore - Oil Storage	N/A	UYA99-BB020	Water Test	Mild Steel	Misc	Containment for Chemical Liquids	.5m³		01/07/2020	01/06/2023	ok
21	n	New Chemstore - Tipping Hall	N/A	UYA99-BB021	Water Test	Mild Steel	Misc	Containment for Chemical Liquids	.5m³		01/07/2020	01/06/2023	ok
22	n	Nitric Atomiser Disk Cleaning bath	N/A	UYA99-BB022	Water Test		Nitric Acid	Containment for Nitric Acid	.8m³		24/01/2019	25/09/2022	ok
23	n	Nitric Atomiser Disk Rincing bath	N/A	UYA99-BB023	Water Test		Nitric Acid	Containment for Nitric Acid	.8m³		24/01/2019	25/09/2022	ok
24	y	Lime Milk Pit	Underground (but visible from above i.e. grating over the top)	UYA99-BB024	Water Test\Hydrostatic Testing	Reinforced Mass Concrete	LimeMilk	Washings from Lime Milk prep tank	15m³		01/07/2020	01/06/2023	ok
25	y	Diesel Filling Station	Above ground	UYA99-BB025	Visual + Leak Detection	Medium Based Polyethylene	Diesel	Containment for Diesel Spill	14m³		01/07/2020	01/06/2023	ok
26	y	Pre Treatment Bund	Underground	UYA99-BB026	UYA99-BB026	Reinforced Mass Concrete	Contaminated Water	Containment for Contaminated Water	2.2m³		15/10/2018	20/08/2021	
27	y	Baker Tank Bund	Above ground	UYA99-BB027	UYA99-BB027	Carbon Steel	Polluted Water	Polluted Water Injections	70m³	N/A	25/09/2019	25/09/2022	ok
28	n	Sulphuric Acid Bund - Inlet	N/A	UYA99-BB028	Water Test		Empty	Contrainment for Chemical Liquids	240l		New	01/06/2023	
30	n	Sodium Hydroxide - Inlet	N/A	UYA99-BB030	Water Test		Empty	Contrainment for Chemical Liquids	240l		New	01/06/2023	
31	n	Sulphuric Acid Bund - Outlet	N/A	UYA99-BB031	Water Test		Empty	Contrainment for Chemical Liquids	240l		New	02/06/2023	
32	n	Sodium Hydroxide - Outlet	N/A	UYA99-BB032	Water Test		Empty	Contrainment for Chemical Liquids	240l		New	03/06/2023	

Table 2.8 *Underground Bund Details*

2.9 Solidification

The solidification plant pre-treats flue gas residues (FGR) and boiler ash. The FGR and ash is mixed with water and the mixture is then bagged and compressed into a mould to form solid blocks. The blocks are hardness tested and they are then transported to Irish Salt Mining and Exploration (ISME) in Co. Antrim where they are used in a recovery process to stabilise the salt mines after they have been excavated.

2.10 Risk Management

Indaver are committed to managing and conducting their work activities in such a way as to ensure, so far as is reasonably practicable, the safety, health and welfare at work of their employees and others who may be affected by their business activities and also to minimising pollution and adverse impacts on the environment.

The plant is operated in line with Indaver's Integrated Management System (IMS) incorporating their Quality, Environmental, Safety and Health (QESH) systems which are accredited to ISO 9001 (Quality), ISO 14001 (Environmental) and ISO 45001 (Safety and Health).

Accident Prevention and Emergency Response:

During the design phase of the plant, hazard and operability (HAZOP) studies were carried out to assess hazards that could arise during both steady and non-steady state operations and identified the necessary mitigation measures required. Based on these studies, a comprehensive set of operating procedures have been drawn up for all aspects of the operation of the plant, to minimise the risk of accident or emergency situations arising.

A comprehensive Emergency Response Plan has been developed for the facility (available on request). The procedure sets out the response measures to be taken by personnel in the event of an emergency. Measures have been designed to ensure maximum protection for site employees, visitors and people in other premises near the site to limit damage to property and minimise the impact of site operations on the environment. A dedicated Emergency Response Team have been appointed to respond to any emergency which may arise.

An Emergency Response Plan is shown in Appendix B.

Employee Training:

Indaver strives to minimise human interaction in safety critical operations in order to eliminate the potential for 'human factors' to initiate or exacerbate major accidents at the site. Through recruitment, training, performance management, employee development and succession planning, the company ensures all members of staff are in possession of the knowledge, skills and experience necessary to perform their jobs to a satisfactory standard. This includes adhering to strict rules on safety such as a working permit system, training and provision and use of personal protection equipment.

All staff are fully trained for all aspects of operation of the facility. Training is managed by means of a Training and Staff Competence Procedure.

Calibration and Maintenance Systems:

Calibration and maintenance of equipment is managed through the company's quality management system which is accredited to ISO9001:2015.

3.0 ENVIRONMENTAL SENSITIVITY

3.1 Risk Identification

To complete this risk assessment in accordance with the requirements of the 2014 EPA guidance, AWN considered the activities carried out at the facility and generated a list of the primary processes and activities with potential to generate environmental effects with reference to Table 3.2 of the EPA guidance document.

A list of the potential risks was provided to the facility QE manager and management team to consider with the intention of screening the identified risks prior to proceeding to evaluation stage. In identifying the environmental hazards at the site, the operations and activities have been divided into the following broad categories:

1. Vehicle movements
2. Tipping Hall
3. Storage and mixing of wastes
4. Heat treatment of wastes
5. Ash handling and storage
6. Air emissions treatment process
7. Fires and fire water
8. Ancillary services
9. Other risks including generic risks

A list of the significant risks identified at the facility is presented in Table 3.1

Risk ID	Process/Area	Potential Risk
1. Vehicle Movements		
1.1	Truck movements around the site including waste and supply deliveries.	Release of diesel from a truck fuel tank or similar vehicle (< 500 litres) due to crash, accident or overfill/non-closure of fuel tank.
1.2	Truck carrying sludge waste to waste bunker.	Accidental release of sludge waste (up to 30m^3) to hard-standing area.
1.3	Truck delivering lime to site, expanded clay or carbon to site	Lime spill (<26t) on delivery which could disperse in the atmosphere (powders)
1.4	Truck delivering caustic (sodium hydroxide solution) (jerrycans) or nitric acid (IBCs) to site	Sodium Hydroxide (25l) or nitric acid delivery spill (<1m^3).
1.5	Truck delivering solid waste (hazardous and non-hazardous)	Solid waste spilled accidently onto hard standing (<30t).
1.6	Truck carrying liquid waste (non-hazardous and hazardous) to liquid waste unloading area.	Accidental release of non or hazardous liquid waste (up to 30m^3) to hard-standing area which has the potential to release into the surface water drainage system.
1.7	Trucks carrying solidified material from pre-treatment (solidification) plant	Accidental release of FIBC bags that contain the hardened material. The blocks could break and disperse to the atmosphere.
2. Tipping Hall		
2.1	General waste load accidentally containing unapproved hazardous waste component enters facility and is placed in waste bunker.	General waste load accidently containing unapproved hazardous waste component enters facility and is placed in the waste bunker. It is then transferred into the hopper and incinerated in the furnace.
2.2	Radiation detector scanning waste loads for radioactive material entering the facility.	Failure of the radiation detector in scanning the waste and radioactive material entering the facility and waste bunker undetected.
2.3	Waste entering the bunker which is outside of acceptance criteria entering bunker	The waste would enter the hopper and be incinerated. Potential for shutdown due to size reasons i.e., cause a blockage in the hopper.
3. Storage and mixing of wastes		
3.1	Waste storage bunker	Leak in waste bunker floor leading to leachate entering groundwater beneath the site.
3.2	Baker Storage Tank	Incompatible wastes mixed in which could cause fire or explosion
3.3	Road Tankers containing liquid (hazardous and non-hazardous) for treatment	Tankers could leak which could enter surface water drainage system.
4. Heat treatment of wastes		
4.1	Furnace explosion	Explosion in the furnace e.g., if gas cylinder/petrol can/explosive entered in waste stream
4.2	Risks associated with emissions due to poor combustion in the incinerator	Generation of excessive/non-conforming combustion gases
4.3	Burning of Unapproved waste in the incinerator	Generation of excessive/non-conforming combustion gases
5. Ash handling and storage		
5.1	Bottom ash wet bath	Release of liquid from bottom ash wet bath.
5.2	Boiler ash silo/flue ash silo (located indoors)	Discharge from ash silo (<1t) with no collection truck in place.
5.3	Ash silo otherwise overflowing	Uncontrolled release of ash to the surrounding area.
5.4	Bottom Ash Hall	Dust Explosion in bottom ash hall
6. Air emissions treatment process		
6.1	Ammonia solution tank	Failure of the ammonia solution tank due to puncture or catastrophic failure (<62m^3).
6.2	Ammonia solution tank	Small loss of ammonia solution from tank or pipeline leak.
6.3	ID fan at stack	Failure of ID fan before the stack.
6.4	Failure of the Air Abatement System	Short term release of excessive air emissions in breach of ELV.
6.5	Release of unabated emission to atmosphere	Short term release of excessive air emissions in breach of ELV.
6.6	Impact of abatement due to extreme cold temperatures	Partial failure of abatement equipment resulting in short term release of excessive air emissions in breach of ELV. All abatement equipment is located within weatherproofed buildings i.e., within the main process buildings and extreme cold weather is not considered to present a problem for the facility other than in all but the most unlikely of scenarios.

7. Fires and firewater		
7.1	Contractors' compound workshop fire	Major fire in contractors' compound building leading to destruction of materials stored and release of smoke. Generation of fire water
7.2	Major fire within waste storage area or incineration process	Release of fire water and/or foam following a major fire in a waste storage or processing area of the site.
7.3	Major fire within waste storage area or incineration process	Potential for release of smoke to the atmosphere.
7.4	Waste bunker storage	Major fire in the waste bunker leading to generation of fire water.
7.5	Trucks arriving to site on fire	Waste from the supplier may be on fire due to burning embers or ignition of the waste by the fermentation process
7.6	Baker tank and propane storage facility	Potential for domino effect if either the baker tank, road tankers or the propane facility is on fire.
8. Ancillary services		
8.1	Diesel tank storage	Diesel tank failure/puncture and potential release of up to 44m^3 of diesel to ground.
8.2	Generator diesel tank storage	Diesel tank failure and release of up to 9m^3 of diesel to ground.
8.3	Domestic effluent treatment process	Failure of domestic effluent treatment system or release of untreated domestic type effluent to groundwater.
8.4	Transformer compound	Release of up to 8.4 tonne of transformer oil (PCB free) to bund.
8.5	Transformer Compound	Potential for release of Sulphur hexafluoride (SF6) gas into the atmosphere
8.6	Pre-treatment (Solidification) Plant	Spill of hazardous residue onto floor or which could get into the environment e.g. explosion. Dry boiler ash or flue gas residue could escape into the atmosphere.
8.7	Pre-treatment (Solidification) Plant	Spill of partly solidified material onto ground and entering drainage system.
9. Other Risks (including Generic Risks)		
9.1	Flooding on site causing uncontrolled damages	Floodwaters entering process buildings area or causing damage to process/utility equipment, pipeline or tank damage.
9.2	Failure of the surface drainage water network, causing releases to ground.	Loss of potentially contaminated surface water to ground.
9.3	Activities of contractors, causing release of materials to atmosphere, surface water, groundwater, noise, dust etc.	Generation of environmental nuisances (air emissions likely to be dust or other particulate matter) or contamination of soil, groundwater or surface water as a result of contractor's activities.
9.4	Gas main on site	Potential for gas explosion and fire
9.5	Failure of the pond to contain storm water or fire water	Overflow of pond or wave creation in pond
9.6	Failure of the foul sewer drainage system or puraflo	Leak of foul waste into the ground and ultimately into the groundwater

Table 3.1 Plausible risks identified for Indaver facility

4.0 RISK ANALYSIS

The risks identified previously have been assessed in terms of their likelihood and consequence based on the classifications presented in Tables 4.1 and 4.2. The consequence rating in terms of potential environmental impacts and costs of a hazard occurrence given the existing controls are presented in Table 4.1. The cost reflects the expense that may be incurred in managing and rectifying the hazard event. Table 4.2 rates the likelihood of the potential hazard occurring given the existing controls.

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

Table 4.1 *Risk Classification Table – Consequence*

Rating	Likelihood	
	Category	Description
1	Very Low	Very low chance of hazard occurring
2	Low	Low chance of hazard occurring
3	Medium	Medium chance of hazard occurring
4	High	High chance of hazard occurring
5	Very High	Very high chance of hazard occurring

Table 4.2 *Risk Classification Table - Likelihood*

Table 4.3 over presents the risk assessment of the identified risks listed previously. For each risk, the table presents the nature of the hazard and its potential environmental effect. A consequence (C) and likelihood (L) rating is assigned to each risk and a risk score is generated based on the product of the two ratings (i.e., C x L). This risk score allows the identified risks to be ranked.

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
1. Vehicle Movements								
1.1	Truck movements around the site including waste and supply deliveries.	Release of diesel from a truck fuel tank or similar vehicle (< 500 litres) due to crash, accident or overfill/non-closure of fuel tank.	Release of diesel to surrounding hard-standing area entering the surface water drainage system. Potential release to road at site entrance if occurrence at entrance.	3	A spill entering the water drainage system will pass through the Class 1 by-pass petrol interceptor, where oil contamination will be contained, before entering the surface water attenuation pond or being diverted to the firewater retention tank once TOC levels exceed set parameters. This is a localised and short duration event with any fuel spilled contained within the surface water drainage system for the site. The Newt population in the surface water pond would be affected by the contaminated firewater.	2	Truck activities (deliveries of waste, collection of ash and supply deliveries) take place daily. The site operates a well-marked two-way traffic flow system with a wide turning area for waste delivery vehicles to reduce the potential for vehicle collisions. 25 km/h speed limit on site. Vendor vetting procedures are used to ensure reputable vendors are used for deliveries. Spill procedures have been developed. The Newt population in the surface water drainage pond would need to be replace/restocked.	6
1.2	Truck carrying sludge waste to waste bunker.	Accidental release of sludge waste (up to $30m^3$) to hard-standing area.	Release of waste sludge to surrounding hard-standing area entering the surface water drainage system or potentially contaminate soil.	3	Any significant release of sludge waste to the water drainage system on the site will trigger the TOC alarm located before the surface water attenuation pond. This surface water runoff will then be diverted to the fire water retention	2	Truck activities (including deliveries of sludge) are typically less than 10% of total waste arrivals onsite. The site operates a well-marked two-way traffic flow system with a wide turning area at the tipping hall to reduce the potential for vehicle collisions. 25	6

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					tank, preventing it reaching any external water bodies. There is also an additional alarm at the surface water attenuation pond outfall. This event would be localised and of short duration.		km/h speed limit on site. Spill procedures are in place	
1.3	Truck delivering lime, expanded clay or carbon to site	Spills from trucks delivering consumables (<26t) on delivery which could disperse in the atmosphere (these are powders)	Release of lime to hard-standing area. Washed into surface water drainage system resulting in elevated pH levels in surface water runoff.	3	A spill of lime washed into the water drainage system on the site may result in elevated pH levels in the surface water runoff. This would trigger the pH alarm located before the surface water attenuation pond and runoff can be diverted to the firewater retention tank. There is also an additional alarm at the surface water attenuation pond outfall. This event would be localised and of short duration.	2	Truck delivery of lime to site is typically weekly or twice weekly. 25 km/h speed limit on site. Vendor vetting procedures are used to ensure reputable vendors are used for deliveries. Spill procedures are in place. Hauliers and contractors to site are inducted prior to entry on site and so are aware of the site rules.	6
1.4	Truck delivering caustic (Sodium hydroxide solution) (jerrycans) or nitric acid (IBC's) to site	Sodium hydroxide (25L) or nitric acid delivery spill (<1m^3)	Release of Sodium hydroxide or nitric acid to hard-standing area. Small quantity washed into surface water drainage system.	2	A spill of caustic or nitric acid washed into the external surface water drainage system on the site may result in reduced or increased pH levels in the surface water runoff. Any significant spill would trigger the pH alarm	2	Truck deliveries of caustic or nitric acid to site are typically every 2-4 weeks. 25 km/h speed limit is in place on site. Vendor vetting procedures are used to ensure reputable vendors are used for deliveries. Spill procedures are in place to ensure spills are contained and	4

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					located before the surface water attenuation pond and the water would be diverted to the underground fire water retention tank. There is also an additional pH sensor at the surface water attenuation pond outfall and once the pH levels are outside of the agreed limits the pump stops discharge. This event would be localised and of short duration. Any spill in the caustic delivery area will be captured in the drainage channel and stored in the recovery tanks.		appropriately disposed of. Hauliers and contractors to site are inducted prior to entry on site and so are aware of the site rules.	
1.5	Truck delivering solid waste (hazardous and non-hazardous)	Solid waste spilled accidently onto hard-standing (<30t)	Solid waste is released to hard-standing area. Contained on site	2	A spill of solid waste to ground would not result in any damage to the environment. Any waste spilled will be collected and placed in the waste bunker. Potential for leachate from solid waste deliveries on the ground if the truck tipped over the kerbing.	2	Waste delivery activities take place in accordance with the licence conditions. The site operates a well-marked two-way traffic flow system with a wide turning area for waste delivery vehicles to reduce the potential for vehicle collisions. 25 km/h speed limit on site. Vetting procedures are used for waste contractors. Spill procedures are in place.	4

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
1.6	Truck carrying liquid waste (non-hazardous and hazardous) to liquid waste unloading area.	Accidental release of non-hazardous liquid waste (up to 30m^3) to hard-standing area which has the potential to release into the surface water drainage system.	Release of non-hazardous liquid waste to surrounding hard-standing area entering the surface water drainage system.	3	Any significant release of liquid waste to the water drainage system on the site will trigger the TOC/pH alarm located before the surface water attenuation pond. This surface water runoff will then be diverted to the fire water retention tank, preventing it reaching any external water bodies. There is also an additional alarm at the surface water attenuation pond outfall. This event would be localised and of short duration.	2	Truck activities (including deliveries of non-hazardous liquid waste) are typically less than 10% of total waste arrivals onsite. The site operates a well-marked two-way traffic flow system with a wide turning area at the tipping hall to reduce the potential for vehicle collisions. 25 km/h speed limit on site. Spill procedures are in place.	6
1.7	Trucks carrying solidified material from pre-treatment (solidification) plant	Accidental release of the FIBC bags that contain the hardened material. The blocks could break and disperse into the atmosphere	Dispersal of residues into the atmosphere	2	If the material broke up and dispersed into the atmosphere, a modelling exercise would have to take place to see where the bulk of the residues have deposited. This ground would have to be dug up and removed for safe disposal	1	The speed limit on the site is <25km/h. Hauliers are approved and are inducted on site. The FIBC bags are tied once filled so the material is unlikely to spill out even if broken. There is an ERT and production site on staff, so any spills/leaks are cleaned up quickly to prevent dispersion to the environment	2
2. Tipping Hall								
2.1	General waste load accidentally containing	General waste load accidently containing	Unsuitable hazardous waste component enters furnace and is incinerated.	2	All waste that comes to site is checked visually prior to entry to the bunker. This	2	Prior to waste being accepted on site, the waste is classified and profiled. It goes through an	4

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
	unapproved hazardous waste component enters facility and is placed in waste bunker.	unapproved hazardous waste components enters facility and is placed in the waste bunker. It is then transferred into the hopper and incinerated in the furnace.	Potential increase in licensed emission levels in combustion gases released to atmosphere.		will help reduce any high concentrations of unapproved hazardous waste entering the incinerator. Combustion gases pass through several treatment steps. Dioxins removed with two levels of dioxin removal. If licensed emission levels are elevated, additional dosing of consumables will be initiated to reduce emission levels to ensure licensed limits are not breached. Emission control is automated and can be switched to manual in order to control emissions and to ensure compliance with the ELV's		approval process on the LIMS system and it is approved by production/process engineer and waste treatment. Only permitted hazardous wastes will be accepted at the site. All waste documentation is checked at the weighbridge before entering the site. Spot checks of waste are carried out to ensure only approved hazardous waste is allowed to enter the waste bunker. Grab operator will visually inspect the waste before it is placed in the hopper and can identify any unsuitable hazardous waste items. There is a waste handling procedure in place and there is a schedule of internal audits to ensure it is followed. There is also always a tipping hall operator present when waste arrives on site.	
2.2	Radiation detector scanning waste loads for radioactive material entering the facility	Failure of the radiation detector in scanning the waste and radioactive material entering the facility and waste bunker undetected.	Radioactive material being incinerated and released into the atmosphere and contaminating the residues going for off-site disposal/recovery.	2	The radioactive material entering the waste bunker would be a very small source or material from medical care. All sources in Ireland are very well controlled under licences from the Office of Radiological Protection and hospitals advise	1	When the radiation detector is operational, it scans incoming waste loads to check for radioactive material. If a radioactive source is detected in the waste, depending on the strength and the half-life of the source, it may be isolated and quarantined on site in a quarantine unit, or the EPA Office	2

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					patients to keep this waste which has the potential to be radioactive for a period of time prior to disposing of it.		of Radiological Protection will come to site and remove it. If radioactive materials were burnt it is more likely that the residues produced from the process would be contaminated. In all the years of operating, no residues from the processes have had any radiation contamination noted at any outlet facility which have radiation detectors installed (e.g. metal recycling facilities, and the ports). The stack was also analysed for gamma radiation and the test results were negative.	
2.3	Waste entering bunker which is outside the Waste Acceptance Criteria	The waste would enter the hopper and be incinerated. Potential risk of shutdowns due to size reasons or chemical limits being breached i.e. cause a blockage in the hopper or lack of control on emission	Very limited but could be an increase in carbon monoxide results for a period of time if there is a blockage or could affect other parameters depending on the substance	2	There is a waste acceptance procedure along with waste acceptance criteria. Waste is checked visually prior to entry to the bunker.	2	The site has been operating for over 7 years and it is very rare that something is accepted which caused plant problems. Prior to waste being accepted on site, the waste is classified and profiled. It goes through an approval process on the LIMS system and it is approved by production/process engineer and waste treatment. Only permitted wastes will be accepted at the site. All waste documentation is checked at the weighbridge before entering the site. Spot checks of waste are carried out to ensure only approved waste is allowed to enter the waste	4

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
							bunker. Grab operator will visually inspect the waste before it is placed in the hopper and can identify any unsuitable waste items. There is a waste handling procedure in place and there is a schedule of internal audits to ensure it is followed. There is also always a tipping hall operator present when waste arrives on site.	
3. Storage and mixing of wastes								
3.1	Waste storage bunker	Leak in waste bunker floor leading to leachate entering groundwater beneath the site. Mixing incompatible wastes in the bunker leading to reactions (fire/gas evolution)	Leachate enters groundwater beneath the site. Potential contamination of groundwater extraction wells in the area.	3	Potential for leachate to contaminate groundwater beneath site with resulting remediation required. Potential effect on any groundwater extraction wells in the area.	1	Waste bunker is designed and built to be impermeable with leak detection (BS 8007: Design of Aqueous Liquid retaining Concrete Structure). Any leak from the concrete waste bunker will be collected above a HDPE liner (double containment) and can be accessed using the inspection chamber for the lining where any liquids will collect. This can then be pumped out for removal and treatment. There is also routine groundwater monitoring as part of site's waste licence. The bunker wall is very thick at over 1m of poured concrete	3

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
3.2	Baker storage tank	Incompatible waste mixed in which could cause a fire or explosion	Fire or explosion on site. Potential for damage to propane cylinder close by which would cause a domino effect. Air quality could be temporarily affected and the area close to the baker tank would need to be monitored to determine if there is any groundwater or soil contamination	3	Potential for short term effect on air quality in the area. The fire/explosion would be short lived. Potential for the ground in the vicinity of the tank to be contaminated and/or have an impact of groundwater quality.	1	The liquid streams that are accepted to site are tested for a full WAC test prior to being allowed to come to site. Once the tank arrives on site, it is sampled to determine if it conforms with the original sample from the customer. The tank is not offloaded until the results show conformity. If the tank does not conform it is moved offsite for different treatment. The typical waste streams that are accepted are primarily washings from pharmaceutical companies. There is very limited solvents present or reactive chemicals so a reaction or compatibility issue is unlikely.	3
3.3	Road tankers containing liquid (hazardous and non-hazardous) for treatment	Tankers could leak which could enter surface water drainage system	Limited environmental effect. Potential for contaminated surface water	2	The area around the road tankers is bunded locally. The liquid would go into an underground tank. Should the liquid run outside of the bunded area, it would enter the surface water drainage system. If there was no change in the limits of TOC, pH or conductivity then the potential for release to the environment is possible, however the material that comes to site	1	Indaver have been accepting hazardous waste to it since 2015 with no issues. The tanks that are delivered to site are from approved hauliers.	2

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					generally has organics present and so the TOC would rise and once the analyser reaches the warning limits, the divert to an underground storage tank would happen.			
4. Heat treatment of wastes								
4.1	Furnace explosion	Explosion in the furnace e.g. if gas cylinder/petrol can/explosive entered in waste stream or if material is directly injected and causes explosion	Potential damage to furnace. Combustion products would pass through the treatment process. Only an extremely large explosion would potentially breach the walls of the furnace releasing untreated combustion gases to the atmosphere.	3	No release of untreated flue gases to atmosphere while process is shut down. If furnace is ruptured from explosion, combustion gases released to atmosphere without treatment. Process will be shut down. Short duration event with rapid dispersal.	1	Control procedures in place to prevent flammable/explosive material wastes entering furnace. Includes waste documentation check at the weigh bridge before entering the site, routine spot checks on waste and grab operator visual inspection of waste before it is placed in the hopper. Furnace is designed to withstand any small explosions such as a domestic gas cylinder. Prior to liquid waste being injected the tank is sampled and analysed for conformity. Only after having evaluated the results is a tank treated on site.	3
4.2	Risks associated with emissions due to poor combustion in the incinerator	Generation of excessive/non-conforming combustion gases	Poor combustion may result in excessive emissions or issues with ash quality for disposal	2	To date Indaver has been operating the facility for a number of years (since 2011) and continuous and non-continuous monitoring results confirm that	1	The incineration process completed at the facility and its subsequent abatement is now well established and as waste streams are well characterised understood the likelihood of a	2

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					emissions from the facility are compliant with ELVs other than very occasional short-term breaches. Dispersion modelling conducted by AWN indicates that even in the worst-case scenario i.e. where ELVs are exceeded for a short-term period, no ambient air quality standard will be breached by the facility.		significant issue in terms of emissions or residue disposal as a result of poor combustion within the incinerator is low. Indaver have been operating for over 7 years now and there has been limited ELV breaches.	
4.3	Burning of Unapproved Waste in the Incinerator	Generation of excessive/non-conforming combustion gases	Combustion of unapproved waste streams may result in excessive emissions or issues with ash quality for disposal	2	To date Indaver has been operating the facility for a number of years (since 2011) and continuous and non-continuous monitoring results confirm that emissions from the facility are compliant with ELVs other than very occasional short-term breaches. Dispersion modelling conducted by AWN indicates that even in the worst-case scenario i.e. where ELVs are exceeded for a short-term period, no ambient air quality standard will be breached by the facility.	2	All waste streams accepted at the facility are subject to a detailed waste acceptance procedure and it is considered that any significant quantities of unapproved wastes types are detected and quarantined prior to incineration. (Small quantities of unapproved wastes are more than likely already present in the waste stream and have not presented any emissions issues to date).	4

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
5. Ash handling and storage								
5.1	Bottom ash wet bath	Release of liquid from bottom ash wet bath.	Potential for released liquid to enter internal drainage system to water recovery tanks.	2	Contaminant potential of water in the bottom ash wet bath is variable and assessment is based on the worst-case scenario with the water being toxic to aquatic organisms with high pH. All water from wet bath would be contained in the water recovery tanks. If the recovery tanks overflow, then the water could get into the surface water drainage system which would go towards the surface water attenuation pond. Should this occur, due to the high pH it would cause a divert into the underground fire water retention tank.	1	The wet bath is designed to be impermeable and fit for purpose. Ongoing maintenance will check structural integrity of the bath and inspection for leaks. The pond is run in automatic mode so the divert will occur once the pH is not within trigger limits. Surface water drainage system is integrity tested.	2
5.2	Boiler ash silo/flue ash silo (located indoors)	Discharge from ash silo (<1t) with no collection truck or FIBC in place, or spill of ash from FIBC	Ash spill to ground. No release to surrounding environment. Potential for some ash to be washed into internal floor drains.	2	Based on the Indaver analysis that boiler ash and flue gas residues are classified as H412 (harmful to the aquatic environment). All ash washed into internal drains collected in internal recovery tanks where it will	1	There are a range of measures and systems in place at the site to minimise the risk of a spill/release of boiler ash and flue gas residue. The system is a mix of automation but also manual so there is no possibility of the material coming out when there is no truck or FIBC in place. The control room will manage via	2

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					be contained. No release off site.		CCTV, all dispensing of ash to collection trucks in coordination with collection truck driver, and dispensing of ash to FIBCs in coordination with operators. The FIBC bags are tied once filled so the material is unlikely to spill out. Spill containment procedures are in place for any ash spills.	
5.3	Ash silo otherwise overflowing	Accidental overfilling of silo etc resulting in release of silo contents in surrounding area	Generation of dust or contaminated run off	2	Based on the Indaver analysis the boiler/flue ash and gas cleaning residues are classified as hazardous. However, even in the event it is unlikely that ash will be mobilised over any distances as overflow will occur within building – limited quantity likely to be spilled before detection.	1	SOP is in place for silo filling. It is considered that the Distribution Control System (DCS) which is manned 24/7 by an operator and includes high level and high-level alarms will prevent any overflow. The system is designed to only operate under control of personnel in control room. Very unlikely to occur.	2
5.4	Bottom ash hall	Dust explosion in bottom ash hall	Emissions to air from the explosion. Release of dust into the atmosphere.	3	There would be a release of emissions from an explosion to atmosphere that should be quickly dispersed. There would also be a release of dust to atmosphere. Modelling would have to be done to determine if ground contamination existed and if it did a clean-up task would ensue.	1	This is not considered likely due to the presence of moisture in this area. The dust particles are quite moist from the bottom ash treatment and there is good ventilation in the area. There is limited combustible materials in the area.	3

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
6. Air emissions treatment process								
6.1	Ammonia solution tank	Failure of the ammonia solution tank due to puncture or catastrophic failure (<62m^3).	Release of ammonia solution (H400): Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment) to the hard-standing area and collected in surface run-off system.	2	Any large spill released at the delivery area will enter the surface drains in the area of the tank and be contained in the 10,000-litre forecourt separator. If the spill exceeds the separator capacity it will enter the surface water drainage system where it will pass through the petrol interceptor. If the pH limit at the monitoring point located after the interceptor is exceeded, the run-off will be diverted and contained in the firewater retention tank. There is also an additional monitoring point at the outfall from the site which will shut down the discharge pump from the site if the limits set are exceeded. This is a localised and short duration event with any spilled material contained within the surface water drainage system for the site. Should it reach the	2	The ammonia solution is contained in a double skinned tank with leak and overfill protection. There is a maintenance procedure for inspecting pipelines to ensure they are kept in a good condition. Pipeline is carried on a pipe tray over ground to aid leak detection. There are no flanges on the pipeline as it is a welded pipe Tank filling is a manned event with a written procedure. Spill containment procedures are in place. ERT is onsite to deal with any spill or incidents. The tanks are under a maintenance programme to ensure they are fit for purpose and integrity tested.	4

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					soil i.e. tank has been punctured and ammonia has spilled to the surrounding soil, the soil will be tested and dealt with accordingly which could include removal from site.			
6.2	Ammonia solution tank	Small loss of ammonia solution from tank or pipeline leak.	Release of ammonia solution (H400): Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment) to the hard-standing area and collected in surface run-off system.	1	Small spill released to hard-standing area. It would then enter the surface drains in the area of the tank and be contained in the delivery area holding tank (2.5m^3) if the event occurs during filling. Outside of filling operations, any spills pass through the forecourt separator and enter the outdoor surface water collection system. Any significant loss will trigger the pH alarm located before the surface water attenuation pond diverting the run-off to the firewater retention tank. There is also an additional alarm at the storm water attenuation pond outfall. This event would be localised and of short duration.	2	The ammonia solution is contained in a double skinned tank with leak and overfills protection. There is a maintenance procedure for inspecting pipelines to ensure they are kept in a good condition. Pipeline is carried on a pipe tray over ground to aid leak detection. There are no flanges on the pipeline as it is a welded pipe. Tank filling is a manned event with written procedures. Spill containment procedures are in place for any ammonia spills at the site. ERT is onsite to deal with any spills or incidents. The tanks are under a maintenance programme to ensure they are fit for purpose and integrity tested.	2

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
6.3	ID fan at stack	Failure of ID fan before the stack	Potential release of odours as process shuts down. Potential for odours from waste bunker as negative pressure is reduced. Combustion gases pass through treatment process.	2	Potential odour release. If there is a problem with the suction fan the process can be quickly shut down.	1	Fan designed to last for facility design life. There are two motors on the suction fan at the stack. This provides a back-up should a motor fail. Power supply to fan backed up by the diesel generator. Service and maintenance schedule for suction fan equipment is in place. The process is manned 24/7 and so should a problem occur it will be dealt with immediately. Manager on call is in place. The motor fan and gear box have online condition monitoring such as temperature and vibration analysis with alarms configured at the DCS.	2
6.4	Failure of the Air Abatement System	Release of untreated emissions to atmosphere	Potential effect on sensitive receptors in the environs of the facility (human health, flora and fauna etc.)	1	To date Indaver has been operating the facility for a number of years (since 2011) and continuous monitoring results confirm that emissions from the facility are compliant with ELVs other than very occasional short-term breaches. Dispersion modelling conducted by AWN indicates that even in the worst-case scenario i.e. where ELVs are exceeded for a short-term	2	It is considered that short term failures of the abatement system (momentary stoppages etc) may occur from time to time however, Indaver's abatement systems is comprised of a number of steps to treat the various components of the flue gases and any failure of the system is therefore likely to be partial rather than a complete shutdown of the system. All steps of the treatment process include duty stand by equipment/alternative process to	2

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					period, no ambient air quality standard will be breached by the facility. Any failure will also be a short-term event.		ensure maintenance of operation of the abatement system.	
6.5	Release of Unabated Emissions to Atmosphere	Release of untreated emissions to atmosphere	Potential effect on sensitive receptors in the environs of the facility.	1	To date Indaver has been operating the facility for a number of years (since 2011) and continuous monitoring results confirm that emissions from the facility are compliant with ELVs other than very occasional short-term breaches. Dispersion modelling conducted by AWN indicates that even in the worst-case scenario i.e. where ELVs are exceeded for a short-term period, no ambient air quality standard will be breached by the facility.	2	It is considered that short term failures of the abatement system (monetary stoppages etc.) may occur from time to time however, Indaver's abatement system is comprised of a number of steps to treat the various components of the flue gases and failure of the system is therefore likely to be partial rather than a complete shutdown of the system. All steps of the treatment process include duty stand by equipment/alternative process to ensure maintenance of operation of the abatement system.	2
6.6	Impact on Abatement due to extreme cold temperatures	Failure or reduced performance of abatement systems	Potential effect on sensitive receptors in the environs of the facility.	1	To date Indaver has been operating the facility for a number of years (since 2011) and continuous monitoring results confirm that emissions from the facility are compliant with ELVs other than very occasional short-term breaches. Dispersion	2	Indaver's abatement systems are housed within weatherproof facility buildings and as such is at limited risk of reduced performance due to cold weather etc. Also, heat tracing is installed where required. Flue gases in flue gas system are typically	2

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					modelling conducted by AWN indicates that even in the worst-case scenario i.e. where ELVs are exceeded for a short-term period, no ambient air quality standard will be breached by the facility.		>140° and so this is unlikely to occur.	
7. Fires and fire water								
7.1	Contractors' compound fire	Major fire in contractors' compound building leading to destruction of materials stored and release of smoke. Generation of fire water	Combustion products to atmosphere. Fire water to drainage.	3	Firewater containment on-site. Once fire alarm is activated, the control room will shut off the outfall pump and all fire water will be diverted to the fire water retention tank. Combustion products are quickly dispersed and diluted and will be short duration once fire is extinguished. Smoke released to atmosphere. There is potential for ground and groundwater contamination as there is no hardstanding in this area.	1	There is a comprehensive fire protection system at the site to minimise the risk of a fire. It includes an Emergency Response Procedure & training/induction requirement for staff, sprinkler systems, fire detection and alarm systems, hose reels and fire hydrants/extinguishers. Spill containment procedures are in place for any release of flammable materials. The site has received the HPR (Highly Protected Risk) award from its fire protection insurance provider. This is a very prestigious award and demonstrates Indaver's commitment to ensuring no fire events occur at the site and that the systems in place are more than sufficient for the site. This award is given to plants that are	3

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
							judged to be subject to a much lower than normal probability of loss by virtue of low hazard occupancy or property type, superior construction, special fire protection equipment and procedures, and management commitment to loss prevention. FM have only given the award to one other waste to energy plant out of the 20 to 25 facilities similar in nature to us in Europe.	
7.2	Major fire within waste storage area or incineration process	Release of fire water and/or foam following a major fire in a waste storage or processing area of the site.	Potential generation of contaminated fire water, which would be retained either locally (where the fire occurred) or within the surface water drainage system, including the fire water retention tank, surface water attenuation pond and the internal surface water recovery tanks. A small quantity of fire water may enter the ground if released onto a non-hard-standing area.	3	Minor impact from the generation of fire water, the in-situ treatment of contaminated firewater and/or clean up in-situ of hard-standing areas. The EIS completed concluded that there is sufficient retention capacity for fire water at the site. Fire water can also be contained in the waste bunker. The fire alarm will trigger the diversion of run-off to the firewater retention tank. All external surface water run-off passes through a petrol interceptor.	1	There is a comprehensive fire protection system at the site to minimise the risk of a fire. It includes an Emergency Response Procedure with training/induction requirements for staff, sprinkler systems, a fire detection and alarm system, hose reels and adjacent fire hydrants/ extinguishers. Spill containment procedures are in place for any release of flammable materials. The site has received the HPR (Highly Protected Risk) award from its fire protection insurance provider. This is a very prestigious award and demonstrates Indaver's commitment to ensuring no fire events occur at the site and that the systems in place are more	3

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
							than sufficient for the site. This award is given to plants that are judged to be subject to a much lower than normal probability of loss by virtue of low hazard occupancy or property type, superior construction, special fire protection equipment and procedures, and management commitment to loss prevention. FM have only given the award to one other waste to energy plant out of the 20 to 25 facilities similar in nature to us in Europe. The site also has a dedicated ERT team on site to deal with fires. The ERT team are all fully fire trained.	
7.3	Major fire within waste storage area or incineration process	Potential for release of smoke and combustion gases to the atmosphere.	Release of smoke to the atmosphere and dispersion with no long-term damage to the environment.	3	No long-term environmental impact but smoke may be a nuisance in the short term or over the duration of the fire.	1	There are a range of measures and systems in place at the site to minimise the risk of a fire, including safety procedures, appropriate storage of flammable and combustible materials, a site-wide fire alarm system, smoke detectors, fire hydrants and fire-fighting equipment (extinguishers and water cannons). Spill containment procedures are in place for any release of flammable materials. The site has received the HPR (Highly Protected Risk) award from its	3

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
							fire protection insurance provider. This is a very prestigious award and demonstrates Indaver's commitment to ensuring no fire events occur at the site and that the systems in place are more than sufficient for the site. This award is given to plants that are judged to be subject to a much lower than normal probability of loss by virtue of low hazard occupancy or property type, superior construction, special fire protection equipment and procedures, and management commitment to loss prevention. FM have only given the award to one other waste to energy plant out of the 20 to 25 facilities similar in nature to us in Europe. The site also has a dedicated ERT team on site to deal with fires. The ERT team are all fully fire trained. A range of fire systems are in place 1) UV/IR Flame/fire detectors 2) Aspiration systems 3) Smoke detectors	
7.4	Waste bunker storage	Major fire in the waste bunker	Release of combustion gases to air without	3	Release of untreated combustion gases and	2	Waste bunker is visually monitored, and any localised fires	6

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
		leading to generation of fire water.	treatment. Generation of firewater.		smoke to atmosphere. All fire water will be contained in the waste bunker. Short duration event with rapid dispersion. Pumping out of bunker and firewater retention tank.		will be removed using the grab. Water cannons are in place in the waste bunker designed to suppress fires in the waste. Water cannons can be controlled from the control room to target exact locations of fires. There are UV/IR combined fire detectors in the waste bunker to detect any fires in the waste. The site has received the HPR (Highly Protected Risk) award from its fire protection insurance provider. This is a very prestigious award and demonstrates Indaver's commitment to ensuring no fire events occur at the site and that the systems in place are more than sufficient for the site. This award is given to plants that are judged to be subject to a much lower than normal probability of loss by virtue of low hazard occupancy or property type, superior construction, special fire protection equipment and procedures, and management commitment to loss prevention. FM have only given the award to one other waste to energy plant out of the 20 to 25 facilities similar in nature to us in Europe.	

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
7.5	Trucks arriving to site on fire	Waste from the supplier may be on fire due to burning embers or ignition of the waste by the fermentation process	Release of combustion gases to air without treatment. Generation of firewater.	3	Release of untreated combustion gases and smoke to atmosphere. Short duration event with rapid dispersion. All fire water will be contained in either the bunker or will go to the surface water drainage system and once the limits at the incoming TOC are triggered it will divert to the underground fire water retention tank. Pumping out of bunker and firewater retention tank. Waste might cause a larger fire if enters the bunker and is not noticed.	1	Waste bunker is visually monitored, and any localised fires will be removed using the grab. Water cannons are in place in the waste bunker designed to suppress fires in the waste. Water cannons can be controlled from the control room to target exact locations of fires. There are UV/IR combined fire detectors in the waste bunker to detect any fires in the waste. The site has received the HPR (Highly Protected Risk) award from its fire protection insurance provider. This is a very prestigious award and demonstrates Indaver's commitment to ensuring no fire events occur at the site and that the systems in place are more than sufficient for the site. This award is given to plants that are judged to be subject to a much lower than normal probability of loss by virtue of low hazard occupancy or property type, superior construction, special fire protection equipment and procedures, and management commitment to loss prevention. FM have only given the award to one other waste to energy plant	3

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
							out of the 20 to 25 facilities similar in nature to us in Europe.	
7.6	Baker tank and propane storage facility	Potential for domino effect if either the baker tank, road tankers or the propane facility is on fire or ruptures.	Combustion products to atmosphere. Fire water to drainage.	3	Release of untreated combustion gases and smoke to atmosphere. Short duration event with rapid dispersion. All fire water will go to the underground recovery tanks but if these fills, then it would go to the surface water drainage system and once the limits at the incoming TOC are triggered it will divert to the underground fire water retention tank. Waste might cause a larger fire if enters the bunker and is not noticed.	1	Waste bunker is visually monitored, and any localised fires will be removed using the grab. Water cannons are in place in the waste bunker designed to suppress fires in the waste. Water cannons can be controlled from the control room to target exact locations of fires. There are UV/IR combined fire detectors in the waste bunker to detect any fires in the waste. The site has received the HPR (Highly Protected Risk) award from its fire protection insurance provider. This is a very prestigious award and demonstrates Indaver's commitment to ensuring no fire events occur at the site and that the systems in place are more than sufficient for the site. This award is given to plants that are judged to be subject to a much lower than normal probability of loss by virtue of low hazard occupancy or property type, superior construction, special fire protection equipment and procedures, and management	3

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
							commitment to loss prevention. FM have only given the award to one other waste to energy plant out of the 20 to 25 facilities similar in nature to us in Europe.	
8. Ancillary Services								
8.1	Diesel tank storage	Diesel tank failure/puncture and potential release of up to 44m^3 of diesel to ground.	Release of oil to surface water run-off system.	3	Any spill released at the delivery area will enter the surface drains in the area of the tank and pass through the 10,000-litre forecourt separator. If the release is above the capacity of the separator it will enter the surface water drainage system where it will pass through the petrol interceptor, where oil will be contained. If the TOC limit at the monitoring point located after the interceptor is exceeded, the run-off will be diverted and contained in the firewater retention tank. There is also an additional monitoring point at the outfall from the site. This is a localised and short duration event with any spilled fuel contained within the surface water	1	Very low probability of tank failure. Tank is double skinned with leak and overfill protection. Tank filling operation is managed and supervised. Low numbers of vehicle movements in the area. There is a tank inspection schedule in place in the maintenance plan for the site.	3

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					drainage system for the site. If the diesel tank ruptures, then there is potential for groundwater and soil contamination. This would be a localised situation.			
8.2	Generator diesel tank storage	Diesel tank failure and release of up to 9m^3 of diesel to ground.	Release of oil to surface water run-off system	3	Any oil spill entering the surface water drains will enter the water drainage system and will pass through the petrol interceptor, where oil will be contained, before entering the surface water attenuation pond. This is a localised and short duration event with any fuel spilled contained within the surface water drainage system for the site.	1	Very low probability of tank failure. Tank is double skinned and regularly maintained and inspected as part of the general site maintenance. Located away from vehicle routes beside 38kV Compound. Fall of the ground is towards the aco channels which would direct the contamination to surface water drainage system where it will be detected on the TOC analyser and diverted to an underground tank. This reduces the possibility for loss outside of the site.	3
8.3	Domestic effluent treatment process	Failure of domestic effluent treatment system or release of untreated domestic type effluent to groundwater.	Improperly treated domestic type effluent enters groundwater at the site.	2	Contamination of groundwater in local vicinity with domestic type effluent from offices and contractors' compound. Potential to affect any extraction wells in the vicinity of the site.	2	A reserve percolation area is provided for use in the event of the main area malfunctioning. The septic tank will be inspected and emptied, as required. No automatic detection of septic tank failure. Domestic waste water system is designed with secondary treatment (Puraflo) and includes an inspection chamber. There is a level	4

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
							detection with local indicator installed also.	
8.4	Transformer compound	Release of up to 8.4 tonne of transformer oil (PCB free) to bund.	Any oil released from transformer enters the bund and is contained.	3	All oil is contained in the bund. Bund is sized to contain 110% of oil contents. All oil is PCB free.	2	Transformer is designed to contain oil. Bunding prevents any release of oil and is maintained/tested as part of the site's ongoing maintenance programmes.	6
8.5	Transformer compound	Potential release of SF6 gas	The amount of SF6 gas has a global warming potential of c.68 tonnes of CO2	1	There is 4 x 0.527kg units and 4 x 0.225kg units so 3.008kg of SF6 gas on site which has the global warming potential of ~68T of CO2.	1	This material is inert. The only cost would be the Emissions Trading Scheme implications.	1
8.6	Pre-treatment (Solidification) Plant	Spill of hazardous residue onto floor or which could get into the environment e.g. explosion. Dry boiler ash or flue gas residue could escape into the atmosphere.	Release of hazardous residue to atmosphere and potential for ground contamination	3	The plant is a covered plant and so the process takes place indoors. The spills or leaks are contained by the process drains. If there was a dust explosion, then there could be potential for it to breach the walls of the process	2	A safety study was completed which demonstrates that there is a low chance of this occurring due to the safety controls at the plant. The equipment is maintained in the maintenance programme. Operators are trained in how to use the equipment. ERT team is present on site for clean-up.	6
8.7	Pre-treatment (Solidification) Plant	Spill of partly solidified material onto ground and entering drainage system	Release of hazardous residue to drainage system	1	The plant is a covered plant and so the process takes place indoors. The spills or leaks are contained by the process drains.	1	If a spill occurs, it will be cleaned up by the operators. Should it reach the process drains then it is internally contained and cannot enter any watercourse.	1

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
9. Other Risks (including Generic Risks)								
9.1	Flooding on site causing uncontrolled damages	Floodwaters entering process buildings area or causing damage to process/utility equipment, pipeline or tank damage.	Contamination of soil, groundwater and potential knock on consequences for facility operation, emissions and residue management etc.	2	The site surface water retention pond has capacity for a 1 in 100-year flood event. In the event of a major flood event at the facility (>1 in 100-year event), the facility paving has been designed to divert flood water away from the building towards the existing drainage network. This should minimise the consequences of any major flood event.	2	The possibility of a major flood event occurring at the site is considered very low.	4
9.2	Failure of the surface drainage water network, causing releases to ground.	Loss of potentially contaminated surface water to ground.	Contamination of soil and bedrock aquifer.	2	All waste handling etc. is carried out within the process buildings and as a result surface water drainage at the facility is generally uncontaminated. Any release of mildly contaminated surface water run-off via a drain failure is likely to have minimal consequences.	2	The likelihood of a failure of the drainage network over the lifetime of the facility is medium.	4
9.3	Activities of Contractors causing release of materials to	Generation of environmental nuisances as a	Air emission (dust or other particulate matter) or contamination of soil,	2	Contractors working on site are carefully chosen and vetted by Indaver to ensure their activities are carefully	2	Having carefully vetted all contractors used on site, it is considered that the likelihood of any loss of a significant amount	4

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
	atmosphere, surface water, groundwater, noise, dust etc.	result of contractor's activities.	groundwater or surface water		managed and any potential impacts minimised. Any releases of materials to atmosphere, soil or water are likely to be small scale therefore consequences are likely to be at lower end of the range.		of hazardous substances is low to moderate. No work can commence before the job owner and reviewed and agreed on the method statement and risk assessment. Permit to work procedures are in place.	
9.4	Gas main on site	Potential for gas explosion	Release of missiles and projectiles and natural gas into the atmosphere	2	There is <1 tonne of natural gas in the pipeline on the site at any one time. An explosion on the site would be small and localised.	1	This is very low as the gas main is subject to controls by Bord Gais. The main site is protected on site by a way-leave.	2
9.5	Failure of the pond to contain storm water or fire water	Overflow of pond or wave creation in pond	Releases of pond contents to the ground	2	Water in the pond will likely be within its discharge limits as otherwise the water would have been diverted to the fire water retention tank. In the rare case of their being a fire and the water backflows into the pond, then it could be released and be over the required trigger levels	2	The pond is continuously monitored for compliance with the trigger levels.	4
9.6	Failure of the foul sewer drainage system or puraflo	Leak of foul waste into the ground and ultimately into the groundwater	Release of waste foul material to the groundwater system	2	The site is on a regionally important karst aquifer and any pollution overground could cause damage. The impact of leaks from effluent drains would be localised as the	2	Domestic waste water system is designed with secondary treatment (Puraflo) and includes an inspection chamber. There is a level detection with local indicator installed and regular checks are included in	4

Risk ID	Area	Potential Risk	Environmental Effect	(C) Rating	Basis of Rating	(L) Rating	Basis of Rating	Risk Score
					overburden is boulder clay which is relatively impermeable, so the leak would be largely or wholly contained within the soils. The soil layer thickness varies across the site, ranging from 4m deep in the west of the site to 10m depth near the centre.		procedures. Any drop-in waste water levels caused by a leak would be detected and a response mobilised. The site is manned by a maintenance team who have regular checks on equipment. Work orders are raised to follow up on things that are not working correctly. This could involve the supplier of the equipment to come to site to resolve.	

Table 4.3 *Assessment of Environmental Risks*

4.1 Risk Evaluation

Table 4.4 presents the assessed risks from Table 4.3 in ranked order based on risk score to assist in prioritisation for risk treatment process.

Risk ID	Location	Potential Risk	(C x L) Risk Score
1.1	Truck movements around the site including waste and supply deliveries.	Release of diesel from a truck fuel tank or similar vehicle (< 500 litres) due to crash, accident or overfill/non-closure of fuel tank.	6
1.2	Truck carrying sludge waste to waste bunker.	Accidental release of sludge waste (up to 30m^3) to hard-standing area.	6
1.3	Truck delivering lime to site	Lime spill (<26t) on delivery	6
1.6	Truck carrying liquid waste (non-hazardous) to liquid waste unloading area.	Accidental release of non-hazardous liquid waste (up to 30m^3) to hard-standing area.	6
7.4	Waste bunker storage	Major fire in the waste bunker leading to generation of fire water.	6
8.4	Transformer compound	Release of up to 8.4 tonne of transformer oil (PCB free) to bund.	6
8.6	Pre-treatment (solidification) Plant	Spill of hazardous residue onto floor or which could get into the environment e.g. explosion. Dry boiler ash or flue gas residue could escape into the atmosphere.	6
1.4	Truck delivering Caustic (jerrycans) or nitric acid (IBCs)to site	Caustic or nitric acid delivery spill (<1m^3)	4
1.5	Truck delivering solid waste (hazardous and non-hazardous)	Solid waste spilled accidently onto hard-standing (<30t)	4
2.1	General waste load accidentally containing unapproved hazardous waste component enters facility and is placed in waste bunker.	General waste load accidently containing unapproved hazardous waste components enters facility and is placed in the waste bunker. It is then transferred into the hopper and incinerated in the furnace.	4
2.3	Waste entering the bunker which is outside the waste acceptance criteria	The waste would enter the hopper and be incinerated. Potential risk of shutdowns due to size reasons or chemical limits being reached i.e. cause a blockage in the hopper or lack of control on emissions	4
4.3	Burning of unapproved material in the incinerator	Generation of excessive/non-conforming combustion gases	4
6.1	Ammonia solution tank	Failure of the ammonia solution tank due to puncture or catastrophic failure (<62m^3).	4
6.2	Ammonia solution tank	Small loss of ammonia solution from tank or pipeline leak.	4
8.3	Domestic effluent treatment process	Failure of domestic effluent treatment system or release of untreated domestic type effluent to groundwater.	4
9.2	Failure of the surface water drainage network, causing release to ground	Loss of potentially contaminated surface water to ground	4
9.3	Activities of contractors causing release of materials to atmosphere, surface water, groundwater, noise, dust etc.	Generation of environmental nuisances or contamination of soil, groundwater or surface water as a result of contractor's activities	4

9.5	Failure of the pond to contain storm water or fire water	Overflow of pond or wave creation in pond	4
9.6	Failure of the foul sewer drainage system or puraflo	Leak of foul waste into the ground and ultimately into the groundwater	4
8.2	Generator diesel tank storage	Diesel tank failure and release of up to 9m^3 of diesel to ground.	3
3.1	Waste storage bunker	Leak in waste bunker floor leading to leachate entering groundwater beneath the site.	3
3.2	Baker Storage tank	Incompatible wastes mixed in which could cause fire or explosion	3
4.1	Furnace explosion	Explosion in the furnace e.g. if gas cylinder/petrol can/explosive entered in waste stream or if material is directly injected and causes explosion	3
5.4	Bottom ash hall	Dust explosion in bottom ash hall	3
7.1	Contractors' compound fire	Major fire in contractors' compound building leading to destruction of materials stored and release of smoke. Generation of fire water	3
7.2	Major fire within incineration process	Release of fire water and/or foam following a major fire in a waste storage or processing area of the site.	3
7.3	Major fire within incineration process	Potential for release of smoke to the atmosphere.	3
7.5	Trucks arriving to site on fire	Waste from the supplier may be on fire due to burning embers or ignition of the waste by the fermentation process	3
7.6	Baker tank and propane storage facility	Potential for domino effect if either the baker tank, road tankers or the propane facility is on fire or ruptures	3
8.1	Diesel tank storage	Diesel tank failure/puncture and potential release of up to 44m^3 of diesel to ground.	3
1.7	Trucks carrying solidified material from pre-treatment (solidification) plant	Accidental release of FIBC bags that contain the hardened material. The blocks could break and disperse to the atmosphere	2
2.2	Radiation Detector scanning waste loads for radioactive material entering the facility	Failure of radiation detector in scanning the waste and radioactive material entering the facility and waste bunker undetected.	2
3.3	Road Tankers containing liquid (hazardous and non-hazardous) for treatment	Tankers could leak which could enter surface water drainage system	2
4.2	Risks associated with emissions due to poor combustion in the incinerator	Generation of excessive/non-conforming combustion gases	2
5.1	Bottom ash wet bath	Release of liquid from bottom ash wet bath.	2
5.2	Boiler ash silo/flue ash silo (located indoors)	Discharge from ash silo (<1t) with no collection truck or FIBC in place, or spill of ash from FIBC	2
5.3	Silo otherwise overflowing	Accidental overfilling of silo etc resulting in release of silo contents in surrounding area	2
6.3	ID fan at stack	Failure of ID fan before the stack	2
6.4	Failure of the air abatement system	Release of excessive air emissions to atmosphere	2
6.5	Release of unabated emissions to atmosphere	Release of excessive air emissions to atmosphere	2
6.6	Impact on abatement due to extreme cold temperatures	Failure or reduced performance of abatement systems	2

9.1	Flooding on site causing uncontrolled damages	Floodwaters entering process areas or causing damage to process, utility equipment, pipeline or tank damage	2
9.4	Gas main on site	Potential for gas explosion	2
8.5	Transformer Compound	Potential release of SF6 Gas	1
8.7	Pre-treatment (solidification) Plant	Spill of partly solidified material onto ground and entering drainage system	1

Table 4.4 *Identified risks ranked in terms of risk score*

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 4.3 and Table 4.4 are presented on the risk matrix in Table 4.5 (referenced by the Risk ID).

LIKELIHOOD						
	Very High	5					
	High	4					
	Medium	3					
	Low	2	6.3, 6.4, 6.5, 6.6,	1.4, 1.5, 2.1, 2.3, 4.3, 6.1, 6.2, 8.3, 9.2, 9.3, 9.5, 9.6	1.1, 1.2, 1.3, 1.6 7.4, 8.4, 8.6		
	Very Low	1	8.5, 8.7	1.7, 2.2, 3.3, 4.2, 5.1, 5.2, 5.3, 9.1, 9.4	3.1, 3.2, 4.1, 5.4, 7.1, 7.2, 7.3, 7.5, 7.6, 8.1, 8.2		
			Trivial	Minor	Moderate	Major	Massive
			1	2	3	4	5

CONSEQUENCE

Table 4.5 *Risk matrix for Indaver facility (numbers in shaded cells are Risk IDs)*

The risk matrix indicates that there are no potential risks in the red or amber zone. All risks are located in the green zone which indicates the need for continuing awareness and monitoring on a regular basis. However, assessment of the risks has indicated that the risk score of a number of these risks can be reduced through the implementation of mitigation measures. These risk mitigation measures will be adopted where considered cost-effective and appropriate.

5.0 RISK TREATMENT

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. Since its development the facility has been designed, constructed and operated to minimise risk in every aspect of its operations.

Though additional suitable hazardous waste streams are now accepted at the facility, the same mitigation measures are in place to ensure the risk of an accident or environmental incident at the site is minimised.

On the basis of the risks identified above a statement of measures is not presently considered necessary but Indaver will continue to review operations to identify additional environmental mitigation as the need arises.

As Risk ID 7.4 has the potential to incur greatest financial liability, it is only identified risk associated in the statement of measures. Each mitigation measure for a major fire in the waste bunker has been listed. Indaver intends to review its statement of measures regularly in accordance with the onsite schedule basis and identify additional risk reduction measures where possible.

Risk ID	Area	Potential Risk	Risk Score	Mitigation Measures to be Taken	Outcome	Action	Completion Date	Responsible Person
7.4	Waste Storage Bunker	Major fire in the waste bunker leading to generation of fire water	6	Strict waste acceptance procedures and checks on waste being accepted to the site. Any localised fires will be removed using the grab. Waste bunker is visually monitored, and any localised fires will be removed using the grab. Water cannons are in place in the waste bunker designed to suppress fires in the waste. Water cannons can be controlled from the control room to target exact locations of fires. There are UV/IR combined fire detectors in the waste bunker to detect any fires in the waste. There are also heat detection cameras. The site has received the HPR (Highly Protected Risk) award from its fire protection insurance provider. This is a very prestigious award and demonstrates Indaver's commitment to ensuring no fire events occur at the site and that the systems in place are more than sufficient for the site. This award is given to plants that are judged to be subject to a much lower than normal probability of loss by virtue of low hazard occupancy or property type, superior construction, special fire protection equipment and procedures, and management commitment to loss prevention. FM have only given the award to one other waste to energy plant out of the 20 to 25 facilities similar in nature to us in Europe.	Cessation of waste activities and pollution from fire event	Clean up, environmental monitoring and ongoing review	Ongoing	Site Operator

Table 5.1 *Statement of risk mitigation measures*

6.0 IDENTIFICATION OF PLAUSIBLE WORST-CASE SCENARIO

The ELRA for this facility hasn't identified any risks with major consequences. There were seven risk scenarios identified with moderate consequences with a low likelihood. These were Risk ID No.'s *1.1 (Release of diesel from a truck fuel tank or similar vehicle (< 500 litres) due to crash, accident or overfill/non-closure of fuel tank.), 1.2 (Spill from truck carrying sludge waste to waste bunker), 1.3 (Truck delivering lime(<26t), spill on delivery), 1.6 (Accidental release of non-hazardous liquid waste (up to 30m3) to hard-standing area.), 7.4 (Major Fire in the Waste Bunker leading to generation of Firewater) 8.4 (Release of up to 8.4 tonne of transformer oil (PCB free) to bund.), and 8.6 (Spill of hazardous residue onto floor or which could get into the environment e.g. explosion. Dry boiler ash or flue gas residue could escape into the atmosphere).*

AWN has determined that while these risk scenarios have the most significant consequences on the environment they do not, in terms of determining events likely to result in greatest financial liability, represent the plausible worst-case scenario.

It is considered that Risk ID 7.4, *Major Fire in the Bunker leading to generation of firewater,* has the potential to incur greatest financial liability (as was similarly identified in the previous 2018 ELRA). The other risk ID's listed above also have the potential to incur significant clean-up/remediation costs however on balance it is considered that Risk ID 7.4 will incur greater costs.

The EPA guidance advises that the plausible worst-case scenario should be determined based on the highest environmental consequence and does not account for likelihood. Table 7.1 overleaf presents the likely costs for Risk ID 7.4.

7.0 QUANTIFICATION AND COSTING

The plausible worst-case scenario has been quantified and costed in Table 7.1.

Task	Description	Quantity	Measurement Unit	Unit Rate (€)	Cost (€)	Source of Unit Rates
RISK ID 7.4 **Major Fire in Waste Bunker leading to generation of Firewater**	Fire Service Attendance at Site – 1 day (Note 1)	1	Day	€720/hr per tender	69,120	Indaver Estimate and information from fire service
	Allowance for testing of Firewater (Note 2)	3	Unit	1,200	3,600	AWN Consulting Estimate
	Disposal of Firewater (rate applied is for disposal of contaminated firewater unsuitable for local WWTP treatment due to hazardous waste content) including transport.	2,185	Cubic meters	250	546,250	Indaver Waste treatment department
	Removal off site of Fire Damaged Materials – not suitable for incineration (allowance for up to 7,111 tonnes @€300tonne) (Note 3)	7,111	Unit	300	2,133,300	Indaver Waste treatment department
	Environmental Consultancy and monitoring post fire to confirm extent of impact (Air Quality Assessment and Dispersion Modelling, Groundwater and Surface Water)	1	Report	35,000	35,000	AWN Consulting Estimate
	Environmental Air Quality Monitoring	100	Samples	185	18,500	AWN Consulting Estimate
	Utility Costs: Electricity (Note 4)	19MWh/day	MWh	70	25,295	Indaver Estimate
	Utility Costs: Water	14	Day	12	168	Indaver Estimate
	Equipment hire- vacuum tanks (To clean out drains, pipelines, bunker hardstand, fire water retention tank etc)	14	Day	1,500	21,000	Indaver Estimate
	Equipment hire-Crane with grab	14	Day	1,750	24,500	Indaver Maintenance Team
	Diesel for auxiliary burners for controlled shutdown	16000	L	0.7	11,200	Indaver Estimate
	Management and Security Costs	2	Weeks	56,615	113,230	Indaver Estimate
	Combustion gases to air without treatment (costs for assessing impact and remediation if necessary) (Note 5)	1	Report	18,000	18,000	AWN Consulting Estimate
	Structural Assessment of the Bunker (Note 6)	1	Report	7,500	7,500	Indaver Quotation by Structural Engineer
	Contractor demolition -Crane hire (300T crane plus 100T crane to set up the 300T one)	14	Days	2,500	35,000	Indaver Estimate
	Demolition and removal of any metal structures over or within the bunker (steel/aluminium/cabling/insulation etc (Contractor Costs) (Note 7)	14	Days	13,385.71	187,400	Independent Cost Survey
	Clean up of site surrounds from fire, internal cleaning also	14	Days	1,152	16,128	Indaver Contractor costs
	Total (€)				3,265,191	
	Contingency at 25% (€)				816,298	
	Total Inc. contingency (€)				4,081,489	

Table 7.1 Costing for Worse-Case Scenario

Note 1: Fire assessments completed for the facility indicate that sufficient water is available on site to fight a 2-hour fire without the need for external fire service attendance. For the purposes of a conservative assessment we have counted for 4 stations @ €720/tender/hour, for 1 day (24 hours) for these cost should the fire services attend site. Calculation is 4*24*720 = €69,120.

Note 2: Fee for testing includes for collection of sample and analysis of sample for suitable suite on rapid turnaround to avoid any potential delay in commencing pumping and disposal of the firewater.

Note 3: Indaver have considered the potential for wastes unsuitable for incineration arising during a major fire scenario. It is considered that all wastes within the bunker at the time of the fire, building roof, walls etc that may be damaged during a fire will be suitable for incineration following the fire. (It is anticipated that much of the waste within the bunker, particularly waste at the base of the bunker will not burn due to lack of oxygen.

Note 4: Estimated 14 days usage, took the 19MWh per day from shutdown data at the site. Cost has come from accounts. Average price for 2021 is €70.07 (per MWh) * 14 (days) * 19 (MWh average day usage during shutdown)

Note 5: An impact assessment and remediation report would consist of an assessment of monitoring result and determination of what remediation measures will be required, if any.

Note 6: Indaver have considered the potential consequences of a major fire on the structural integrity of the bunker and conclude, given the construction and design of the bunker, that the bunker will remain intact even in the worst-case fire scenario. The bunker floor is 1.5m thick and the walls are 1m thick. The concrete of the floor was installed by continuous pour to ensure no structural weaknesses etc. Underneath the bunker is a liner (made of HDPE) and any leaks that could come from the bunker lead to a HDPE lined culvert. Every quarter a sample is taken from this culvert and the results are evaluated. To date there have been no unusual results and this demonstrates that the bunker is still intact. It is for this reason there is to be no loss to the environment. It is anticipated that there will be no need for any demolition or relining of the bunker following a fire. For the purposes of a conservative assessment, an allowance has been made for a post fire structural integrity assessment to confirm the bunker remains intact.

Note 7: An independent study was completed for the site in relation to demolition costs. The overall cost is €937,000 and the bunker roof is approximately 20% of the area so a cost of €187,400 applies

8.0 CONCLUSION

An ELRA has been completed for the activities carried out at Indaver Ireland Limited in accordance with current EPA guidance.

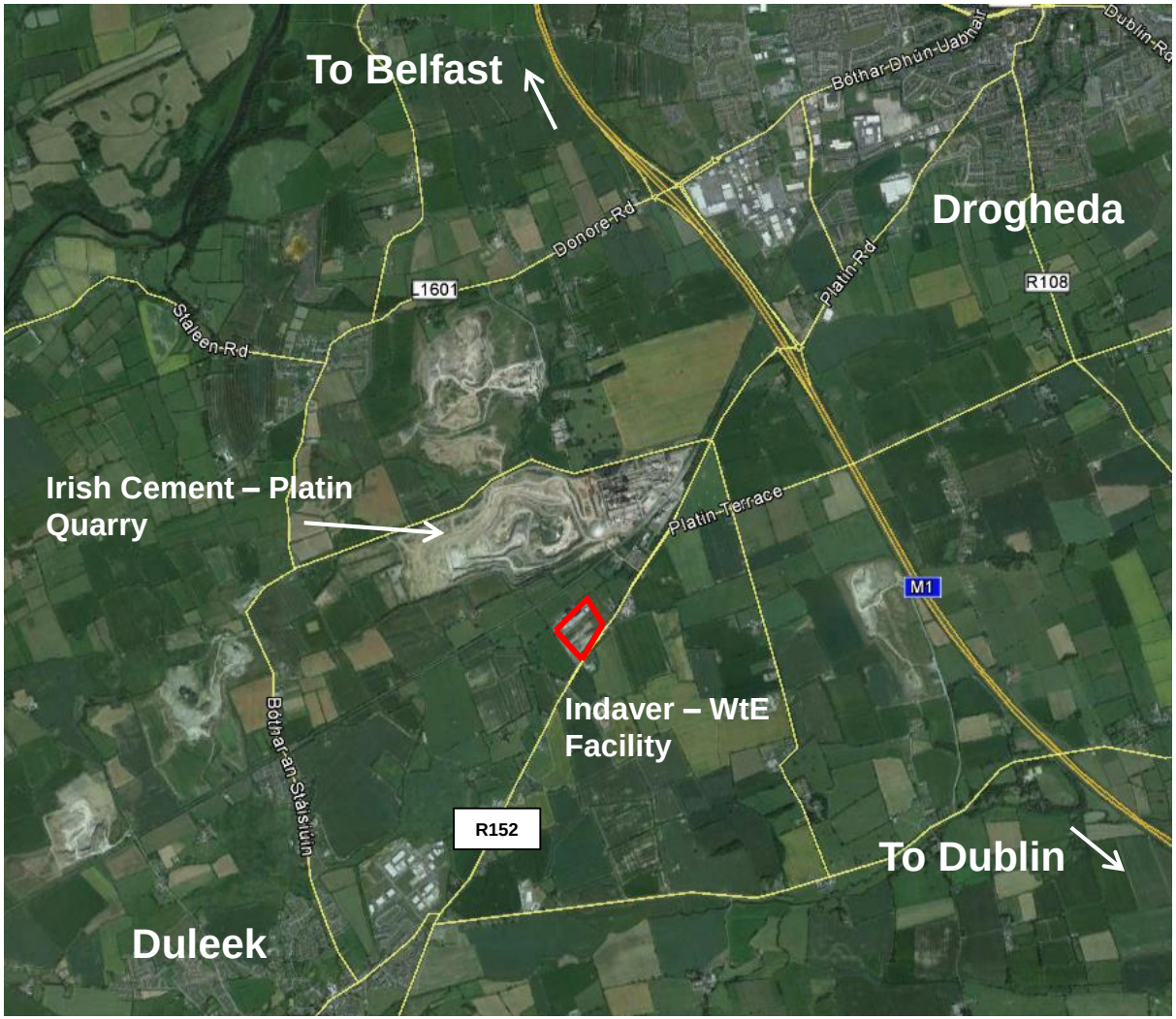
The potential environmental liability cost has been based on the risk that poses the plausible worst-case scenario. This is the maximum liability that may be incurred and, as such, financial provision is calculated as €4,081,489 based on this event.

The Indaver Group holds environmental liability insurance which provides for cover for pollution legal liability, contractor's pollution liability, on site clean-up, third party claims for off-site clean-up, third-party claims for bodily injury and property, biodiversity damage and transportation liability.

Risk management at Indaver is a dynamic process and will be revised through the addition of new risks or the omission of redundant risks. The financial provision will be reviewed in accordance with the requirements of the facility licence to ensure that it continues to cover the environmental liabilities.

Indaver holds extensive Environmental Liability Insurance for the facility and separately it is proposed that a bond will act as financial provision for the identified unknown liabilities in this report. There is a bond in place currently and it will be updated to reflect this report once agreed with the Agency.

Figure 1 – Site Location



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Source: Google Earth

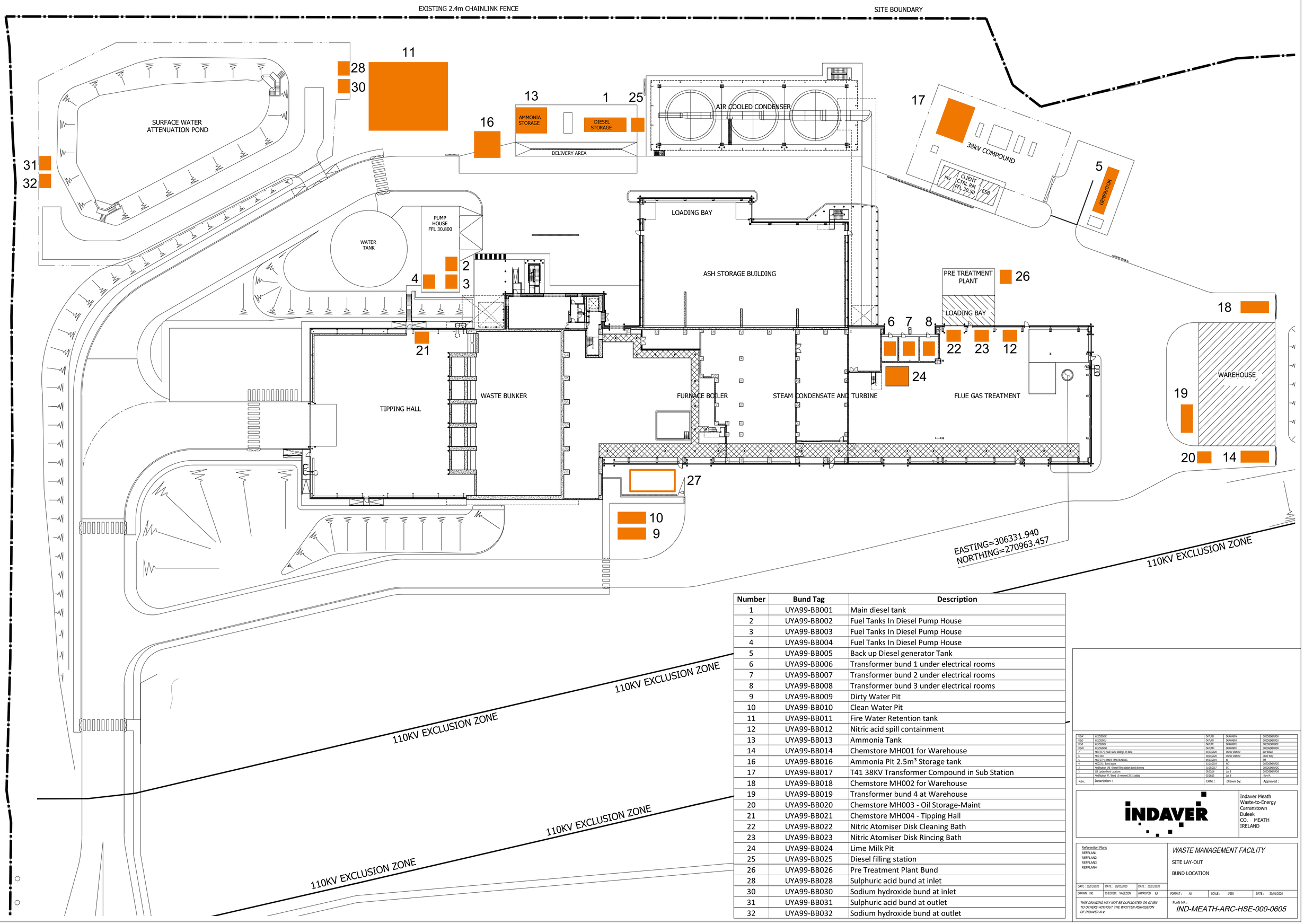
Drawing is for illustrative purposes only. Do not use to scale.

awnconsulting
The Tecpro Building, Clonshaugh Business & Technology Park, Dublin 17
T: +353 1 847 4220 F: +353 1 847 4257

Project:	Client:	Reference:	
Environmental Liability Risk Assessment (2018 Review)	Indaver Ireland Ltd.	GR/18/10175R02	**Figure 1**
	Drawing: Site Location Map		

Figure 2 – Site Layout

NOTES



Number	Bund Tag	Description
1	UYA99-BB001	Main diesel tank
2	UYA99-BB002	Fuel Tanks In Diesel Pump House
3	UYA99-BB003	Fuel Tanks In Diesel Pump House
4	UYA99-BB004	Fuel Tanks In Diesel Pump House
5	UYA99-BB005	Back up Diesel generator Tank
6	UYA99-BB006	Transformer bund 1 under electrical rooms
7	UYA99-BB007	Transformer bund 2 under electrical rooms
8	UYA99-BB008	Transformer bund 3 under electrical rooms
9	UYA99-BB009	Dirty Water Pit
10	UYA99-BB010	Clean Water Pit
11	UYA99-BB011	Fire Water Retention tank
12	UYA99-BB012	Nitric acid spill containment
13	UYA99-BB013	Ammonia Tank
14	UYA99-BB014	Chemstore MH001 for Warehouse
16	UYA99-BB016	Ammonia Pit 2.5m³ Storage tank
17	UYA99-BB017	T41 38KV Transformer Compound in Sub Station
18	UYA99-BB018	Chemstore MH002 for Warehouse
19	UYA99-BB019	Transformer bund 4 at Warehouse
20	UYA99-BB020	Chemstore MH003 - Oil Storage-Maint
21	UYA99-BB021	Chemstore MH004 - Tipping Hall
22	UYA99-BB022	Nitric Atomiser Disk Cleaning Bath
23	UYA99-BB023	Nitric Atomiser Disk Rincing Bath
24	UYA99-BB024	Lime Milk Pit
25	UYA99-BB025	Diesel filling station
26	UYA99-BB026	Pre Treatment Plant Bund
28	UYA99-BB028	Sulphuric acid bund at inlet
30	UYA99-BB030	Sodium hydroxide bund at inlet
31	UYA99-BB031	Sulphuric acid bund at outlet
32	UYA99-BB032	Sodium hydroxide bund at outlet

Rev.	Description :	Date :	Drawn by:	Approved :
REVK	W1252ING9K	24TJAN	DIANABYK	GDEDGENSUBDK
REVJ	W1252ING9J	24TJAN	DIANABYJ	GDEDGENSUBDJ
REVI	W1252ING9I	24TJAN	DIANABYI	GDEDGENSUBDI
REVH	W1252ING9H	24TJAN	DIANABYH	GDEDGENSUBDH
7	MOD 317 / Made some addings on table	01/07/2020	Chiriac Vladimir	Ian Wilson
6	MOD 303	20/01/2020	Chiriac Vladimir	Oliver Kelly
5	MOD 277 / BAKER TANK BUNDING	04/07/2019	KL	BM
4	MOD231 / Bund layout	31/01/2019	NCJ	GDEDGENSUBDD
3	Modification 146 / Diesel filling station bund drawing	31/05/2017	SYJ	GDEDGENSUBDC
2	118 Update Bund Locations	29/03/16	Luc B	GDEDGENSUBDB
1	Modification 97 / Bund 15 removed 20-21 added	03/08/15	Luc B	Rory M.

INDAVER

Indaver Meath
Waste-to-Energy
Carranstown
Duleek
CO. MEATH
IRELAND

Referention Plans
REFPLAN1
REFPLAN2
REFPLAN3
REFPLAN4

WASTE MANAGEMENT FACILITY

SITE LAY-OUT

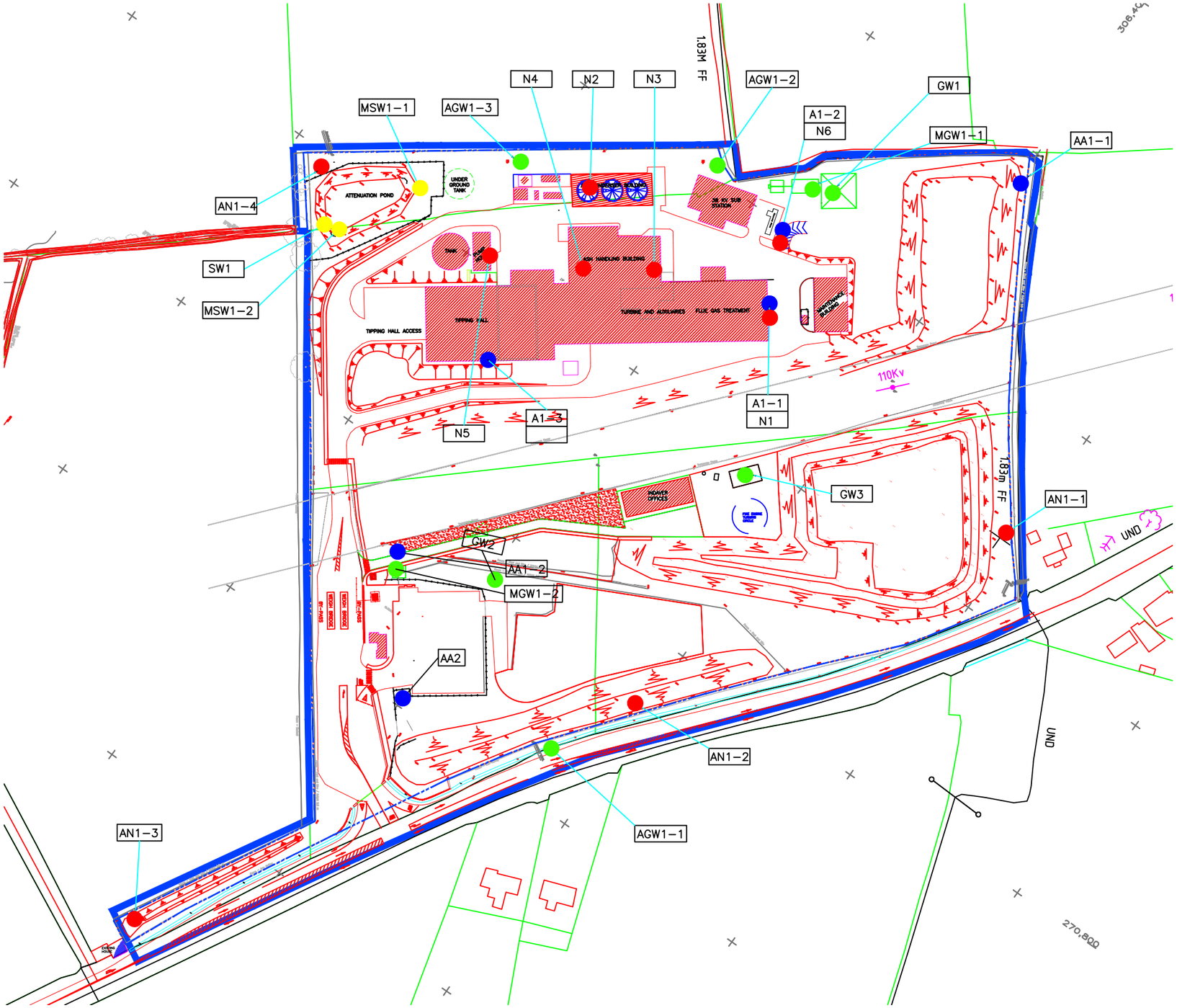
BUND LOCATION

DATE : 20/01/2020	DATE : 20/01/2020	DATE : 20/01/2020			
DRAWN : KKI	CHECKED: NAGEDEN	APPROVED : RA	FORMAT : A0	SCALE : 1/250	DATE : 20/01/2020

PLAN NR :

IND-MEATH-ARC-HSE-000-0605

Figure 3 – Emissions Monitoring Locations



NAME		LABEL
A1-1	●	STACK AIR EMISSION/MONITORING POINT
A1-2	●	EMERGENCY GENERATOR AIR EMISSION
A1-3	●	CARBON UNIT AIR EMISSION
AA1-1	●	DOWNWIND ODOUR MONITORING
AA1-2	●	UPWIND ODOUR MONITORING
SW1	●	SURFACE WATER DRAINAGE OUTFALL EMISSION
MSW1-1	●	SURFACE WATER MONITORING CHAMBER 1
MSW1-2	●	SURFACE WATER MONITORING CHAMBER 2
GW1	●	GROUNDWATER PERCOLATION AREA EMISSION
GW2	●	GROUNDWATER PERCOLATION AREA EMISSION
GW3	●	GROUNDWATER PERCOLATION AREA EMISSION
MGW1-1	●	GROUNDWATER PURAFLO MONITORING CHAMBER
MGW1-2	●	GROUNDWATER PURAFLO MONITORING CHAMBER
AGW1-1	●	UPSTREAM GROUNDWATER MONITORING WELL
AGW1-2	●	DOWNSTREAM GROUNDWATER MONITORING WELL 1
AGW1-3	●	DOWNSTREAM GROUNDWATER MONITORING WELL 2
N1	●	STACK NOISE EMISSION
N2	●	AIR COOLED CONDENSOR NOISE EMISSION
N3	●	TURBINE COOLING NOISE EMISSION
N4	●	GRATE COOLING No's 1& 2 NOISE EMISSION
N5	●	PUMP HOUSE LOUVER NOISE EMISSION
N6	●	EMERGENCY GENERATOR LOUVRE NOISE EMISSION
AN1-1	●	AMBIENT NOISE MONITORING 1
AN1-2	●	AMBIENT NOISE MONITORING 2
AN1-3	●	AMBIENT NOISE MONITORING 3
AN1-4	●	AMBIENT NOISE MONITORING 4
AA2	●	WEATHER MONITORING STATION

McElroy Associates
Consulting Engineers & Project Managers
72 Haddington Road, Ballsbridge, D4.
Tel: 660 9000 Fax: 660 9099
E-Mail: info@mea.ie Web: www.mea.ie

Rev.	Description:	Date :	Approved:
C	UPDATE LOCATIONS	13/09/2013	OK
B	REISSUED FOR WASTE LICENCE	25/10/2012	MC
A	ISSUED FOR WASTE LICENCE	19/04/2012	MC

INDAVER

Plant:
INDAVER IRELAND ltd
4 HADDINGTON TCE
DUN LAOGHAIRE
CO DUBLIN
TEL: +353 1 21 45 830
FAX: +353 1 28 07 885

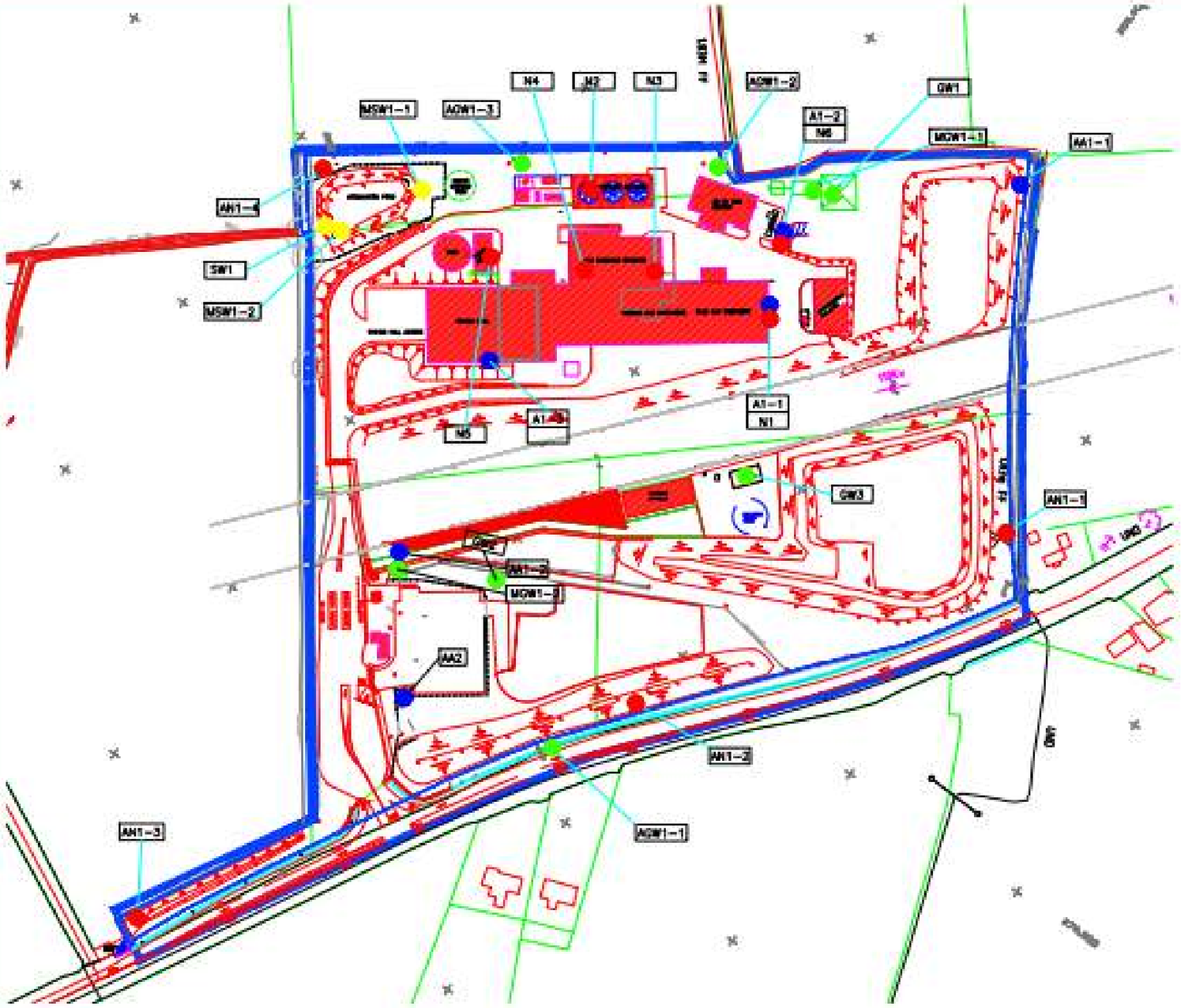
Reference drawings:

INDAVER MEATH

EMISSION AND MONITORING POINTS
SITE PLAN

DATE: 13/09/2013	DATE:	DATE:	
DRAWN BY: TDR	CHECKED:	APPR.:	
FORMAT: A3	SCALE: 1/2500	DATE: 13/09/2013	

DRAWING NUMBER:
MEA-MEATH-HSE-DWG-000-7401



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McElroy Associates
Consulting Engineers & Project Managers

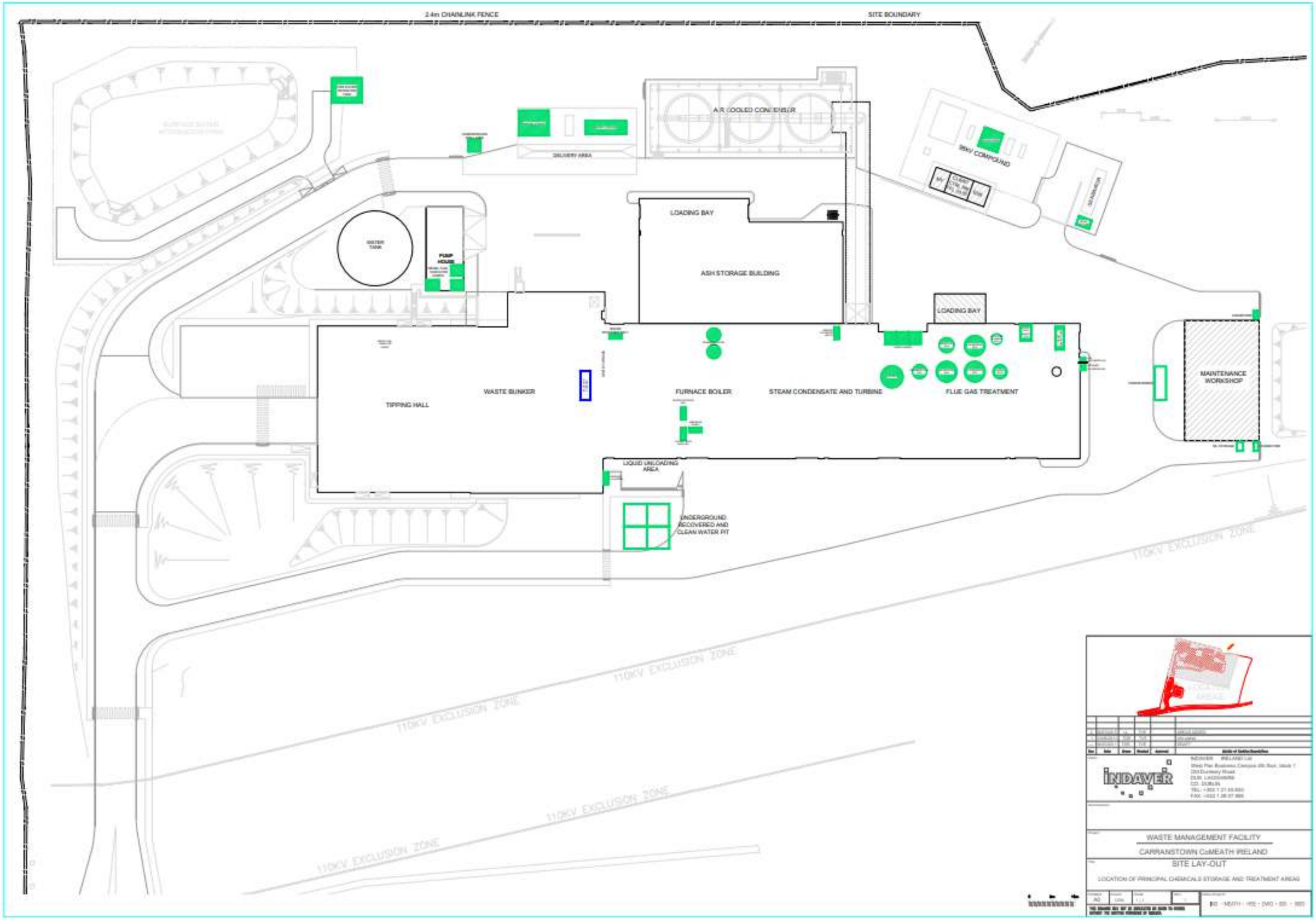
INDAVER

INDAVER MEATH

EROSION AND MONITORING POINTS
SITE PLAN

MEA-MEATH-HSE-DWG-000-7401

Figure 4 - Location of Principal Chemicals Storage and Treatment Areas


2.4m CHAINLINK FENCE
SITE BOUNDARY
A/R COOLED CONDENSER
DELIVERY AREA
WATER TANK
PUMP HOUSE
LOADING BAY
ASH STORAGE BUILDING
WEIGHBRIDGE
WEIGHBRIDGE
LOADING BAY
MAINTENANCE WORKSHOP
TIPPING HALL
WASTE BUNKER
FURNACE BOILER
STEAM CONDENSATE AND TURBINE
FLUE GAS TREATMENT
LIQUID UNLOADING AREA
UNDERGROUND RECOVERED AND CLEAN WATER PIT
110KV EXCLUSION ZONE
110KV EXCLUSION ZONE
110KV EXCLUSION ZONE
110KV EXCLUSION ZONE
INDAVER
WASTE MANAGEMENT FACILITY
CARRANSTOWN CoMEATH IRELAND
SITE LAY-OUT
LOCATION OF PRINCIPAL CHEMICALS STORAGE AND TREATMENT AREAS

Appendix A – Inventory of Chemicals stored On-site.

No.	Chemical Name	CAS Number	Storage Area	Container/Drum Size	Amount Stored on Site	Nature of Use	Hazard Statement	Danger Category
	Process							
1	Ammonia Solution (25% v/v)	1336-21-6	Double skinned tank Hardstanding Area with spill drainage channel	62 m3	1	Neutralise the NOx present in the flue gas	H314 H400	Skin Corr. 1B Aquatic Acute 1
2	Diesel	94114-59-7	Double skinned tank/IBC in Hardstanding Area with spill drainage channel	52.9 m3	1	Control heating/cooling of the furnace	H350 H351	Carc. 2
3	Sodium Hydroxide (30% v/v)	1310-73-2	Jerricans in the Flue Gas Treatment Area	0.15 m3	1	Stabilise the pH of the boiler drum	H314	Skin Corr. 1A
4	Nitric Acid (27%)	7697-37-2	IBCs in the Flue Gas Treatment Area	3 m3	1	Pipework and atomiser cleaning	H272 H314	Ox. Liq. 2 Skin Corr 1B
5	Sodium Chloride	7647-14-5	Bags stored on pallets in Demineralisation Plant	4 tonnes	1			
6	Quicklime (95%)	1305-78-8	Silo in Flue Gas Treatment Area	115 m3	1	Neutralisation of the acids in the flue gas		
7	Hydrated Lime	1305-78-8	Silo in Flue Gas Treatment Area	150 m3	1	Neutralisation of the acids in the flue gas		
8	Activated Carbon	931-328-0	Silo in Flue Gas Treatment Area	80 m3	1	Adsorption of dioxins/furans in the flue gas		
9	Expanded Clay		Silo in Flue Gas Treatment Area	80 m3	1	Adsorption of dioxins/furans in the flue gas		
10	Ethylene Glycol	107-21-1	Closed loop vessels and IBCs in the Plant	12 m3	1	Cooling circuits	H302	Acute Tox. 4
11	Lubricant Oil		Tank in Turbine Hall	7 m3	1	Turbine		
12	Propane		Cage at Baker Tank	18-50 kg	22	Oil burners for start up; forklifts	H220	Flam. Gas 1
	Waste							
13	Waste Feed		Bunker	7111 tonnes	1	Waste		
14	Bottom Ash		Ash Storage Building	600 tonnes	1	Waste		
15	Boiler Ash		Ash Storage Building	122 m3	1	Waste		
16	Flue Gas Residue		Ash Storage Building	476 m3	1	Waste		
17	Recovered Ferrous Metal		Receiving Hall	100 tonnes	1	Waste		
18	Non Ferrous Metal		Receiving Hall	25 tonnes	1	Waste		
19	Waste Oils		Spare Parts Warehouse	1000L	1	Waste		
20	Interceptor Residue		Temporary Storage IBC 1 m3	5 m3	1	Waste		
21	WEEE		Storage Yard	<25 T	1	Waste		
22	Recyclables		Waste Storage Area	20T	1	Waste		
23	Biowaste		Puraflo x2 and Septic Tanks	max. 65m3	1	Waste		
24	Miscellaneous Hazardous		Storage Yard	1T	1	Waste		
25	Solidified Residues		Curtian siders in the yard	100T	1	Waste		
26	Liquids for Injection		Aqueous liquid injection area	220T	1	Waste		
	Miscellaneous Chemicals / Oils / Greases / Lubricants							
27	Acetone	67-64-1	Chemstore	25L	1	not used		
28	ANTI-FREEZE COOLANT ELF FINOL 20 LTR		Chemstore	20L	1	Production		
29	Buffer Solution pH 4		Chemstore	1L	4	Pond		
30	Buffer Solution pH 7		Chemstore	1L	4	Pond		
31	Chilltech		Chemstore	25L	4	Production		
32	Conductivity Standard 1413uS/cm		Chemstore	500ml	4	Pond		
33	Disinfectant FAM 30 5L		Chemstore	5L	3	Production		
34	Ethylene Glycol	107-21-1	Plant	1000L	1	Cooling circuits	H302	Acute Toxicity
35	GREENOX Adblue (Urea)	57-13-6	Chemstore	20L	4	Production		
36	LUBRICANT BRILUBE 30 (20L)		Chemstore	20L	2	Lubricant		
37	LUBRICANT QUAKER 888-46 F/R 180KG		Chemstore	208L	3	Furnace and flue gas hydraulics		
38	Methanol	67-56-1	Chemstore	25L	1	not used		
39	OIL MOBIL DTE26 (208L)		Chemstore	208L	1	Lubricant		
39	Pedrogen (Hydrogen Peroxide Solution)	7722-84-1	Chemstore	1L	1	Mech	H302 H318 H413	Acute Toxicity Irritant Aquatic Chronic
40	sulphuric acid	7664-93-9	Pond bund	200L	2	Easl (E+I)	H290 H315 H319	
41	Phosphoric Acid	7664-38-2	Chemstore	25L	4	not used	H314	Irritant (Skin Corrosive 1B)
42	REAGECON BUFFER SOL.TOC100 100PPM-500MLS		Chemstore	500ml	2	Pond		
43	RoClean 12		Chemstore	1kg	3	Mech		
44	RoClean 2	77-92-9	Chemstore	500g	3	Mech	H319	Irritant (Eye Irritant 2)
45	SODIUM BISULPHATE SOLUTION (25L DRUM)		Chemstore	25L	1	not used		
45	Sodium Hydroxide 22%		Chemstore	5L	1	CEMS multigas analyser		
46	Sodium Hydroxide	1310-73-2	Pond bund	200L	2	Easl (E+I)	H290 H314	
47	Sodium Persulphate	7775-27-1	Chemstore	25L	4	not used		
48	Testomat 2000		Warehouse	500ml	3	Production		
49	Thermbond		Chemstore	1 gallon	16	Maintenance		
50	Toluene	108-88-3	Chemstore	25L	1	Cleaning of dioxin probe during service	H225 H315 H304 H336 H373 H361d	Flammable Irritant STOT Aspiriation Tox. Toxic for Reproduction
51	Caustic Liquor		Chemstore	25L	2	Production		
52	CAT Transmission and Drive Train Oil		Chemstore	20L	1	Loader		
53	CAT Hydraulic Oil		Chemstore	20L	3	Loader		
54	CAT Extended Life Coolant		Chemstore	20L	1	Loader		
55	CAT Engine Oil		Chemstore	20L	1	Loader		
56	Karcher Machine Protector Advance 1		Chemstore	1L	5	Loader		
57	Karcher Active Cleaner		Chemstore	1L	1	Loader		
58	Disofil 32 Refractory Binder		Chemstore	5L	37	not used		
59	Carter SY 220		Chemstore	20L	2	Shutdown		
60	Ecocool 420 (Slugger Metal Working Fluid)		Mech	5L	1	Coolant for bandsaw		
61	Lubricant/Coolant for Bredel Hosepump		Warehouse	5L	4	Lubricant for hose		
62	MOBIL CHASSIS GREASE LB2		Mech	15L	1	Chassis grease		
63	MOBIL DTE 26		Mech	208L	2	Lubricant		
64	Mobil SHC 630		Chemstore / L4	20L	1	Lubricant		
65	MOBIL XMP 220		Mech	20L	2	Gearboxes		
66	Mobilgear 600 XP 150		Mech	20L	3	Bunker cranes		
67	Mobilgear 600 XP 220		Mech	20L	2	Gearbox oil		
68	Mobilgear 600 XP 460		Mech	20L	2	Gearbox in the maturation silo		
69	Mobilgear 600 XP 680		Mech	20L	2	Gearbox in the maturation silo		
70	Mobilgrease XHP 222		Mech	400g	12	Bearings		
71	Mobil NUTO H 46		Chemstore	20L	1	Pumps		
72	Total Preslia GT 46		Chemstore	208L	4	Lubricant for turbine		
73	Ridgid Dark Thread Cutting Oil		Mech	2L	1	Thread cutting machine oil		
74	TOTAL PRESLIA GT46		Chemstore	208L	3	Lubricant		
75	Total Multis Complex EP3		Mech	400g	12	Motor grease		
76	Renolith 443 HD 88		Mech	400g	12	Double deck		
	CEMS Gases							
77	Hydrogen	1333-74-0	CEMS/Cage	50L	4	Continous Emissions Monitoring	H220 H280	Flammable Gases under Pressure
78	Ineregen Mixture of Gases (Oxygen, Carbon Dioxide, Argon 93%)	7440-37-1	Plant	143kg	3	Fire Suppression	H280	Gases under Pressure
79	Mixture of Gases (Anhydrous Ammonia, Nitrogen 99.98%)	7727-37-9	Cage	10L	2	Continous Emissions Monitoring	H280	Gases under Pressure
80	Mixture of Gases (Carbon Dioxide 12%, Nitrogen 88%)	124-38-9 7727-37-9	CEMS/Cage	50L	2	Continous Emissions Monitoring	H280	Gases under Pressure
81	Mixture of Gases (Dinitrogen Oxide, Nitrogen 99.998%)	7727-37-9	CEMS/Cage	50L	2	Continous Emissions Monitoring	H280	Gases under Pressure
82	Mixture of Gases (Hydrogen chloride, Nitrogen 99.76%)	7727-37-9	Spray Dryer	10L	1	Continous Emissions Monitoring	H280 H314	Gases under Pressure Corrosive (Skin Corr. 1B)
83	Mixture of Gases (Nitrogen dioxide, Nitrogen >99.99%)	7727-37-9	CEMS	50L	1	Continous Emissions Monitoring	H280	Gases under Pressure
84	Mixture of Gases (Oxygen, Nitrogen 99.6%)	7727-37-9	Spray Dryer/Cage	50L	3	Continous Emissions Monitoring	H280	Gases under Pressure
85	Mixture of Gases (Oxygen, Nitrogen 92%)	7727-37-9	Spray Dryer/Cage	50L	2	Continous Emissions Monitoring	H280	Gases under Pressure
86	Mixture of Gases (Oxygen, Nitrogen 98%)	7727-37-9	CEMS/Cage	50L	2	Continous Emissions Monitoring	H280	Gases under Pressure
87	Mixture of Gases (Propane, Nitrogen >99.99%)	7727-37-9	CEMS/Cage	50L	2	Continous Emissions Monitoring	H280	Gases under Pressure
88	Mixture of Gases (SO2, CO, NO, Nitrogen >99.9%)	7727-37-9	CEMS/Cage	50L	3	Continous Emissions Monitoring	H280 H332	Gases under Pressure Acute Tox. 4
89	Mixture of Gases (Sulphur dioxide, Nitrogen >99.91%)	7727-37-9	Spray Dryer/Cage	10L	3	Continous Emissions Monitoring	H280	Gases under Pressure
90	Nitrogen	7727-37-9	CEMS/Cage	50L	3	Continous Emissions Monitoring	H280	Gases under Pressure

Appendix B Emergency Response Plan

Meath Site Emergency Plan

Prepared by:	*Managed by:*	*Training Required*
Denis Spillane	Aidan Kennedy	No

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Meath Site Emergency Plan

1. SAFETY

1.1. PRODUCTS

Indaver has made a significant investment in the design, construction and safety systems, procedures, training and equipment to ensure that emergency situations that can arise can be dealt with as safely and efficiently as possible.

1.1.1 . Plant Design

The Meath plant buildings, facilities and equipment have been designed in accordance with regulatory requirements and best practice including:

- Building Regulations Technical Guidance Note B Fire Safety (Fire Certificate received from local authority).
- Relevant Irish/European Standards (IS EN).
- Insurance Company Standards (FM Global).
- Indaver Corporate guidelines which are based on operational experience of similar plants.
- Consultation with Fire Brigade.

1.1.2 . Means of Escape

Escape routes, fire protection and ventilation of escape routes, travel distances to exits, emergency exits, and normal and emergency lighting, have been designed and provided in accordance with the requirements of the Building Regulations and relevant Irish & European standards. A fire safety certificate was received from the local authority approving the building and facilities design with respect to the above. A drawing showing the access/egrees from the main process building and the designated Assembly Point is referenced in Section 6.4.1 below.

1.1.3 . Fire Detection & Alarm System

The fire alarm system is the primary means of alerting people to an emergency situation and the need to evacuate. The devices on the system include:

- Optical Smoke Detectors, Heat detectors, and UV/IR Flame Detectors located throughout plant.
- VESDA Aspirating Smoke Detectors in MCC Room cabinets, VSD room, Technical Galleries and Turbine Hall.
- CCTV monitoring of key process operations (i.e. ash hall, hopper, bunker, turbine etc.).
- Fire Alarm Break Glass Units located throughout plant.
- Local alarms (sounders and strobes) in individual areas and sitewide klaxon evacuation alarm.
- Master fire alarm panel located in MCC Room Boiler Area and a Repeater Panel (fully functional) located in Control Room.
- Mimic Panel (Synoptic Board) located in Control Room showing Building Layout, Individual Zones and LED Display showing location of alarm activation.

Inspection and testing of the fire detection and alarm system is carried out in accordance with relevant Irish standards (IS EN series) and regulatory requirements. The P&ID for the fire fighting system on site is referenced in Section 6.4.4 below.

1.1.4 . Firefighting Systems

Firewater is supplied in an external 250mm fire main to external fire hydrants and an internal 250mm fire main to fixed hose-reels, landing valves, water canons, sprinkler heads, and foam deluge systems on site.

The ring main is supplied by a combined firewater and process water tank. The tank has a total capacity of 2,185m^3 with a minimum firewater reserve capacity of 1,855m^3 which is sufficient to provide firewater for up to two hours. The tank is supplied with water from the on-site groundwater wells.

The firewater pump house is equipped with 3 No. diesel pumps (2 Duty/1 Standby) and an electrical jockey pump which are designed to maintain the pressure in the fire main between 10 -12 bar. Pressure regulating valves at the fire hydrants reduce the pressure to 4 - 6 bar for use with fire hoses. This arrangement ensures the availability of firewater for emergency response even if certain essential services such as electricity are unavailable during an emergency.

The firemain provides firewater to the following systems:

- External Fire hydrants located throughout the site.
- Internal fixed hose reels and landing valves.
- Automatic/Manual Dry and Wet Sprinkler Systems in the following areas: Tipping Hall & Waste Inspection Area, Bunker Crane Lay-down Areas, Auxiliary Burners, Firewater Pumphouse, Manual Deluge Systems in the following areas: Hopper (high level) and Turbine Bearings.
- 4 No. Water Cannons in Bunker Area.

AFFF foam is stored in a 1.3 m^3 foam tank which provides foam to the lube oil protection system.

An automatic/manual Inergen gas suppression system is provided in the Variable Speed Drive (VSD) room. Stage 1 and Stage 2 alarms together with sounders and strobes located inside and outside room will warn personnel to evacuate/not to enter room in event of Inergen activation.

Fire cabinets located close to external fire hydrants contain sections of fire hose, branchpipe hose nozzles, hydrant keys, bars and standpipes. Fire cabinet(s) located at the 38kV compound has sections of fire hose, containers of foam concentrate, foam branchpipes, and foam inductors.

Different types of portable fire extinguisher (water, foam, carbon dioxide, dry powder) are mounted in prominent positions throughout the site.

Drawings showing the location of the external firemain and hydrants and a schematic of the internal fire-fighting system are referenced in Section 6.4.2 & 6.4.3 below.

1.1.5 . Fire Blankets

Fire blankets are mounted in appropriate locations suitable for small fires and wrapping individuals in.

1.1.6 . Smoke Ventilation

Manual smoke vents are located in the Tipping Hall, the Bunker, Bottom Ash Hall, and Administration Building Stairwells. With respect to the smoke vents in the Bunker these will activate once water flow is detected to the dry sprinkler heads above the cranes in the bunker. Heat vents (permanently open air louvres) located on the building roof will also dissipate smoke from the building in the event of a fire situation.

1.1.7 . Control of Plant and Equipment in Fire Situations

In the event of certain fire situations the DCS will automatically bring to a safe state and/or shutdown specified plant and equipment including:

- Burner Gas Supply Slam Shut Valves Activated.
- Shutdown Fuel Oil Pumps.
- Close Primary Air Intake Damper at Bunker.
- Cranes in bunker return to home position.
- Turbine shutdown
- Shutdown of activated carbon & clay mixture dosing

- Shutdown of LAB hydraulic pack..

In addition, lifts will automatically return to ground floor in event of fire detection/plant evacuation alarm.

1.1.8 . Explosion Mitigation & Protection

An Explosion Protection Document (EPD) has been prepared for the site which details the measures taken to prevent the formation of flammable/explosive atmospheres, prevent ignition sources (e.g. EX-rated equipment) occurring, and mitigate the effects of an explosion. Areas with potential flammable atmospheres (EX-rated areas) identified on site are the Activated Carbon Silo & System, Pilot Fuel Propane Gas Cylinders, Hydrogen Cell and Cylinder at CEMS Room, and Flammable Chemical Storage Cabinets. Equipment in these areas is appropriately EX-rated. The activated carbon silo also incorporates a nitrogen inertion system and explosion pressure relief venting to a safe location.

1.1.9 . On-Site Locations for Management of Emergency Response

The on-site emergency response will be co-ordinated from the following locations:

- Emergency Control Centre (ECC): Plant Managers Office on Level 4 of the Administration Building or alternative location (e.g. indaver offices in construction village / Gatehouse) if the Office is unsafe to use in emergency situation.
- Control Room: Level 5 of the Administration Building.
- Assembly Point : Outside main facility entrance at the Gatehouse or alternative location if unsafe to use in emergency situation.
- Emergency Response Team (ERT) Room: Located adjacent to Diesel backup generator and pre-treatment plant offices

The Control Room contains the following equipment and documentation for use in an emergency situation:

- Site radio, Landline & Mobile Phone.
- Access to Safety Data Sheets (SDS's) for all chemicals used on site.
- Meath Site Emergency Plan.
- Indaver Emergency Contact Telephone List.
- Site Plan Drawings showing building layouts and location of emergency equipment.

A copy of the Indaver Emergency Contact List and this Emergency Plan will also be kept in the ECC where a site radio, landline and mobile phone are also available. The relevant documentation described above will be provided to the Fire Brigade.

1.1.10 . Communications

All ERT, production and maintenance personnel can communicate using site radios in an emergency situation. Upon activation of the Plant Evacuation Alarm, all parties involved in the execution of the Emergency Plan change to Channel 1 on the site radios. This channel is used exclusively for this type of event.

The Administration Building, Control Room and Gatehouse are equipped with landline phones.

The Control Room/ERT can be contacted on the site radio system or by dialing Extension 4017 in an emergency situation. The Control Room will then notify the ERT using site radios provided to the individual ERT members.

The Indaver Emergency Contact List is maintained in The Incident Management Plan and contains names of relevant Indaver personnel and external Emergency Services and agencies to be contacted in an emergency situation.

1.1.11 . First Aid

There will be a minimum of one occupational first aider on site at any one time. In addition, all members of the Emergency Response Team (ERT) are trained in emergency first aid. The names and contact numbers for the site occupational first aiders are displayed on prominent signage throughout the site. First aiders can also be contacted by dialing the control room on Extension 4017. First aid boxes are located at various central locations on site and a special Trauma bag is stored in the control room for more serious injuries. If necessary individual offices in the administration block can be used to administer first aid in an emergency situation.

1.1.12 . Safety Showers and Eyewash Stations

Safety showers and/or eyewash stations are located in areas of the site where there is a potential for exposure to hazardous materials. External safety showers and eyewash stations are fitted with trace-heating to prevent freezing during the winter months. A drawing showing the location of safety showers and eyewash stations referenced in Section 6.4.6 below.

1.1.13 . PPE

Appropriate Personal Protective Equipment (PPE) is provided for use by the site Emergency Response Team (ERT) and other site personnel in emergency situations. The exact PPE to be worn will depend on the emergency situation, but may include some or all of the following:

- Safety Glasses or Goggles
- Chemical Resistant Boots
- Chemical Resistant Gloves: Inner Nitrile and Nitrile Gauntlet Gloves
- Heat Resistant Gloves
- High Visibility Clothing
- Hard Hats
- Tyvek F Chemical Resistant Suits
- Full Face Masks with ABEK2 P3 Filters
- Portable self contained breathing apparatus (SCBA)
- Protective Clothing for Firefighting (Helmet, Flash Hood, Jacket, Leggings, Gloves, Boots).

- The PPE for use by the ERT is stored in a dedicated ERT room located adjacent to Diesel backup generator and pre-treatment plant offices.
- All PPE has been assigned in accordance with P0535 Assignement of PPE
- All PPE is donned and worn as per use of PPE training and in accordance with P0040 Use of Personal Protective Equipment.

1.1.14 . Containment of Liquid Releases (Spills/Leaks)

1.1.14.1 . Process Building

All waters produced from wash down etc. and any leaks/spills within the process building are directed to a underground containment tank with a capacity of 50m^3. Water from this tank will be used to supplement process water requirements or will be transported off-site for treatment or disposal to an appropriately permitted or licensed facility. There is no process effluent discharged from the facility.

1.1.14.2 . Storage of Hazardous Materials

Bulk tanks containing hazardous materials (ammonia, diesel fuel oil) are double skinned and equipped with interstitial leak detection. The tanks are also fitted with level monitoring and overfill protection. Pipe work from the bulk tanks is located over-ground, over paved areas and undergoes regular visual inspection.

There is a designated bulk tanker unloading area for diesel and ammonia which is graded towards an ACO channel. Prior to unloading a diversion valve on the surface water drainage system is activated which diverts the drainage from the ACO channel to an underground Retention Forecourt Separator. This ensures that during tanker unloading any spills/leaks are contained within the unloading area and underground separator. Any contained spills of hazardous materials will be treated appropriately.

Aqueous hazardous waste liquid is accepted and stored on site in a 50 cubic meter storage tank located on the south road. The area has been designated as an ATEX zone and there are restrictions on the activities allowed in this area to prevent sources of ignition being present. The baker tank is double skinned and located in a bunded area, any potential spills are captured in the underground tank known as the “dirty water pit”. All material in the bund is transferrable directly to the furnace by pumps and fixed hosing.

All other hazardous materials on site are stored in smaller quantities (e.g. 200L drums, IBCs etc.) in individual bunded areas (e.g. spill pallets, trays, chemical storage cabinets) to contain any spills/leaks.

1.1.14.3 . Surface Water Drainage System

The site surface water drainage system has been designed in general accordance with Sustainable Drainage Systems (SuDS) principles and collects rainwater from all roofs, hardstanding areas, roads on site and which fall naturally towards these areas. A site services drawing showing the layout of the surface water drainage system is listed in Section 6.4.2 below.

The surface water drainage system routes the surface water (rainfall) from roads, hardstanding areas and building roofs to:

- a Class 1 Bypass Separator.
- a continuous online monitoring chamber (TOC, pH, Conductivity).
- a surface water attenuation pond with a capacity of 1,600m^3.
- a continuous online monitoring chamber (TOC, pH, Conductivity) on the outfall from the attenuation pond.
- local surface water drainage network and River Nanny.

The Class 1 Bypass Separator is designed to retain any oil/hydrocarbons present in the surface water runoff.

The pre-attenuation pond monitoring chamber diverts any contaminated runoff to an underground diverted water tank with a capacity of 300m^3. This water is re-used in the process where possible while the remainder is stored within the tank for off site treatment or disposal to a suitably licensed facility. Should this storage tank be filled the pre-attenuation pond monitoring chamber will go into overflow mode and allow water to pass into the attenuation pond.
The surface water attenuation pond and outfall pump is designed to provide a controlled pumped discharge from the site to the local surface water drainage network to prevent any downstream flash flooding. The discharge rate of 59.8 litres/second has been agreed with the local authority. The attenuation pond has been designed to cater for 1 in 30 year and 1 in 100 year storm events.
A second continuous online monitoring chamber on the outfall from the attenuation pond shuts-off the discharge pumps from the attenuation pond if any contamination in the discharge and retains the contaminated runoff in the attenuation pond.

The surface water attenuation system described above will prevent the discharge of any contaminated runoff from the site in the event of accidental leaks/spills or emergency situations.

1.1.14.4 . Contaminated Firewater Retention

Fire suppression is provided by an on site firewater storage tank with an effective fire-fighting storage volume of 2,185 m^3 as described in Section 3.1.4. Of the total tank capacity 100 m^3 is provided for process water requirements with 2,085 m^3 fully reserved for fire fighting. However in the event of a fire,

the process water requirement will not be needed and potentially all 2,185 m^3 will be available for fire fighting.

The greatest potential for fire at the facility arises within the waste bunker (water-tight) where localised heating can occur due to decomposition of organic material. Up to the level of the tipping hall, the bunker has a capacity of ca. 5,670 m^3 approximately. If a 50% voidage ratio is assumed for the waste, then there would be a retention capacity of 2,835 m^3 within the waste bunker. With 2,185 m^3 of water available for fire fighting, this demonstrates that all of the water would be retained within the bunker even in the most extreme fire event.

With respect to a fire occurring elsewhere in the process building or other buildings on site the firewater run-off will drain either to the process building 50m^3 capacity dirty / clean water pits or be contained by collection in the surface water drainage system as described in Section 3.1.14.3 which incorporates a 300m^3 diverted water tank and a 1,600 m^3 surface water attenuation pond.

A firewater retention study has been carried out for the facility to demonstrate that the above containment facilities are adequate to contain the maximum projected volumes of firewater runoff in an emergency situation.

1.1.14.5 . Spill Response Materials

Spill response materials such as spill mats, absorbent materials, brushes, non-sparking shovels, drum putty, drain blockers, litmus paper are located in designated locations in the plant.

1.1.15 . Monitoring Equipment

Monitoring equipment used on site to detect potential emergency situations and/or process upsets include:

- Smoke, heat and flame detectors.
- Closed Circuit Television Monitoring (CCTV) of key process operations.
- Process monitoring (Pressure, Temperature, Level etc.) as part of the DCS control system.
- Continuous emissions monitoring of atmospheric and surface water discharges.
- Interstitial leak detection on double-skinned chemical storage tanks.
- Level monitoring on bulk chemical tanks.
- Portable Gas Detectors (LEL, O_2, CO, H_2S) used by the ERT and for specified types of work (e.g. confined space entry) on site.
- Ammonia detector at bulk ammonia tank pump station.
- Oxygen Depletion and Hydrogen Detectors in Central Emissions Monitoring Room (CEMS).
- Litmus paper used for checking spills/leaks.

1.1.16 . Weather Monitoring

A windsock is located on the top of the main process building and the aqueous ammonia storage tank which can both be used for monitoring wind direction during an emergency. There is also a weather station located on site which records wind speed and direction, temperature, precipitation levels, humidity and atmospheric pressure which can be accessed remotely.

1.1.17 . Other Rescue Equipment

A variety of other equipment may also be used on site in emergency situations such as rescue equipment for confined spaces and work at height (e.g. Tripods & Winches, Harnesses & Lanyards, Escape Sets etc.).

1.1.18 . Inspection and Checking

All emergency equipment and facilities are inspected and maintained in accordance with regulatory requirements, relevant standards, and corporate requirements and is managed as part of the site maintenance management system using SAP.

1.2. IMMEDIATE RISKS

N/A

1.3. SDS

Safety Data sheets for all of the products used on site are kept in hard copy in the Control Room for use in emergency situations and the list of products used on site is referenced in Section 6.3 below.

2. CONTEXT

2.1. OVERVIEW

2.1.1 . Purpose

The purpose of this plan is to describe the emergency response process including roles, responsibilities, resources, facilities & equipment to identify, respond to, and address emergency situations.

2.1.2 . Definitions

2.1.2.1 . Local Emergency

An incident that can be handled at a local level by the operational team and/ or plant Emergency Response Team (ERT) without impacting on others part of the plant, personnel or environment e.g. first aid injury, minor spill etc.

2.1.2.2 . Plant Emergency

An incident that could have a significant adverse impact on on-site personnel and/or the Indaver plant and site environment e.g. serious injury, major fire.

2.1.2.3 . External Emergency

An incident that could have an adverse off-site impact e.g. major bunker fire with release of smoke-plume off-site, significant damage to off-site environment etc.

With respect to the above emergency situations, two different types of alarm signal may be generated:

- Local Alarm
- Plant Evacuation Alarm

2.1.2.4 . Local Alarm

Description: A local alarm is heard as a continuous siren with a varying amplitude.

Meaning: Local alarm (e.g. small fire) activated either manually or automatically in a specific part of the plant.

Individual local areas of the plant (Flue Gas Cleaning, Bottom Ash Hall, Steam/Condensate Area & Turbine, Furnace Boiler, Tipping Hall & Bunker, Administration Building, Warehouse and Construction Village) are equipped with local Sounders (different sound to Plant Evacuation Alarm) and Strobes which are activated by smoke / heat / flame detectors and break glass units in the local area.

These detectors and break glass units are not linked to the Plant Evacuation Alarm which requires manual activation from the Control Room. Production personnel investigate all local alarms and if necessary a direct communication (via site radio) will be sent from the Control Room to the Emergency Response Team (ERT) Members should there be a requirement for the ERT Team to respond.

2.1.2.5 . Plant Evacuation Alarm - Start:

Description: Intermittent siren (approx. 20 times / min.)

Meaning: Plant wide alarm (e.g. for large fire). Activated by key switch in Control Room.

In the event of a malfunction of the Plant Evacuation Alarm siren, the Control Room will issue an alarm message over site radio to individual personnel and a Manual Plant Horn will be activated by both the Shift Supervisor in the building and by the Gatehouse personnel outside the gatehouse.

2.1.2.6 . Plant Evacuation Alarm - End:

Description: Continuous non-waving flat sound of siren (approx. 1 minute)

Meaning: End of Alarm. Activated from the Control Room.

2.1.2.7 . Evacuation Drills & Alarm Tests

Tests on the Plant Evacuation Alarm are carried out every month on the third Thursday at 12:00.

Evacuation drills are arranged by the Plant Manager and are carried out bi-annually. A record of the evacuation list is kept by the site evacuation co-ordinator and filed by the Health & Safety manager as required under P0120 General Fire and Evacuation Procedure.

2.1.2.8 . Incident Management Team

The Incident Management Team is made up of RLT members and its function is to manage communications and information flow to all Key Stakeholders and to ensure Business Continuity in the event of a major incident at an Indaver facility in the Region (IRE & UK). Key Stakeholders include;

- Regulatory Authorities
- Indaver Staff
- Injured persons & next of kin
- Indaver Group
- Neighbours
- Insurance Company
- Media

As per the Incident Management Plan (reference Section 6.5 below), there are a defined set of criteria applied to any incident which will decide whether the Incident Management Plan is to be activated and in the event of any uncertainty, the plan is activated.

Once activated, the Incident Management Team is called to an appropriate location and in all scenarios, this location must be remote from the site where the incident has occurred.

2.1.3 . RESPONSIBILITIES

2.1.3.1 . Incident Controller (Plant Manager)

- Overall responsibility for ensuring there are adequate resources, training, facilities and equipment in place to address any emergency situations that may arise at the Meath plant.
- Establishes Emergency Control Centre (ECC) in Plant Managers Office or alternative location if emergency situation/safety considerations dictate.
- Proceeds to ECC in order to ascertain as much detail (i.e. number of injured persons, location, nature and extent of incident etc.) of the emergency as possible from the ERT Leader or from the person discovering the incident.
- Responsible for contacting the Emergency Services are contacted if they are required.
- Responsible for ensuring the sharing of valid information between emergency services and other regulatory bodies
- Briefs other ECC Members and co-ordinates activities in the Emergency Control Centre.
- Ensures that all roles identified in this procedure are assigned.
- Communicates with ERT Leader for duration of emergency situation.
- Communicates with the Site Evacuation Coordinator to ensure all persons are accounted for in the event of an evacuation.
- Communicates with Process Controller in Plant Control Room on any process control required during the emergency situation.
- Responsible for ensuring that the Emergency Services are brought directly into contact with the ERT Leader when they arrive on site. However, depending on the location of incident, the Incident Controller may request a production operator to meet the Emergency Services at the Gatehouse and bring them to the incident to meet with the ERT leader.
- Manages all other external communication required during emergency through the Incident Management Team.
- If, due to the scale or nature of an incident, the Incident Management Team is not established then the Incident Controller manages any external communciations required.
- In the absence of the EHS advisor, an assessment of the external impact of the emergency situation is undertaken. This may lead to sharing information with emergency services or regulatory bodies in order to ensure the safety of the environment and of the public.
- Decides on End of Emergency following consultation with ERT Leader and Emergency Services (if present on site) and instructs Process Controller to sound Plant Evacuation Alarm End.
- Follows (as appropriate) the Incident Controller Prompt Sheet in the Manuals and Plans section of the QESH MOSS page under “Plant Meath”.

2.1.3.2 . Site Liaison Officer (Production Manager)

- Proceed to Emergency Control Centre (ECC) upon hearing the Plant Evacuation Alarm.
- Establishes contact with the Emergency Services, as directed by the Incident Controller.
- Alerts Indaver Ireland Managing Director or RMT member as directed by Incident Controller so that a decision on establishing the Incident Management Team can be made.
- Assumes the role of primary contact with the Incident Management Team.
- All queries from incoming calls are to be passed to the Incident Management Team via the main reception number (01) 280 4534. If the Incident Management Team is not established, then the Site Liaison Officer will deal with such calls as directed by the Incident Controller.
- Meets external officials arriving on-site (HSA, EPA, Meath Co Co etc.) as directed by the Incident Controller.

2.1.3.3 . Information Officer (Process Engineer)

- Proceeds to the ECC upon hearing the Plant Evacuation Alarm.
- Records and documents the timing and sequence of events during the emergency situation.
- Assists the Site Liaison Officer as required.

2.1.3.4 . QESH Advisor (EHS Manager or deputy)

- Proceed to ECC upon hearing the Plant Evacuation Alarm.
- Complete an initial assessment of the potential impact to the environment or the public based on the emergency scenario.This assessment may be completed in co-ordination with any emergency services and regulatory bodies that are required. This information should be given to the incident controller to share with the emergency services and regulatory bodies.
- Advises Incident Controller on any actions required to mitigate EHS consequences of incident.
- Advises the Incident Controller on potential licence compliance issues and any required communication with relevant authorities (EPA, HSA).
- Once the immediate emergency scenario has been controlled, arrangements will be put in place for a review of the initial assessment and this may include further analysis e.g. air modeling study.
- An incident notification will be sent to the EPA as per procedure P0112.

2.1.3.5 . Emergency Response Team (ERT) Leader

- In the event of a Local Alarm, the ERT Leader awaits instruction from the Control Room and responds accordingly.
- Upon hearing the Plant Evacuation Alarm the ERT Leader proceeds directly to ERT Room.
- Contacts Control Room and ECC in order to ascertain as much detail of the emergency as possible from the person discovering the incident.
- Briefs the ERT Members on the situation in the ERT Room, designates role to each ERT member giving them specific instructions, assigns PPE for each role, and ensures they are adequately equipped.
- Completes roll-call of ERT members and informs Evacuation Coordinator of same.
- Proceeds to incident scene with the ERT and co-ordinates and leads the actions of the ERT.
- Directs Indaver occupational first aiders to treat any injured personnel as required.
- Assesses the incident scene and decides on additional actions and resources required.
- Contacts the ECC ASAP with the request for Emergency Services support.
- Briefs the Emergency Services and acts as the Indaver point of contact after their arrival on site. Takes lead from and provides assistance to Emergency Services Commander who takes control of incident after arrival on site.
- Stays in contact with the control room shift supervisor with regards to any required process actions (e.g. stop production equipment).
- Informs the ECC about the status and progress of the emergency response.
- Determines when the site is safe to return to normal operations with Emergency Services Commander and communicates to the Incident Controller to declare End of Emergency.

2.1.3.6 . ERT Members

- Proceed to ERT Room (unless otherwise directed by the ERT Leader) upon hearing the Plant Evacuation Alarm or upon notifciation by the ERT.
- Immediately donn emergency PPE and undergo briefing by ERT Leader.
- Executes the ERT role and tasks assigned by the ERT Leader in accordance with their training.
- Check their equipment and PPE including SCBA is in good working order prior to use.
- Always consider their own safety and that of their fellow team members before undertaking any hazardous tasks as part of emergency response.

2.1.3.7 . Occupational First Aiders (Day shift Leader / Deputy Day Shift Leader)

- If notified of personnel injury, proceed to location of injured personnel (provided it is safe to do so) with First Aid Trauma bag as specified by the ERT leader. If the injured person is located in a hazardous area, proceed to safe location to administer first aid in agreement with ERT Leader.
- In the event of a plant evacuation alarm, proceed to the control room and collect the First Aid Trauma bag and await instruction from ERT Leader.
- Provide first aid to injured personnel in accordance with training given.
- Remain with injured personnel until the arrival of the Emergency Services.

- Depending on the nature and severity of the injury, it may be necessary to accompany injured personnel if they are taken to hospital. The Occupational First Aider must notify the Incident Controller of this before departing the site and provide a mobile phone number so that he/she can be contacted. The Incident Controller may nominate a different person if the circumstances demand it (eg if a contractor is injured, his on-site supervisor may be a more appropriate person to accompany him).

2.1.3.8 . Site Evacuation Coordinator

- Proceeds directly to the designated Asembly Point upon hearing the Plant Evacuation Alarm.
- Manages activities of personnel (Traffic/Entry Controller, Visitors Guide), evacuees, and vehicles at the designated Assembly Point (Gatehouse or alternative).
- Obtains list of persons present on site from Gatehouse personnel and conducts roll-call of personnel at the Assembly Point.
- Confirms roll call with ERT leader, Shift Leader and Incident Controller at the Assembly Point.
- If any persons are missing, asks assembled personnel where missing persons were last seen.
- Informs the Emergency Control Centre (ECC) about roll-call status and any missing persons.
- Maintains contact with the ECC and changes Assembly Point location if situation dictates.
- Manages evacuees present at the Assembly Point to ensure they act appropriately during emergency situation (i.e. no smoking, no photographs, no standing in way of traffic, vehicles parked at side of road and engines switched off allowing access for the Emergency Services).
- Co-ordinates access control to site during emergency.
- Informs the ECC about arrival of external authorities and others (e.g. media) at the Gatehouse.

2.1.3.9 . Traffic/Entry Controller (Gatehouse personnel)

- Prints out list of persons present on site and hand to Site Evacuation Coordinator at the Assembly Point.
- Stops all incoming and outgoing traffic and manages traffic at entrance to ensure Emergency Services vehicles have free access.
- Depending on the situation and arrival of external parties, Gatehouse personnel will close the main gate upon discussion with the Site Evacuation Coordinator.
- Opens the normally locked pedestrian gate to prevent persons evacuating the site from “badging out” at the turnstyle and ensuring an accurate roll call is possible.
- Directs Emergency Services to ERT Leader/incident location on arrival on site (as requested).
- Controls entry of all persons to site. Prohibits entry of unauthorised persons unless specifically directed by Site Evacuation Coordinator.
- Assists the Evacuation Coordinator to keep all external persons (e.g. journalists or members of the public) outside the facility entrance.

2.1.3.10 . Process Controller (Control Room Shift Leader)

- Proceeds to Control Room in emergency situation.
- Coordinates the production activities during the Emergency Situation.
- Completes roll-call of production personnel present in Control Room and informs Evacuation Coordinator of same.
- Decides on activation of Local and Plant Evacuation Alarms based on consultation with Panel Operator and ERT Leader.
- Maintains contact with ERT Leader and ECC during emergency and makes any process changes (e.g. start/stop equipment) on request of ERT Leader.
- Co-ordinates activities of the Panel Operator and Production Operators during emergency situation.
- Directs the Panel Operator to activate End of Alarm Signal upon request of Incident Controller.
- Outside normal business hours:
    - Initiates the emergency response, coordinates activities of Panel Operator and Process Operator, and activates the Local and/or Plant Evacuation Alarm as deemed necessary.
    - Contacts the Emergency Services.
    - Contacts the Plant Manager and Manager on Call to inform them of the situation.

2.1.3.11 . Process Operators

- All production personnel proceeds to Control Room in emergency situation as directed by Process Controller.
- Undertakes tasks as directed by the Process Controller.
- Outside normal business hours, if instructed by Process Controller or by the Incident Controller during business hours, meet the Emergency Services at the Gatehouse and direct them to incident scene.

2.1.3.12 . Panel Operator (Control Room Panel Operator)

- Acts as collecting point for initial alarm messages.
- Activates the Local and Plant Evacuation Alarm Signals on direction of Process Controller or ERT Leader or based on own assessment of severity of situation.
- Alerts the ERT of emergency situations using site radio.
- Executes the process related actions as directed by the Process Controller.

2.1.3.13 . Visitors Guide

- Ensures public visitors are briefed on emergency procedures prior to commencing site visit.
- Guides the public visitors back to the Visitors Room (standard procedure) in event of Local Alarm.
- Guides the public visitors to designated Assembly Point in event of Plant Evacuation Alarm.
- Report to the Site Evacuation Coordinator at the Assembly Point for Roll Call.
- Organizes a debriefing of Visitors after end of emergency situation.

2.1.3.14 . Persons without Specific Responsibilities in Emergency Situation

On discovering fire, spill, or other emergency situation:

- In case of fire, activate the local area fire alarm by using the nearest Break Glass Unit.
- Contact Control Room on Extension 4017 or by site radio and follow their instructions.
- Make your job safe where possible e.g. stop machinery etc.
- Evacuate area as appropriate.
- Only tackle hazard (e.g. small fire or small spill) if safe to do so and if you have received appropriate training

On hearing a Local Alarm in the area you are in:

- Make your job safe where possible.
- Evacuate the local area following emergency exit signage and proceed to the Control Room (unless unsafe to do so).
- Walk, Do Not Run, Do Not Stop to Collect Personnel Belongings.
- Await further instruction from the Control Room.

On hearing the Plant Evacuation Alarm:

- Make your job safe.
- Proceed to the designated external Assembly Point (Located adjacent to the Gatehouse) following emergency exit signage and lighting.
- Walk, Do Not Run, Do Not Stop to Collect Personnel Belongings.
- Report to the Site Evacuation Coordinator at the Assembly Point for Roll-Call.

Contractors are made aware of these three scenarios and the actions to take during their site safety induction prior to entering onto the site.

Visitors should follow the instructions of their Indaver host .

2.2. ABBREVIATIONS/DEFINITIONS

ACO Drain/Channel	Grate-covered trench drain
A.F.F.F	Aqueous Film Forming Foam
BA Cylinders	Breathing Apparatus Cylinders
CCTV	Closed Circuit Television
CER	Commission for Energy Regulation
CEMS	Continuous Emissions Monitoring System
DCS	Distributed Control System (used to control & monitor the plant)
ECC	Emergency Control Centre
EPD	Explosion Protection Document
EPA	Environmental Protection Agency
ORPEM	Office of Radiological Protection and Environmental Monitoring (Formally EPA ORP and RPII)
ERT	Emergency Response Team
Emergency Services	Fire Service, Ambulance & An Garda Siochána
Ex Rated	Instruments & equipment that are designed to work safely in areas that could contain or always contain an explosive atmosphere
HSA	Health & Safety Authority
LEL	Lower Explosive Limit
MCC	Motor Control Centre
PPE	Personal Protective Equipment
RLT	Regional Leadership Team
Regulatory Authorities	EPA, HSA, Meath Co Co, CER, EIRGRID, Bord Gais-,ORPEM
SCBA	Self Contained Breathing Apparatus
SuDS	Sustainable Drainage Systems
TOC	Total Organic Carbon

3. OPERATING/WORK INSTRUCTIONS

3.1. EMERGENCY RESPONSE ORGANISATION

3.1.1 . Structure

The roles and responsibilities of individual personnel in an emergency situation are described in Section 4 and actions to be undertaken by individuals in an emergency situation are described in Section 5.2 and 5.3.

The full emergency response organisation including ERT is only present on-site during normal business hours (Monday to Friday 08:00 – 16:30), during which time full production (i.e. waste deliveries etc.) and maintenance activities take place. However, the plant incineration process operates on a 24-hour, seven day per week basis, with a reduced manning level outside normal business hours. Therefore due to the difference in manning levels, the emergency actions taken on-site will differ between normal business hours and outside normal business hours.

The management structure for dealing with emergencies is shown during normal business hours and outside normal business hours in shown below in Figures 1 and 2 respectively.

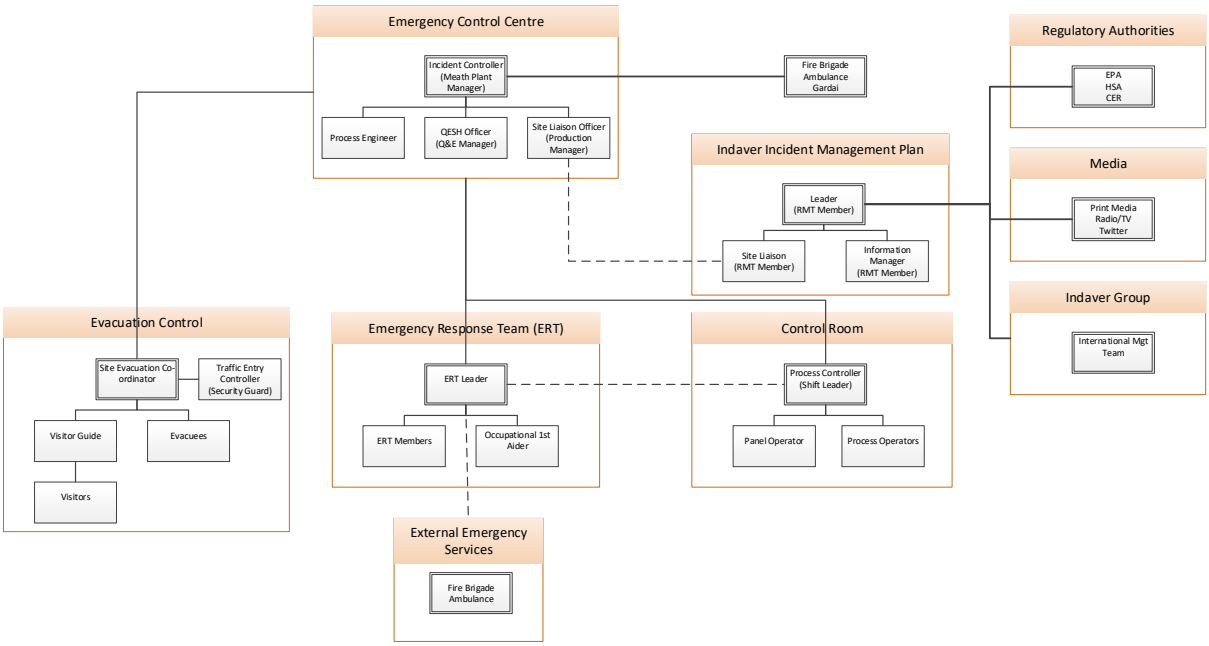

Figure 1: Structure of Emergency Response Organisation (During Normal Business Hours)

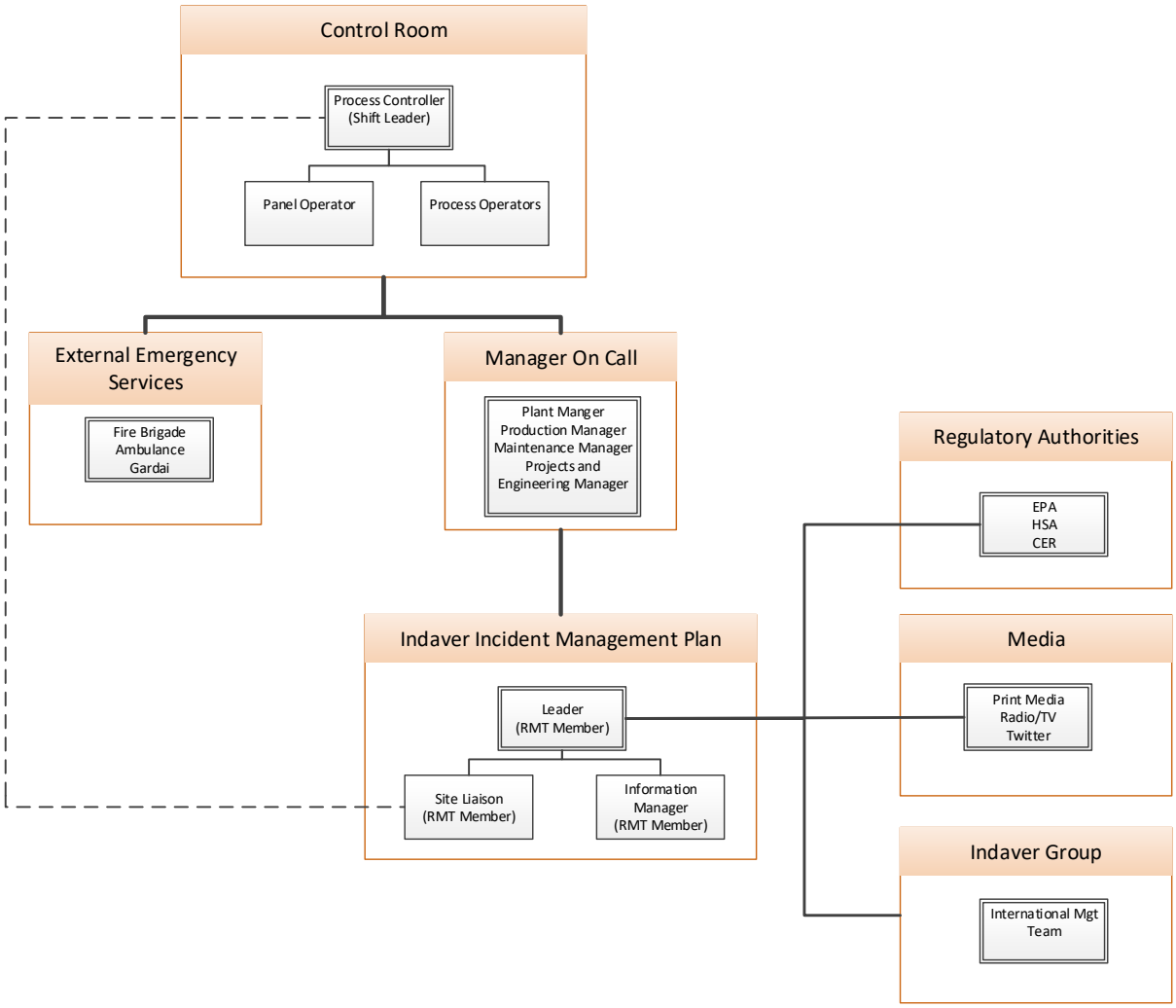

Figure 2: Structure of Emergency Response Organisation (Outside Normal Business Hours)

3.1.2 . Backup Personnel

In the event of absence (holidays, sick-leave, off-site business) of key personnel in the Emergency Response Organisation, the following personnel are nominated as backup.

Emergency Response Role	Primary Responsible	Nominated Backup
Emergency Control Centre		
Incident Controller	Plant Manager	Production Manager
Site Liaison Officer	Production Manager	Process and Enginerering Manager
QESH Advisor	Process and Engineering Manager	Production Manager
Information Officer	Process Engineer	Q&E Manager
Emergency Response Team (ERT)		
ERT Leader	Mechanical Technician	Maintenance Manager
Evacuation and Headcount (Assembly Point)		
Site Evacuation Co-Coordinator	Pretreatment team Leader	Pretreatment Deputy Team Leader
Control Room		
Process Controller	Shift Leader	Deputy Shift Leader
Process Operator	Shift Operator	Deputy Shift Leader
Panel Operator	Shift Operator	Deputy Shift Leader

The holidays of key personnel are managed to ensure a minimum level of coverage on site for the above roles. In the event of unexpected sick leave combined with holidays and personnel at meetings off-site there is a daily report of who is on site sent by Gatehouse personnel to the shift leader so that they can check to see if it is possible for the ECC to be established. If it is obvious from the list that it will not be possible, then the Shift Leader will follow the procedure outlined in Section 5.3.2 below for out of hours operation.

3.1.3 . Training and Emergency Response Drills

Appropriate training is delivered to members of the Emergency Response Organisation which is backed up by periodic drills and training exercises. The behaviour of personnel is monitored during all drills and exercises with to continuously improve both the instructions for emergency responses and the personnel's implementation of these responses.

Training is provided for all personnel who have key roles in emergency management, encompassing all levels of the Emergency Response Organisation. This includes a comprehensive programme for the Emergency Response Team (ERT) including:

- Fire Fighting
- Chemical Spill Response
- Use of PPE and Self-Contained Breathing Apparatus (SCBA)
- Search and Rescue
- Emergency First Aid
- Confined Space Entry & Rescue

- Rescue from height.

Arranged by the ERT team leader, ERT personnel participate in regular drills that simulate specific emergency scenarios that could potentially arise on site. Any lessons learned from these exercises are incorporated as necessary into the emergency response procedure and addressed in subsequent drills. As a minimum, emergency response drills are carried out twice per year to test the efficacy of this plan.

Local Fire Brigade units will visit the site as per their own procedures to ensure they are familiar with site layout and emergency equipment. The Maintenance Manager is the site contact for the Fire Brigade.

3.2. ACTIVATION OF ALARMS

Local Alarms (area sounders and strobes) are activated automatically by the local heat/smoke/flame detectors in the area. Local alarms can also be activated by personnel using the Break glass Units located in the specific area if personnel notice a fire or other situation requiring emergency action. Alternatively personnel can contact the Control Room on Extension 4017 or by site radio to inform them of the situation and the Control Room can then activate the Local Alarm as required.

The Plant Evacuation Alarm can only be activated from the Control Room using a designated key switch. The Control Room can be notified of an emergency situation by activation of a Local Alarm as described above or by contacting the Control Room on Extension 4017 or by site radio.

After being informed or otherwise notified of an emergency situation, the Panel Operator in the Control Room shall consult with the Process Controller (Shift Supervisor) who shall assess the need for the activation of the Plant Evacuation Alarm based on the severity of the situation and if deemed necessary shall instruct the Panel Operator to activate the Plant Evacuation Alarm using the key switch in the Control Room.

The Panel Operator may also activate the Plant Evacuation Alarm without consulting with the Shift Supervisor if the severity of the emergency situation so requires and/or if instructed to do so by the ERT Leader or Incident Controller (Plant Manager).

If the Plant Evacuation Alarm malfunctions/does not operate the Panel Operator shall contact the Shift Supervisor and Gatehouse personnel who will operate the Manual Mobile Alarm in the building and outside the Gatehouse respectively. The Panel Operator will inform all personnel of the Plant Evacuation Alarm over site radio.

At the end of the Emergency situation, the Panel Operator shall generate the End of Plant Evacuation Alarm signal after being instructed to so do by the Incident Controller (during normal business hours) or the Shift Supervisor (outside normal business hours).

3.3. ACTIONS TO BE TAKEN IN EVENT OF ALARM / EMERGENCY SITUATION

As explained in Section 5.1 above, manning levels on site during normal business hours are very different than the rest of the 24 hour period of operation and hence different actions must be taken depending on when an incident occurs.

3.3.1 . During normal business hours

3.3.1.1 . Personnel Discovering the Incident/Hearing Alarm

Fire

- Activate the local area fire alarm by using the nearest Break Glass Unit.

- Contact Control Room on Extension 4017 or by site radio and follow their instructions.
- For small fires, having regard for personal safety and the safety of others, undertake 'reasonable action' to extinguish small fires or prevent escalation e.g. shut off source of ignition and attack fire with appropriate extinguisher if trained to do so.
- If this is not possible, do the following:
    - Make your job safe – stop machinery, hot work etc.
    - Evacuate local area.

Spill of Hazardous Material

- Contact the Control Room on Extension 4017 or by site radio to report the spill giving them as much information as possible about the nature of the spill (material names, approximate size of spill, location etc.) and follow their instructions (e.g. evacuate area).
- Make your job safe - stop machinery, hot work etc.
- For small spills/leaks, having regard for personal safety and the safety of others, undertake 'reasonable action' to contain/clean up small spill using local spill kit if trained and properly equipped (e.g. correct PPE) to do so.

Injury to Person(s)

- Contact the Control Room on Extension 4017 or by site radio to report the injury and request them to send first aider.
- Remain with the injured person until the arrival of the First Aider.
- Follow the instructions of the First Aider.

All other accident/incident/emergency situations

- Contact the Control Room on Extension 4017 or by site radio and follow their instructions.

Personnel Hearing Local Alarm

All local alarm activations are investigated by production personnel. If the alarm is due to a serious incident e.g. fire, spillage, the ERT Team will be alerted by site radio. Upon alerting the ERT team, the Incident Controller will also be notified and if necessary he will organise members of the ECC to make their way to the ECC on Level 4 or aother suitable location.

If the local alarm is a false alarm the local alarm will be reset.

- Personnel without specific responsibilities in an emergency should do the following:
    - On hearing Local Alarm
        - Make your job safe where possible.
        - Evacuate the local area following emergency exit signage and lighting and proceed to Control Room.
        - Walk, Do Not Run, Do Not Stop to Collect Personnel Belongings.
        - Await further instruction from the Control Room.

If the incident intensifies and the site needs to be evacuated for personnel safety the control room will activate the Plant Evacuation Alarm.

Personnel Hearing Plant Evacuation Alarm

On Hearing the plant evacuation alarm, personnel who are part of the Emergency Response Organisation (ERT, ECC and Production) shall carry out their specific duties as defined in Section 4 and in accordance with their training.

- On hearing Plant Evacuation Alarm:
    - Make your job safe where possible.

        - Proceed to the designated external Assembly Point following emergency exit signage and lighting.
        - Walk, Do Not Run, Do Not Stop to Collect Personnel Belongings.
        - Report to the Site Evacuation Coordinator at the Assembly Point for Roll-Call.
    - Plant visitors or contractors should follow the instructions of their Indaver host/contact.

3.3.1.2 . Local Alarm

- Control Room is notified of emergency situation in local area (e.g. fire, chemical spill, personnel injury etc.).
- Production and/or Maintenance personnel discovering incident in local area take first action to address situation if safe to do so (e.g. extinguish small fire, contain small spill).
- The Control Room decides whether or not to activate Local Alarm (sounders and strobes) in area if not already activated by smoke/heat/flame detectors in area or Break Glass Unit.
- If the Local Alarm Sounders and Strobes are activated, the local area will be evacuated and evacuees will proceed to Control Room and await further instruction from the Control Room. Normal operation will continue in other areas of the plant.
- If there are any visitors on site, the Control Room Panel Operator shall inform the Visitors Guide by site radio or telephone about the restricted area and if necessary not to leave the visitors room.
- The Control Room Panel Operator shall alert the ERT if required to respond by site radio.
- Members of the ERT will report to ERT Leader, don the appropriate PPE and equipment and execute the necessary mitigation actions to address the emergency in the local area.
- The ERT Leader will inform the Control Room Panel Operator when the emergency situation has been contained or the requirement to upgrade the Local Alarm to the Plant Evacuation Alarm.
- The Panel Operator shall inform the Incident Controller (Plant Manager) of the situation if appropriate (e.g. serious incident/severe personal injury/potential for escalation).

3.3.1.3 . Plant Evacuation Alarm

After being informed or otherwise notified of an emergency situation, the Panel Operator in the Control Room shall consult with the Process Controller (Shift Supervisor) who shall assess the need for the activation of the Plant Evacuation Alarm based on the severity of the situation and if deemed necessary shall instruct the Panel Operator to activate the Plant Evacuation Alarm using the key switch in the Control Room.

The Panel Operator may also activate the Plant Evacuation Alarm without consulting with the Shift Supervisor if the severity of the emergency situation so requires and/or if instructed to do so by the ERT Leader or Incident Controller (Plant Manager).

On activation of the Plant Evacuation Alarm the following actions will take place:

- Persons with a specific role in the Emergency Response Organisation shall carry out their duties as defined in Section 4 and in accordance with their training.
- All other persons should:
    - Make their job safe
    - Proceed to the designated external Assembly Point following emergency exit signage and lighting.
    - Walk, Do Not Run, Do Not Stop to Collect Personnel Belongings.
    - Report to the Site Evacuation Co-Coordinator at the Assembly Point for Roll-Call.
- All site radios shall be turned to the Emergency Radio Channel # 1. Personnel responsible for control of operational equipment shall remain on separate operational Radio channel # 14 if instructed to do so by Control Room.
- All non-emergency site radio and telephone calls will be stopped.
- The Site Evacuation Coordinator will ensure that all vehicles shall be moved to the side of the road/designated parking area and shut down to allow access by Emergency Services.
- The Emergency Control Centre shall contact the Site Evacuation Coordinator to confirm all personnel present and accounted for.

- The ERT Leader reports to the Emergency Control Centre on the scale and nature of the emergency situation and requirement for Emergency Services support.
- The Emergency Control Centre contacts the Emergency Services and other external organisations as required. Note: Fire Brigade will always be contacted in event of any fires which cannot be immediately contained by Indaver.
- If deemed necessary the Incident Controller shall inform Indaver Ireland Managing Director of the situation who in turn activate the Incident Management Plan if necessary.
- During the Emergency situation, nobody except the Emergency Services will be allowed to enter the plant. All other external personnel will be kept outside the entrance of the facility unless specific authorisation to enter is given by the Incident Controller.

3.3.2 . Outside Normal Business Hours

Outside of normal business hours, a minimum of three personnel (1 x Shift Supervisor, 2 x Production Operators) may be on site at any one time. At least one person shall be a trained occupational first aider.

The Shift Supervisor shall be responsible for initiating the emergency response and activating the Local and/or Plant Evacuation Alarm as deemed necessary.

The Shift Supervisor shall initiate any appropriate actions (e.g. process control) to contain/ mitigate/ prevent escalation of the emergency situation if safe to do so.

In the event of a Local and/or Plant Evacuation Alarm all personnel shall evacuate the area and proceed to the Control Room or other safe Assembly Point as instructed by the Shift Supervisor.

The Shift Supervisor shall contact the Emergency Services to respond to:

- any significant fire situation that cannot be immediately controlled and extinguished.
- any significant spill of hazardous materials.
- personal injury requiring medical attention.
- other emergency situation requiring the intervention of the Emergency Services.

The Shift Supervisor shall send one of the Production Operators to meet the Emergency Services at the entrance gate (if safe to do so) and direct the Emergency Services to the emergency location on site.

The Shift Supervisor shall contact the Plant Manager and Manager on Call to inform them of the situation.

The Manager on Call is required to proceed to the site and liaise with Shift Supervisor in the Control Room if the Emergency Services attend site.

3.3.3 . End of Emergency Situation

The end of a Local Alarm is decided by the Control Room (Shift Supervisor and Panel Operator) after consultation with the ERT Leader. The Control Panel Operator will switch off the Local Alarm sounders and beacons in the local area.

The end of a Plant Evacuation Alarm is decided by the Incident Controller after consultation with the ERT Leader and Emergency Services (if present on site). The Incident Controller will inform the Control Room Panel Operator to activate the End of Alarm Signal.

Following an emergency situation, the incident scene should remain undisturbed until the necessary information (e.g. photographs etc.) has been gathered as part of the incident investigation or until as instructed by the Plant Manager/Manager On Call.

Following the end of the emergency situation, the ERT Leader shall ensure that any equipment (e.g. spill kits, BA cylinders, PPE, fire extinguishers etc.) used during the emergency situation is checked and cleaned/re-stocked/re-filled as required so that it is available for future use.

The Incident Controller shall:

- Ensure the Health & Safety Manager and Quality & Environmental Manager are informed of any accident and emergency situations so that an investigation is carried out and regulatory authorities (EPA, HSA etc.) are notified as appropriate.
- Liaise with the Guide for any public visitors so they receive the necessary information about the incident.
- Consult with Indaver Ireland Managing Director regarding requirement to issue company wide update and/or media release on incident.

Outside normal business hours, similar actions to the above are taken at the end of the emergency with the following exceptions:

- The end of a Local Alarm is decided by the Shift Supervisor. The Control Panel Operator will switch off the Local Alarm sounders and beacons in the local area.
- The end of a Plant Evacuation Alarm is decided by the Shift Supervisor after consultation with the Plant Manager/Manager on Call and Emergency Services (if present on site). The Shift Supervisor shall inform the Control Room Panel Operator to activate the End of Alarm Signal.

3.4. CONTROLS AND ACTIONS TO BE TAKEN FOR SPECIFIC EMERGENCY SITUATIONS

The plant controls in place and actions to be taken to address specific emergency scenarios are summarised in the Meath Emergency Scenarios document maintained in the Manuals and Plans section of the QESH MOSS page under “Plant Meath”.

3.5. NOTIFICATION OF EMERGENCY SITUATIONS TO REGULATORY AUTHORITIES

If the nature or scale or the emergency situation / incident requires regulatory authorities (e.g. HSA, EPA, ORPEM etc.) to be notified, the relevant authorities will be contacted in accordance with site licence(s) and/or regulatory requirements. The Indaver Emergency Contact List has contact numbers for relevant authorities which is maintained in the Incident Management Plan. *P0112 Environmental Incident Investigation and Reporting* details the procedure to be followed for notifying the EPA and other authorities of environmental incidents. For any notifications required to the HSA please refer to P0175 Health & Safety Accident Investigation & Reporting.

4. REFERENCES/ANNEX

All of the documents below are stored in the section of the QESH MOSS site as indicated below.

MOSS – QESH – MANUALS & PLANS - DEPARTMENT IRL: PLANT MEATH

4.1. MEATH INCIDENT CONTROLLER PROMPT SHEET

4.2. SPECIFIC EMERGENCY SCENARIOS & RESPONSE SPREADSHEET

4.3. PRINCIPLE CHEMICALS & RESPONSE LIST

4.4. DRAWINGS

4.4.1 . Site Layout Access and Egress Points Ref: IND-MEATH-HSE-DWG-000-0600_rev1.

4.4.2 . Fire Main Hydrants and Underground Services Ref: IND-MEATH-HSE-DWG-000-0601_rev1.

4.4.3 . Fire Main Hydrants Hose Reels and Canon Layout Ref: IND-MEATH-HSE-DWG-000-0602_rev1.

4.4.4 . Fire Protection System P & ID Diagram Ref: IND-MEATH-FPR-DWG-010-0600_rev0.

4.4.5 . rincipal Chemical and Materials Storage Areas Ref: IND-MEATH-HSE-DWG-000-0603_rev1.

4.4.6 . Safety Shower and Eye Wash Station Locations Ref: IND-MEATH-HSE-DWG-000-0604.

MOSS - – QESH – MANUALS & PLANS - DEPARTMENT IRL: COMMUNICATIONS

4.5. INDAVER INCIDENT MANAGEMENT PLAN

4.6. P0112 ENVIRONMENTAL INCIDENT INVESTIGATION AND REPORTING