

3.5 Incineration/Waste to Energy Facility - Description of Facilities

3.5.1 General

The main elements of the waste to energy plant will be as follows:

- Main process building
- Turbine building
- Service yard
- Tank farm
- Security building
- Laboratory.

Ancillary facilities will include:

- Tanker unloading bays
- Tanker sampling bays
- Fire water storage
- Storm water/ firewater retention
- Weigh bridges
- Radioactivity detector
- Pipe rack
- Nitrogen generator
- Natural gas compound
- Electrical compound
- Emergency access
- Public footpath.

Refer to figures 3.6 to 3.8 for the layout plans of the waste to energy plant.

3.5.2 Main Process Building

The main process building will be L-shaped. The main part of the building will be 216m x 54m, approximately, in plan. The building height will vary from approximately 17m to 35m. The general floor level will be 5.77mOD, with parts of the floor dropped by 5m. The lowered floor area will be constructed as a concrete basement. In the event of a fire in the building, the water used to fight the fire will collect in this area, which will act as a firewater retention tank.

The main part of the building will be single storey and largely a single space, with subdivisions along the western side, the northern side and the eastern side. The furnaces, post combustion chamber, boilers and gas cleaning equipment will be located in the building. The ash bunker, ash handling areas and ash silos, for the moving grate furnace, will be located in the building, along the western side. The boiler feed water treatment equipment, boiler feed water tank, transformers and high voltage switch room will be located in the building along the northern side. The gypsum recovery equipment, solidification area, lime/limestone preparation area and activated carbon area will be located inside the building along the eastern side. The silos for the residues from the fluidised bed line will be located along the southern side.

A room to house the stack emission monitoring equipment will be located at high level under the roof. It will have a floor level of 22.77mOD and will be adjacent to the stack, in the main part of the building. This room will be accessible by stairs.

The stem of the L will be partly single storey and partly 4 storeys. The waste bunker and the reception hall will form single storey spaces in the stem of the L. Advantage will be taken of the very steep slope of the site at this location. The floor of the waste bunker will be at 2.77mOD and the floor of the waste reception hall will be a 22.77mOD. Waste, discharged into a chute in the wall/floor of reception hall, will fall by gravity into the waste bunker. The 4-storey portion will house maintenance warehouse and offices at the lower levels, and locker rooms and offices at the intermediate level. The control room/crane operator room, canteen and offices will be located on the top floor, which will be at the same level as the floor of the reception hall, 22.77mOD. The control room/crane operator room will have windows overlooking the bunker. The roof level of this part will vary from 32.4m to 37.3m approximately. The plan area of the stem of the L will be 73m x 60m approximately.

The reception hall will be enclosed and trucks carrying waste will enter the reception hall through doors at its eastern side. There will be 6 chutes in the northern wall/floor of the reception hall into which waste will be tipped. The reception hall and waste bunker will be under negative pressure with the air extracted from these spaces used for primary combustion air.

The bunker will be reinforced concrete and will be divided into several separate compartments, with each compartment dedicated to particular waste types. Each compartment will have a sump in the floor. The sump will be constructed of concrete to a water retaining specification. The floor of each bunker compartment will be laid to falls so that any leachate will drain to the sump.

3.5.3 Turbine building

The turbine building will be located in the southeastern part of the service yard. It will be mainly single storey with a small two-storey area. It will be 27.7m x 46.9m in plan and 12m in height. The turbine, transformer station, water demineralisation equipment, condensate tank and air compressor equipment will be located in the building. A large air-cooled condenser will be mounted on the roof of the building.

3.5.4 Service yard

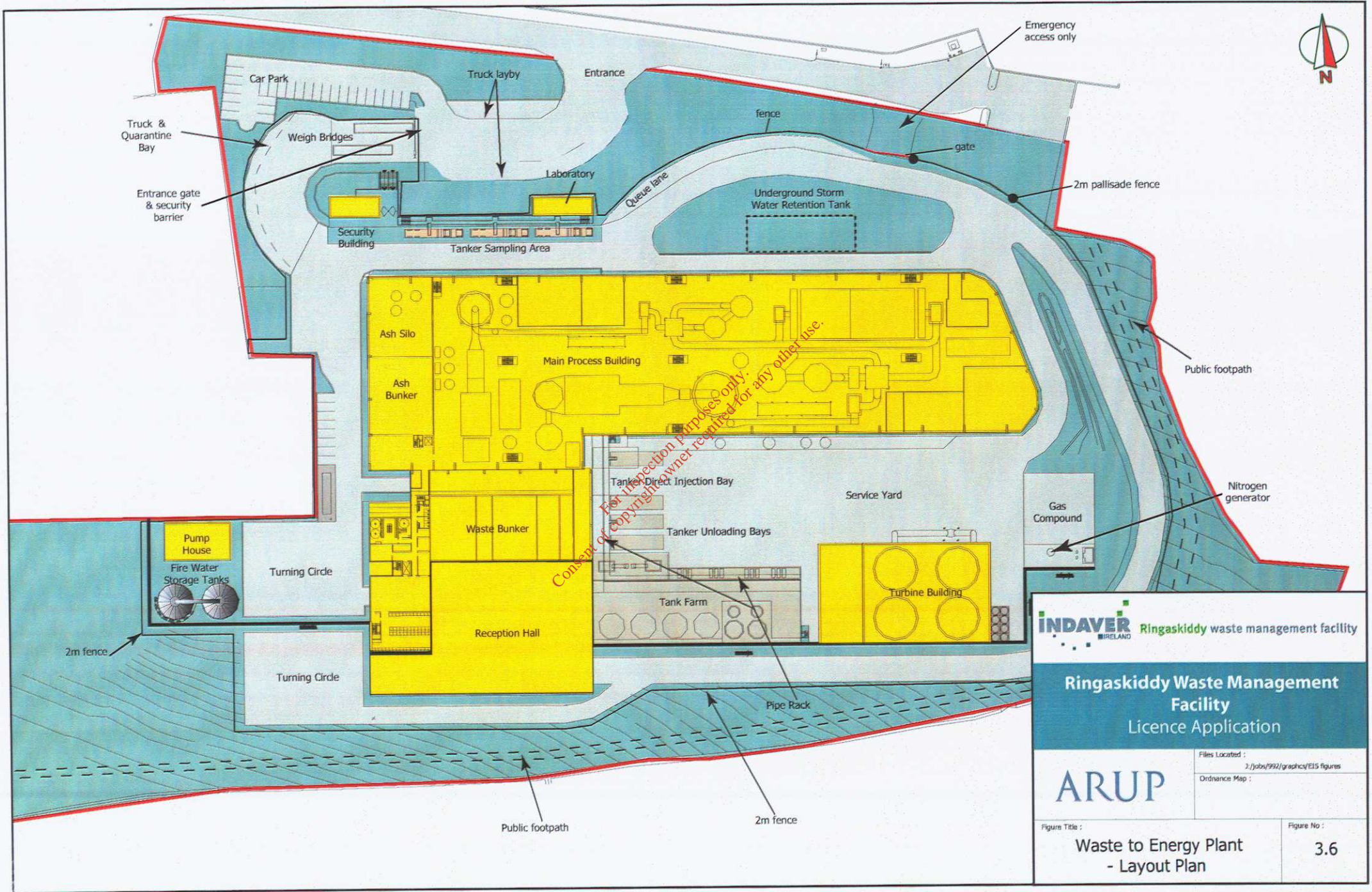
The service yard will be on the southern side of the main process building. It will be at a general level of 5.77mOD. It will provide truck and fork lift access to the tank farm, the turbine building and the southeastern side of the process building. The tank farm and turbine building will be located along the southern side of the service yard. To the south of them, there will be a retaining wall, separating these elements from the roadway leading to the reception hall. The roadway and reception hall will be at a higher level than the service yard.

At the western side of the service yard there will be four road tanker unloading bays. The compound for the natural gas supply and the nitrogen generator will be located at the eastern end of the service yard.

3.5.5 Tank farm

The tank farm will have 14 days storage for incoming waste and will have a total capacity of approximately 2000m³. There will be eight solvent storage tanks comprising of the following:

- 2 x 200m³ decantation tanks
- 4 x 400m³ main storage tanks
- 1 x 50m³ day tank



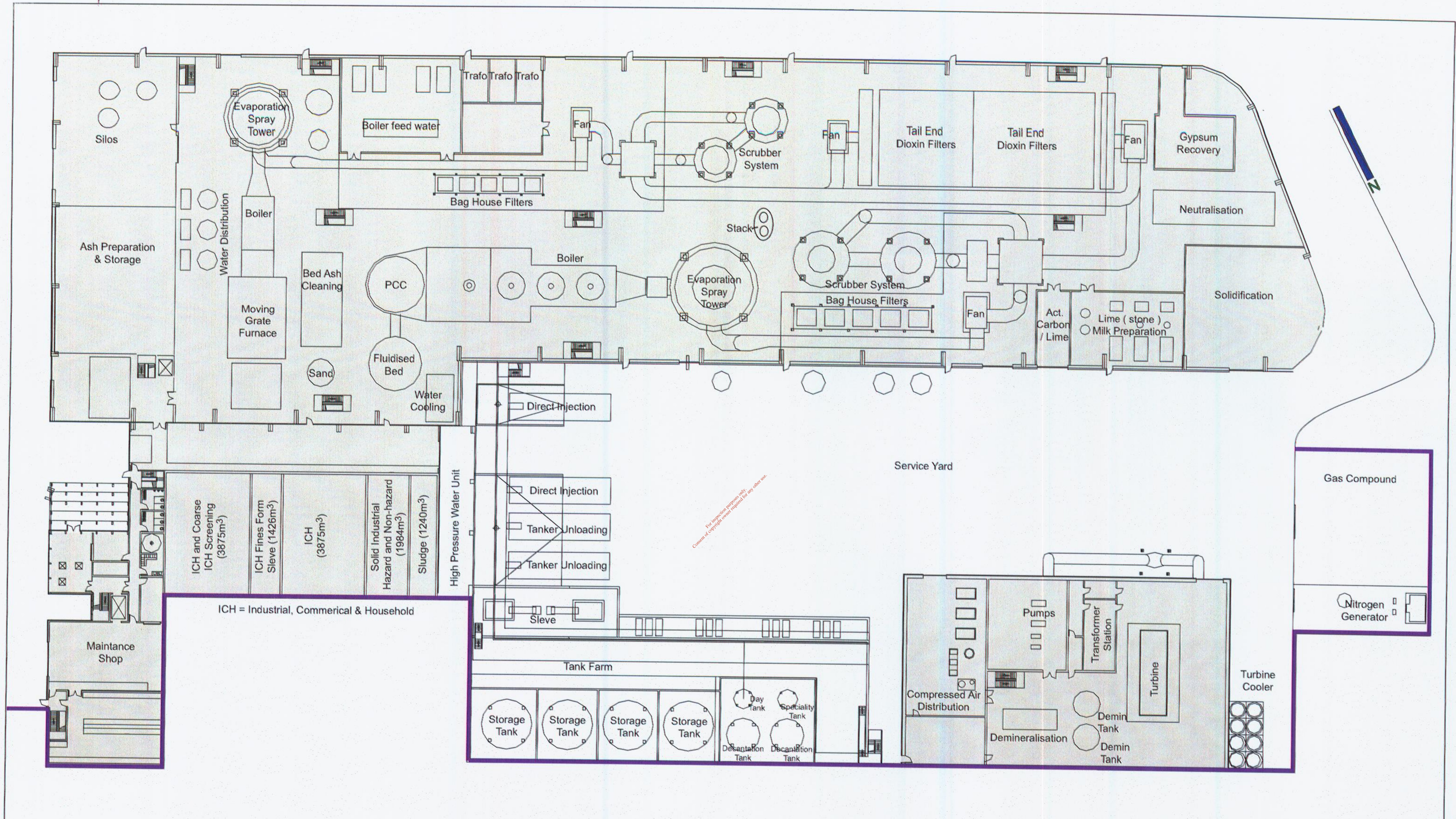
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Figure Title : Waste to Energy Plant - Layout Plan
Figure No : 3.6



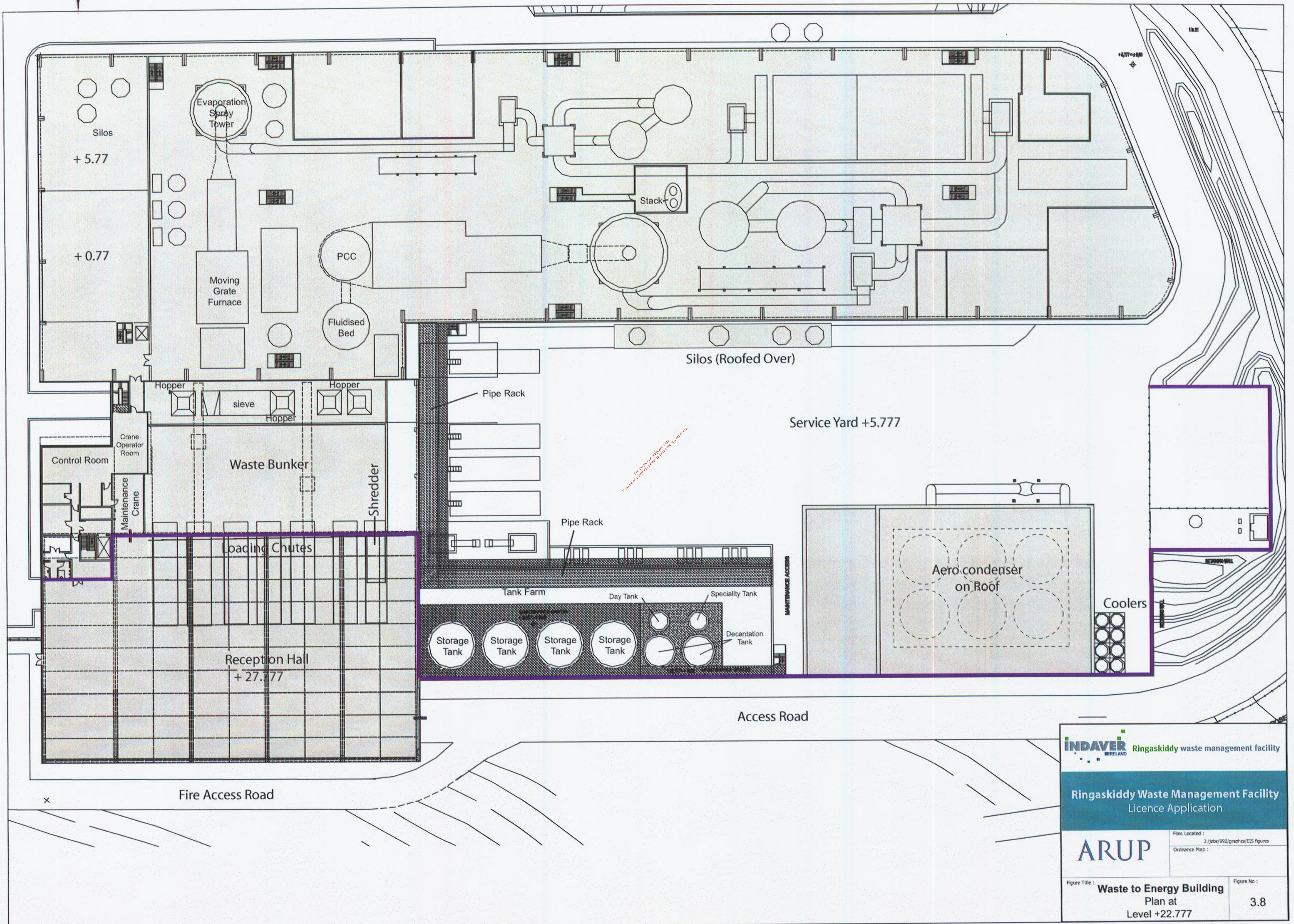
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Figure Title : **Waste to Energy Building**
 Plan at
 Level +5.777

Figure No :
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Figure Title : **Waste to Energy Building Plan at Level +22.777** Figure No : **3.8**

- 1 x 50m³ speciality tank.

Refer to section 3.7.3 below for a description of the tank farm operations.

3.5.6 Security building

The security building will be located in the northwestern part of the waste to energy plant. This will be a single storey building, 14m x 5.8m approximately in area. It will accommodate the site security and waste reception staff. The drivers of waste trucks and tankers will report to the security staff on arrival at the waste to energy plant. The only exception will be some truck drivers on long term contracts, carrying non-hazardous waste, who will access the facility using swipe cards. The security building will also have canteen and toilet facilities for truck drivers.

3.5.7 Tanker sampling bays

Three road tanker parking bays will be provided adjacent to the laboratory. Road tankers will park in these bays in order for samples of their contents to be taken. To facilitate taking samples, the bays will be provided with an overhead gantry, which will allow access to the man lids on the top of the tankers. The bays will be paved in concrete. Any spillage from the sampling activity will be collected with adsorbent pads.

3.5.8 Laboratory

The laboratory building will be located on the northern side of the waste to energy plant. This will be a single storey building, 17m x 5m approximately in plan. The building will accommodate a small laboratory and offices for the laboratory staff. Refer to section 3.14 below for a description of the activities of the laboratory.

3.5.9 Tanker unloading bays

Four tanker unloading bays will be located at the western end of the service yard of the waste to energy plant. Tankers discharging liquid waste will park at one of the bays. Tankers discharging waste for direct injection to the post combustion chamber will park at the two northern most bays. One of these bays will also be used for unloading ammonia/urea. The bays will be paved in concrete, laid to falls. The rainwater run off from each bay will be collected in a sump, which will also serve the tank farm bunds. Water will only be discharged from the sump if testing demonstrates that it is not contaminated. Refer to section 15.5.1 for a description of the drainage of the bays. A leaking road tanker could be parked at one of these bays in an emergency.

3.5.10 Fire water storage

Two tanks will be provided for the storage of water to be used for fire fighting in the waste to energy plant. The two tanks will have a total capacity of 2000m³. The tanks and associated pump house will be located at a level of 5.77mOD, on the south-western side of the waste to energy plant.

3.5.11 Storm water/ firewater retention

A storm water/firewater retention tank will be provided on the northern side of the waste to energy plant. It will have a capacity of 1500m³. Refer to section 15.7 for a description of the storm water/firewater retention system.

3.5.12 Weigh bridges

Two weighbridges will be located close to the waste to energy plant entrance. All trucks and tankers will be weighed on entering and before leaving the plant.

3.5.13 Radioactivity detector

All vehicles entering the waste to energy site will pass through a radioactivity detector. Radioactive wastes will not be accepted at the facility.

3.5.14 Pipe rack

Liquid wastes will be conveyed in pipes, on an overhead pipe rack, from the tankers parked at the tanker unloading bays to the bulk tanks and from the bulk tanks to the waste to energy building. A maintenance gantry will run alongside the pipe rack. The service yard, above which the pipe rack will run, will be paved with impermeable surfacing.

3.5.15 Nitrogen generator

Nitrogen generation equipment and a nitrogen storage tank, for storage of liquid nitrogen to be used when the nitrogen generator is down, will be located at the eastern end of the service yard.

3.5.16 Natural gas

A compound for the equipment, associated with the supply of natural gas to the site, will be located at the eastern end of the service yard.

3.5.17 Electrical compound

The electrical switchgear, associated with the export of electricity from the waste to energy plant to the national grid, will be located in a compound at the southwestern side of the waste transfer station. The size shown on figure 3.1 is indicative. It is expected that the size will be reduced once the exact requirements of the ESB are known.

3.5.18 Emergency access

A second access road will be provided to the waste to energy plant. This will be located to the east of the main access road and will be reserved for use by the emergency services.

3.5.19 Public footpath

A public footpath, located outside the facility's security fence, will be provided along part of the southern and eastern site boundaries to allow public access between the Martello tower and the shore.

3.6 Waste to Energy Plant – Waste acceptance

3.6.1 General

The waste-to-energy facility will be developed in two phases. In the first phase, a fluidised bed furnace and post combustion chamber will treat hazardous and non-hazardous waste. The capacity of the plant will be 45MW, corresponding to circa 100,000 tonnes per annum of waste with an average calorific value 12.1MJ/kg. In phase 1 space will be provided in the main process building for the equipment associated with the second phase.

In the second phase, a moving grate furnace will be installed in the main process building. The grate moving furnace will treat non-hazardous waste. The capacity of the plant will be 35.2MW, corresponding to circa 100,000 tonnes per annum of waste with an average calorific value 9.5MJ/kg.

The heat produced by the combustion process will be recovered and used to generate electricity, approximately 10MW and 8MW in phases 1 and 2 respectively. Each phase will have its own emissions control and flue gas cleaning equipment. The flue gas cleaning technology will be similar for both phases.

It is anticipated that the waste to energy facility will operate 24hrs/day, seven days per week. There will be planned shutdowns for maintenance purposes. Waste acceptance will be limited to the hours 09.00 to 19.00 Monday to Friday and 09.00 to 14.00 on Saturdays.

The following main activities will be undertaken in the waste-to-energy process:

- waste acceptance
- waste storage and handling
- combustion
- energy recovery (incl. boiler operation)
- flue gas cooling
- flue gas cleaning
- ash handling.

The main process elements of Phase 1 and Phase 2 are described separately up to the flue gas cooling stage. The flue gas cleaning technology is described in section 9.5.

Figure 3.6, is a layout plan of the waste to energy facility. Figures 3.7 and 3.8 show the main process building, service yard and tank farm in greater detail. Figure 3.9 is an overall process flow diagram for the waste to energy process.

3.6.2 Waste acceptance - general

Solid hazardous and non hazardous waste will arrive at the site in compactor trucks or in skip trucks, with the skip contents covered. All waste trucks entering the waste to energy plant will pass through a scanner to detect the presence of any radioactive elements. Radioactive waste will not be accepted in the facility. A truck found to be carrying radio active waste will be quarantined and the customer, who dispatched the truck, and the appropriate competent authorities will be notified.

Refer to figure 3.10 for a flow diagram of the solid waste acceptance procedure.

Waste trucks will drive onto the weighbridge, located at the entrance. All trucks for waste, which enter and leave the plant, will be weighed. Drivers will present their documentation, relating to the waste load, to the staff in the security office. Some trucks, on long-term contracts, carrying non hazardous waste, will access the facility using a swipe card, which will record their details. The drivers of these trucks will not have to report to the security offices.

Liquid Waste (Phase 1)

Liquid wastes will arrive in road tankers, either directly from Indaver's customers or from the waste transfer station where liquid drummed wastes will have been bulked up. All road tankers will be sampled and the waste analysed. The tanker sampling bays and the laboratory will be located adjacent to the security office. Refer to section 3.14 for a description of the laboratory activities. An exception to this will be the tankers carrying waste for direct injection. The characteristics of wastes going for direct injection will have been determined prior to leaving the customer's facility. Following completion of the acceptance procedures the road tanker drivers will be directed to proceed to the tanker unloading bays in the service yard. If the waste does not meet the acceptance criteria, it will be returned to the customer, or sent for disposal or recovery at an appropriate facility. Refer to figure 3.11 for a flow diagram of liquid waste acceptance procedure.

Solid Waste (Phase 1 and 2)

Following completion of the waste acceptance procedures, the trucks carrying solid waste will proceed via the site road to the enclosed reception hall.

3.6.3 Process Control

All incoming hazardous liquid wastes will have their characteristics verified, either by onsite laboratory analysis or prior to leaving the customer's facility.

A certain number of trucks carrying non-hazardous solid waste will be required to discharge their waste onto the floor of the waste reception hall to allow visual inspection of their contents, prior to transfer to the bunker.

Indaver Ireland will implement procedures, similar to those which are currently in operation at other Indaver facilities, to regulate the acceptance, approval and if necessary, the rejection of incoming wastes.

3.6.4 Throughputs, Inputs and Outputs

The appropriate indicator of the capacity of an incinerator is the thermal input, rather than the tonnage of waste. A greater tonnage of lower calorific waste than of higher calorific waste can be treated.

Table 3.9 shows typical calorific values for the range of waste types which will be treated in Ringaskiddy.

Table 3.9 - Typical Calorific Values

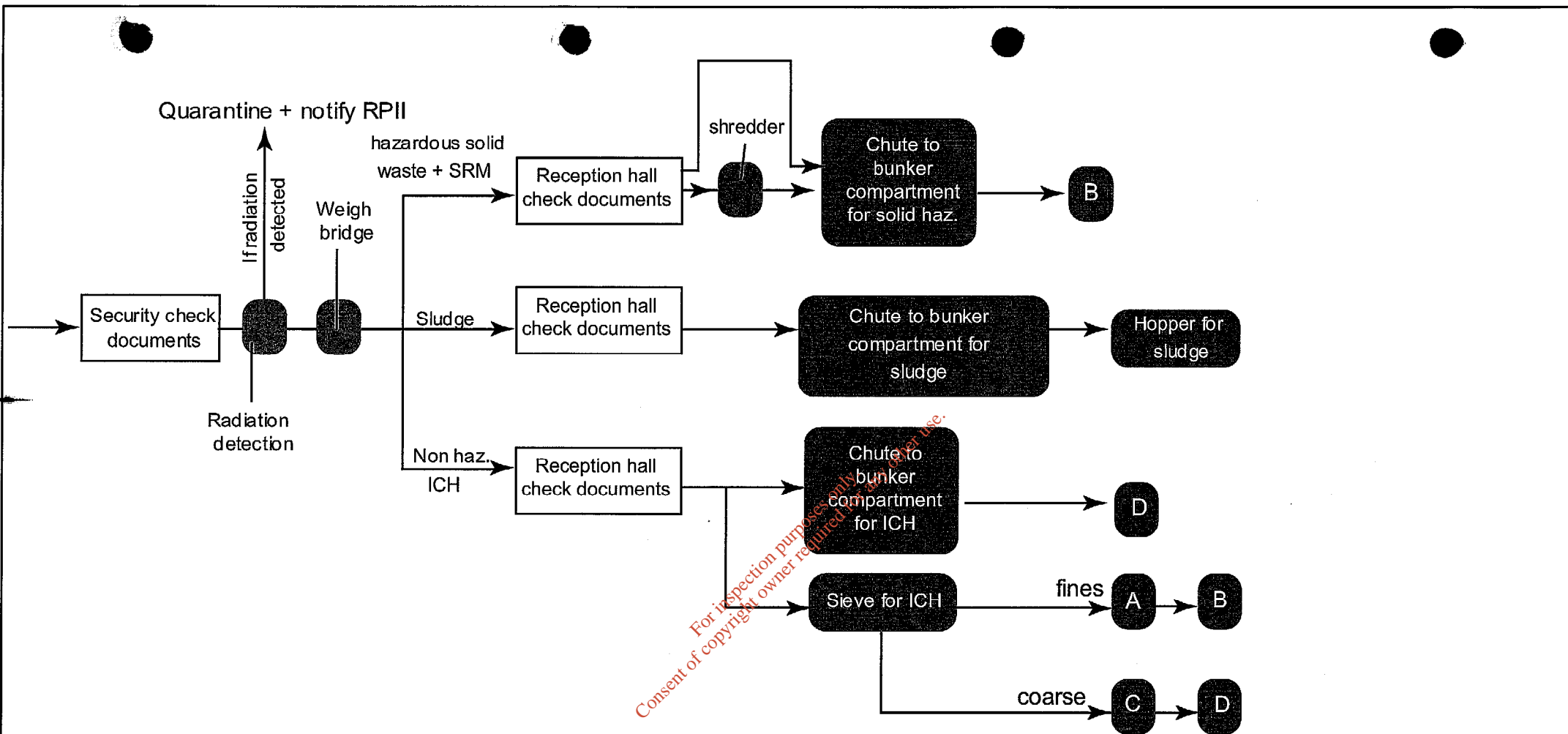
Waste type	Calorific value (MJ/kg)
Meat and bone meal / specified risk material	12.5
Municipal solid waste	9.5
Sludge	1.0
Liquids (high calorific - solvents)	18.5
Liquids (low calorific - water)	0
Packaging waste	15.0

Fluidised Bed Furnace and Post Combustion Chamber Throughput

The thermal throughput of the PCC will be additive to the thermal throughput of the fluidised bed furnace. Figure 3.12 shows the combustion diagram for the combined fluidised bed furnace and post combustion chamber. The thick black line represents the theoretical operating envelope for the combined line. A more realistic operating envelope is represented by the area enclosed by the points CBAG, on the diagram. The thermal capacity of the combined line is 45MW. If the waste has a very high calorific value of 40MJ/kg, only circa 4 tonnes/hour will be treated. With low calorific value waste, e.g. 8MJ/kg, 20 tonnes/hour could be treated. Typically 13.3 tonnes/hour of waste with an 'average' calorific value of 12.1MJ/kg will be treated, giving a nominal annual capacity of 100,000 tonnes (fluidised bed and PCC combined), on the basis of 7500 hours per year of operations. The maximum continuous load, with an ideal mix of waste, will be 49.5MW, which will be 110% of the average yearly thermal throughput. It will also be possible to operate the furnace at a lower thermal input, to a practical minimum of 13.1MW, representing a turn down to 30% of the yearly average.

Moving Grate Furnace Throughput

Figure 3.13 shows the combustion diagram for the moving grate. The thick black line represents the expected normal operating envelope for the furnace. The yearly average thermal throughput of the furnace is expected to be 35.2MW. If the waste has a calorific value of 14MJ/kg, only circa 9 tonnes/hour will be treated. With lower calorific value waste, e.g. 8MJ/kg, 15.3 tonnes/hour will be treated. 13.3 tonnes/hour of waste with a 'typical' calorific value of 9.5MJ/kg will be treated, giving a nominal annual capacity of 100,000 tonnes, on the basis of 7500 hours per year of operations. The furnace will be designed to operated at up to



- A: Bunker compartment for ICH fines
- B: Hopper for fluidised bed
- C: Bunker compartment for ICH coarse
- D: Hopper for moving grate
- ICH: Industrial/ commercial/ household waste

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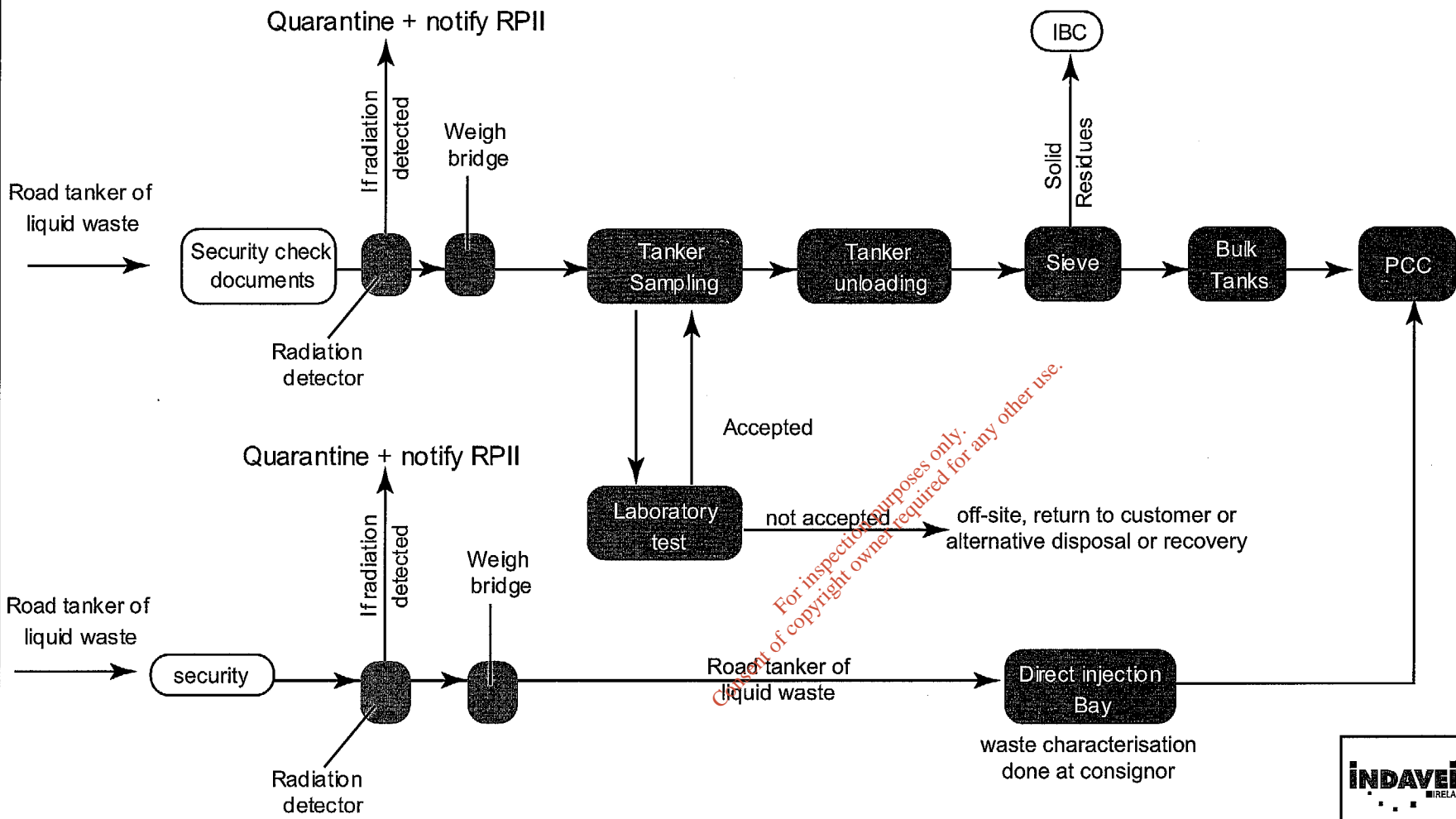
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Figure Title :
 Process Flow Diagram - Solid Waste Acceptance & Storage

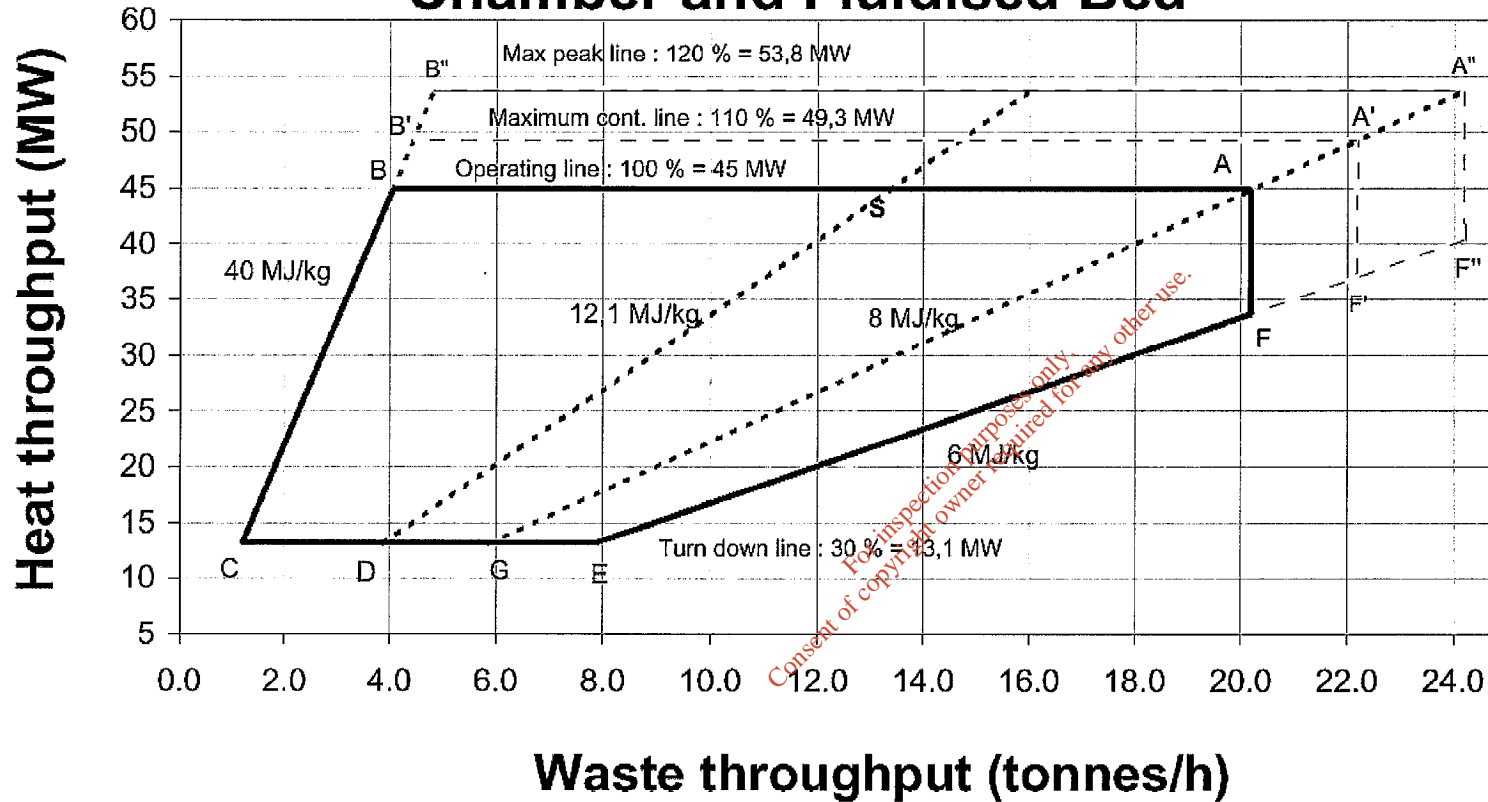
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Process Flow Diagram - Liquid Waste Acceptance & Storage	3.11

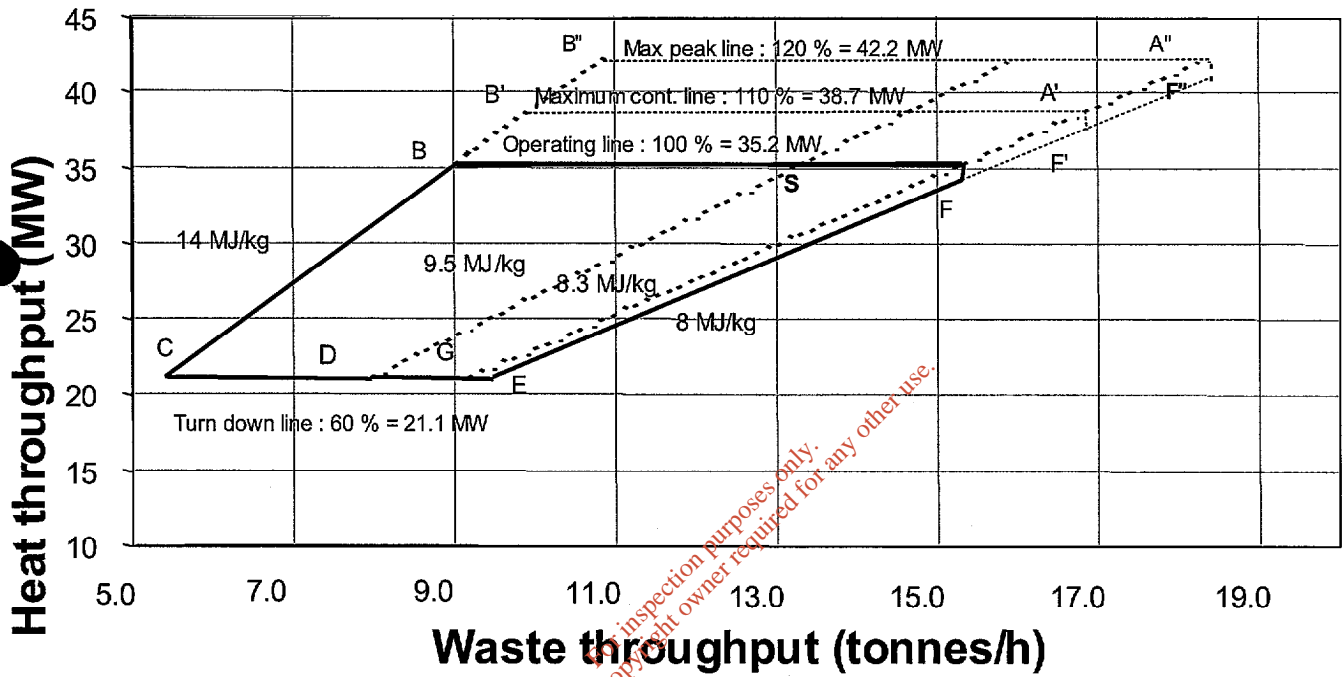
COMBUSTION DIAGRAM Post Combustion Chamber and Fluidised Bed



S : Operating point : 13,3 t/h ; 45 MW ; 12,1 MJ/kg

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	Figure Title : Combustion Diagram (Phase 1) Figure No : 3.12

COMBUSTION DIAGRAM - Moving Grate



S: operating point : 13.3 t/h ; 35.2 MW ; 9.5 MJ/kg

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Combustion Diagram (Phase 2)	3.13

42.2MW, representing 120% of the average yearly thermal throughput. The maximum continuous load, with an ideal mix of waste, will be 38.7MW, which will be 110% of the average yearly thermal throughput. It will be possible to operate the furnace at a lower thermal input, to a practical minimum of 21.1MW, representing a turn down to 60% of the yearly average.

Tables 3.10 to 3.13 list the different waste types which will be treated in the waste to energy plant.

Table 3.10 - Waste Types and Quantities (Phase 1 and 2) Waste to Energy Plant

WASTE TYPE	Nominal Capacity		Maximum Capacity	
	Tonnes per annum (Note 1)	Total (over the life of the site) tonnes (Note 2)	Tonnes per annum (Note 3, 4)	Total (over the life of the site) tonnes (Note 2)
Household waste collected by or on behalf of the local authority	note 5			
Household waste delivered to civic waste facilities and other bring facilities				
Other household waste	note 5			
Commercial waste	note 5			
Sewage sludges	note 5			
Construction and demolition waste				
Industrial sludges	note 5			
Industrial waste not elsewhere specified	note 5			
Hazardous waste (EWC classification)	50,000			

Note 1: The nominal capacity is 200,000 tonnes per annum for both phase 1 and phase 2. The relative quantities of different types of waste will vary from year to year.

Note 2: As the waste will be treated, but not retained in the waste to energy plant, the total volume over the life of the facility is not relevant.

Note 3: The tonnage capacity of the furnaces in the waste to energy plant will depend on the calorific value of the waste. Refer to section 3.6.4 in which the combustion diagrams for the furnaces are presented and explained.

Note 4: The theoretical maximum quantity of waste going to the PCC and fluidised bed combined line, in any one year, would be 150,000 tonnes, that is the maximum capacity of the two furnaces, treating low calorific value waste. However, there are practical reasons, such as limitations on the temperature and pressure of steam in the boiler, which would make this throughput unlikely. The expected annual throughput of waste, with a typical calorific value, is 100,000 tonnes. The theoretical minimum capacity is 30,000 tonnes per annum, of waste with a maximum calorific value of 40MJ/kg.

Note 5: The total non-hazardous waste for both phases will be 150,000 tonnes nominal capacity. The decision to proceed with phase 2 will be taken when the waste strategies of the Cork local authorities and the requirements of other waste producers have been defined.

Table 3.11 - Hazardous Waste Types and Quantities (Phase 1 and 2) Waste to Energy Plant

HAZARDOUS WASTE (EWC classification)	European Waste Code	Detailed Description	Nominal Tonnes Per Annum (note 1)	Maximum Tonnes Per Annum (note 2)
Waste oil	13 XX XX	Oil and fuel wastes	45	
Oil filters	15 02 02 16 01 07	Waste oil filter	5	
Asbestos				
Oil/sand mixtures or mixtures of oil and other material	13 05 01 15 05 08 15 02 02	Mixtures from grit chambers and oil/water separators	20	
Wood preservation waste	03 XX XX	Waste from wood processing and production and processing of pulp, paper and cardboard	10	
Wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal	05 XX XX	Waste oils, tars and sludges from refining operations	20	
Wastes from inorganic chemical processes	06 XX XX	Inorganic chemical process waste including spent activated carbon	900	
Wastes from organic chemical processes	07 XX XX	Wastes from the MFSU of organic chemicals including chlorinated/non-chlorinated solvents and aqueous washing liquids	40,000	
Agrochemical wastes	02 01 08	Obsolete products and off specification batches	100	
Infectious healthcare waste	18 01 XX 18 02 XX	Wastes from the treatment, diagnosis or prevention of disease in animals or humans	100	
Photographic processing waste				
Paint, inks, adhesives and resins	08 01 XX 08 03 XX	Waste paint, inks and aqueous ink/paint solutions	800	
Batteries and accumulators				
Florescent tubes and other mercury containing waste				

Note 1: The table shows an indicative mix, and indicative relative quantities, of wastes which will be treated in the waste to energy plant in any one year. The relative quantities of different types of waste will vary from year to year.

Note 2: The theoretical maximum quantity of any particular type of waste, in any one year, depends on its calorific value and the requirement to achieve a minimum calorific value for the total waste

Table 3.11 cont'd - Hazardous Waste Types and Quantities (Phase 1 and 2) Waste to Energy Plant

OTHER HAZARDOUS WASTE (APPLICANT TO SPECIFY) (EWC classification)	European Waste Code	Detailed Description	Nominal Tonnes Per Annum (note 1)	Maximum Tonnes Per Annum (note 2)
Waste packaging, absorbents, filters and protective clothing	15 01 XX 15 02 XX	Hazardous packaging, filters, absorbents and protective clothing	2,000	
Off specification batches containing organic or inorganic wastes	16 03 03 16 03 05	Waste pharmaceutical products	2,000	
Commercial wastes	20 01 XX	Wastes including solvents, paints, inks and medicines from industries and institutions	2,000	
Sludges from physio-chemical treatment plants	19 02 05	Sludges containing dangerous substances will be accepted	2,000	

Note 1: The table shows an indicative mix, and indicative relative quantities, of wastes which will be treated in the waste to energy plant in any one year. The relative quantities of different types of waste will vary from year to year.

Note 2: The theoretical maximum quantity of any particular type of waste, in any one year, depends on its calorific value and the requirement to achieve a minimum calorific value for the total waste.

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Table 3.12 - Non-Hazardous Waste Types And Quantities (Phase 1 and 2) Waste to Energy Plant

INERT WASTE (note 1)	Check (if accepted)	European Waste Code	Additional Information
Stones and soil			
Topsoil			
Brick			
Natural sand			
Concrete			
Pottery & china			
Asphalt, tar and tarred products			
BIODEGRADABLE WASTE	Check (if accepted)		Additional Information
Wood & wood products	✓	20 01 38	This will be accepted at the facility
Paper & paper products	✓	20 01 01	This will be accepted at the facility
Vegetable matter	✓	20 01 08	This will be accepted at the facility
Non-infectious health-care waste	✓	18 01 03 18 02 02 18 01 04 18 02 01 18 02 03	Non-infectious wastes from the treatment, diagnosis or prevention of disease in animals or humans
Natural & manmade fibres			
Street cleaning residues	✓	20 03 03	This will be accepted at the facility
Gully emptyings	✓	20 03 99	This will be accepted at the facility
Septic tank sludge	✓	20 03 04	This will be accepted at the facility
Dredging spoil			
Food stuffs	✓	02 XX XX	Foodstuffs unsuitable for consumption or processing
Oil/water mixtures			
Vegetable oil	✓	20 01 25	Edible oils and other oils and fat
Oil and fat	✓	20 01 26	
Animal faeces, urine and manure (including spoiled straw) effluent, collected separately and treated off-site	✓	02 01 06	This waste is not expected to be treated but there may be occasions when it is accepted
Animal blood	✓	18 02 03	This waste is not expected to be treated but there may be occasions when it is accepted

Note 1: The table shows an indicative mix of wastes which will be treated in the waste to energy plant in any one year. The relative quantities of different types of waste will vary from year to year.

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