APPENDIX 7-1: FUGITIVE RISK ASSESSMENT

The events identified in this appendix have been scored using the matrix detailed in Tables 7.4, 7.5 and 7.6 of the main SHBEC Application Document (ref. 60580855/SHBEC/0001).

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	PATHWAY	RECEPTOR	FREQUENCY	CONSEQUENCE	RISK			
1. Releases To Air								
Material transport around the processes (e.g. conveyors, screws, etc)	• Air • Water • Land	• Public • Staff • Local environment	5	2	10	• All material transport plant and equipment will be serviced and maintained in accordance manufacturer's recommendations • High standards of housekeeping will be maintained • Transport of materials around the process takes place within process buildings • Enclosed conveyor systems • Slight negative pressure on main process due to downstream ID fan will minimise releases from the furnace and flue gas treatment ductwork. • Extraction of primary combustion air from the tipping hall and fuel bunker will reduce emissions from these areas	5	2
Surface accumulations of dust	• Air • Water • Land	• Public • Staff • Local environment	5	2	10	• Facility will be subject to regular inspections and high standards of housekeeping will be maintained	5	2
Plant spillage and leaks	• Air • Water • Land	• Public • Staff • Local environment	4	2	8	• All material transport plant and equipment will be serviced and maintained in accordance manufacturer's recommendations • High standards of housekeeping will be maintained • Silos and tanks designed in accordance with appropriate design, fabrication and safety standards. • Silos and tanks will be equipped with local dust filter, level monitoring/alarms and over-pressure control	5	1.6
Tanker filling during discharge of Flue Gas Treatment (FGT) residue	• Air • Water • Land	• Public • Staff • Local environment	4	2	8	• All discharge activities will be supervised. • Silo and tankers designed in accordance with appropriate design, fabrication and safety standards. • Silos and tankers will be equipped with local dust filter and over-pressure control. • Load discharge in accordance with discharge procedures. • Tankers will vent back into the silos during discharge to avoid dust generation and minimise venting.	5	1.6
Dust, particulates and litter during loading and unloading of vehicles	• Air • Water • Land	• Staff • Public • Local Environment	6	2	12	• Loading and unloading of waste takes place in a fully enclosed reception hall – emissions are therefore retained inside • Reception hall has fast-acting roller shutter doors to minimise the release of emissions from vehicles off-loading in the building • Tipping hall and waste bunker retained under a slight negative pressure due to extracting primary combustion air from these areas • All loads (incoming/despatch) will be fully covered to minimise the potential for material becoming airborne • Facility operators and drivers will be fully trained • Material clean-up via sweeping or vacuum will be utilised in the event of a spillage	5	2.4
Windblown dust from external roads, pathways and other surfaces	• Air	• Public • Staff • Local Environment	5	2	10	• Road surfacing will be subject to routine inspection and maintenance – any accumulation of materials will be removed promptly • Water suppression to abate dust emissions will be available for use during dry periods if required • Speed limits on site will be restricted to 10mph to minimise the potential for dust being raised from roads	5	2

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	**PATHWAY**	**RECEPTOR**	**FREQUENCY**	**CONSEQUENCE**	**RISK**			
Silo (powdered reagents and FGT residue) overfills or dust release during discharge	• Air	• Public • Staff • Local environment	5	2	10	• Silo design in accordance with appropriate design, fabrication and safety standards • Silos fitted with level alarm connected to the control system that will cause discharge into silo to be automatically stopped • Silos are equipped with local dust filter and over-pressure control. • Load discharge in accordance with discharge procedures • System subject to plant inspection and maintenance • Filters will be self-cleaning (e.g. through pulsing)	5	2
Dust from waste storage associated with storage of bottom ash	• Air	• Public • Staff • Local environment	3	2	6	• Bottom ash will be quenched as it is removed from the process and will be stored in an enclosed bottom ash bunker	5	2
2. Releases to Land and Water								
Spillage of waste, fuels or other materials	• Water • Land	• Surface water • Ground water • Sewer system	4	3	12	• Operator daily checks for signs of spillage • High standards of housekeeping will be maintained across the facility • Spill kits will be available to deal with any leaks • Operators will be trained in facility operational control procedures • Procedures will be developed for control of material transfer	5	2.4
Leaks from tanks, containers, valves or pipework	• Water • Land	• Surface water • Groundwater • Sewer system	4	1	4	• Flanged connections will be kept to a minimum • All tanks, pipes and valves will be designed to appropriate industry standards • All tanks, pipes and valves will have a preventative maintenance programme to ensure ongoing integrity and effectiveness • Operator daily checks for signs of leak • Spill kits will be available to deal with any leaks • Tanks will be provided with secondary containment (110% of a single tank) • Pipework runs are within bunds, inside the building or over concrete surfaces • Drainage in process areas flows to process water system where water can be used for bottom ash quenching or if excess water, this will be discharged to the foul sewer in compliance with a Trade Effluent Discharge Consent • Drainage external to building in material delivery and storage areas flows to attenuation pond via a class 1 interceptor which can be isolated in the event of spillage entering the drain and material removed using suction plant and taken offsite for disposal	5	0.8
Run-off from waste and treatment residue storage	• Water • Land	• Surface water • Groundwater • Sewer system	4	4	16	• Concrete flooring • Collection gullies and drains direct materials into the sedimentation tank • Regular inspection and maintenance programme	5	3.2
Surface run-off from roads and pavements	• Water • Land	• Surface water • Ground water	5	2	10	• Engineered site drainage system developed in line with EA guidance. • Drainage system equipped with high efficiency separators and silt trap systems • Drainage system subject to routine inspection along with a preventative maintenance regime • Emergency spills kits used in conjunction with a site emergency plan will help mitigate the effects of any contamination • Surfacing for all areas accessed by vehicles will be concrete designed to an appropriate BS • Operator daily checks for signs of leaks • High standards of housekeeping will be maintained	5	2
Overflow of storage containers	• Water • Land	• Surface water • Ground water	4	2	8	• Tanks fitted with high level alarms • Procedures in place for deliveries including checking available capacity • Bunded storage vessels • Routine inspection and maintenance programme	5	1.6

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	PATHWAY	RECEPTOR	FREQUENCY	CONSEQUENCE	RISK			
						• Minimum of flanged connections • Design standards • Impervious operational areas indoors • Localised catchment volume • Training in unloading practices • Deliveries sized to reduce number of deliveries/unloading operations •		
Overflow from process water storage	• Water • Land	• Surface water • Ground water	5	2	10	• Concrete sedimentation tank equipped with level monitoring and overflow protection. • Excess water will be discharged to the foul sewer in compliance with a Trade Effluent Discharge Consent.	5	2
Failure to contain used firefighting water	• Water • Land	• Surface water • Ground water	3	5	15	• Containment within plant area with impervious surfaces and floors set to flow to internal drains which contain materials in process water system • Containment in waste and ash bunkers • Final firewater arrangements will be confirmed through detailed design	5	3
3. Nuisance Issues								
Mud/litter carried onto highway	• Water • Land	• Public	5	2	10	• All incoming and outgoing loads will be sheeted • All internal roads, storage and processing areas will be hard-surfaced with concrete or tarmac, and swept regularly	5	2
Pest, vermin and scavengers	• Land	• Staff • Public	4	1	4	• Due to the design of the facility, waste that will be the main attraction for pests, vermin and scavengers will be kept inside the fully enclosed treatment building • Use of registered pest control contractors and rodenticide will be considered if required	6	0.67
4. Odour								
Odour from loading and unloading of waste	• Air	• Staff • Public	6	3	18	• During plant commissioning, staff training will include raising employee awareness with respect to normal plant operational odour levels and actions to be taken to rectify any faults • All waste will be unloaded, stored and loaded within an enclosed treatment building • The reception hall and treatment buildings will be maintained at a slight negative pressure • Fast-acting roller doors ensure that the potential for odour releases are minimised • Odour checks will be completed as part of the site monitoring and inspection regime	5	3.6
Odour release from waste storage	• Air	• Staff • Public	6	3	18	• Reception hall maintained at negative pressure. Fuel bunker ventilation air is used as combustion air in the combustion process • Odour checks will be completed as part of the site monitoring and inspection regime	5	3.6
5. Noise and Vibration								
Noise and vibration from motors and other equipment	• Air	• Staff • Public	6	3	18	• During plant commissioning, staff training will include raising employee awareness with respect to normal plant operational noise levels and actions to be taken to rectify any faults • During periods of downtime, all plant will be switched off where possible • Site plant will be maintained in line with manufacturer's recommendations this includes checking for deterioration of plant condition (e.g. bearings becoming worn) - repairs will be undertaken as appropriate to rectify any identified defects	5	3.6
Noise from vehicles delivering/collecting waste	• Air	• Staff • Public	6	3	18	• • Engines will be switched off when not in use	5	3.6

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	**PATHWAY**	**RECEPTOR**	**FREQUENCY**	**CONSEQUENCE**	**RISK**			
						• Waste unloading will take place within an enclosed building • Waste deliveries will be restricted to 6am – 6pm		
Noise from on-site mobile plant movements	• Air	• Staff • Public	6	3	18	• Mobile plant will be maintained in accordance with manufacturer's recommendations to ensure potential vehicle noise is minimised • Plant operator training includes using the plant effectively to minimise noise emissions, switching off when not in use, ensuring daily checks are completed to identify defects as early as possible • Mobile plant operates primarily inside the main building and this will be clad using materials with appropriate acoustic attenuation properties • Doors on the buildings will be kept closed when practicable to minimise the release of noise due to internal vehicle movements. This is assisted by fast-acting doors.	5	3.6

APPENDIX 7-2: ACCIDENT RISK ASSESSMENT

The events identified in this appendix have been scored using the matrix detailed in Tables 7.4, 7.5 and 7.6 of the main SHBEC Application Document (ref. 60580855/SHBEC/0001).

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	PATHWAY	RECEPTOR	FREQUENCY	CONSEQUENCE	RISK			
1. Material Delivery (Raw Materials, Waste)								
Major vehicle accident on-site leading to a significant loss of reagents	• Air • Water • Land	• Staff • Public • Local Environment	3	2	6	• Site speed restrictions in place and compliance with highway speed restrictions • Approved carriers (i.e. trained hauliers employed by the operator or supplier) • Emergency procedures in place which staff are trained to implement. • Material clean-up arrangements in place • Road vehicles are robust and designed to withstand high speed collisions that may occur on public highways • Drainage via Class 1 full retention interceptors where potential for contamination is identified and can be isolated. Isolated material will be removed by tanker for offsite disposal	5	1.2
Waste material loss from delivery vehicle whilst on-site	• Air • Water • Land	• Staff • Public • Local Environment	6	2	12	• All loads will be fully covered during transport • Site speed restrictions in place • Approved carriers (i.e. trained hauliers employed by the operator supplier) • Material clean-up arrangements in place • Emergency procedures in place which staff are trained to implement	4	3
Delivery of non-permitted waste	• Air • Water • Land	• Staff	3	2	6	• All loads will be visually checked against the details provided on the waste transfer documentation • All loads will be visually inspected at the point of discharge/off-loading • Non-permitted waste identified will be quarantined and transfer arranged to a suitably licensed facility	4	1.5
Silo (powdered reagents) overfills	• Air • Land	• Staff • Public • Local Environment • Surface and Ground Water	4	2	8	• Silos fitted with level alarm connected to the control system that will cause discharge into silos to be automatically stopped • Silos are equipped with local dust filter and over-pressure control • There will also be a procedure in place with checks which will ensure that the receiving silo has sufficient capacity to accept the load • Systems will be subject to routine planned preventative maintenance and inspections in line with manufacturer's recommendations • Emergency procedures in place which staff are trained to implement, which will include dealing with windblown material • Facility drainage will be checked for signs of ingress and if necessary interceptor will be isolated and material removed by suction plant for off-site disposal	6	1.34
Dust release during discharge into silo	• Air	• Staff	4	2	8	• Silo design in accordance with appropriate design,	6	1.34

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	**PATHWAY**	**RECEPTOR**	**FREQUENCY**	**CONSEQUENCE**	**RISK**			
(powdered reagents)	• Land	• Public • Local Environment • Surface and Ground Water				fabrication and safety standards • Silo equipped with local dust filter and over-pressure protection • Load discharge supervised in accordance with operational procedures • Procedure in place for the monitoring and control of silo operation including silo filling • Systems will be subject to routine planned preventative maintenance and inspections in line with manufacturer's recommendations		
Arrival of Non-conforming waste load	• Air • Water • Land	• Staff	4	1	4	• Waste to be accepted only from approved sources • Regular visual inspection will be undertaken during tipping of waste. Non-conforming waste will be identified at that stage • Waste handling procedures for non-conforming waste to be implemented • Non-conforming waste to be isolated in relevant quarantine area and arrangements made for treatment by a suitable on- or off-site treatment route	5	0.8
Arrival of a 'hot' load	• Air • Land	• Staff	4	2	8	• Waste to be accepted only from approved sources • Waste loads suspected to be a 'hot load' to be directed to the 'hot load' quarantine area • Waste handling procedures for 'hot loads' to be implemented • Fire control measures (onsite or via emergency services) to be implemented • Staff trained on site emergency arrangements and hot load procedures	5	1.6
Tank (liquid reagent or fuel) overfills	• Air • Water • Land	• Staff • Local Environment	4	2	8	• Tank design is in accordance with appropriate design, fabrication and safety standards • Tanks fitted with level alarm connected to the control system that will cause filling operation into tank to be automatically stopped • There will be a delivery procedure in place with checks which will ensure that the receiving tank has sufficient capacity to accept the load • Systems will be subject to routine planned preventative maintenance and inspections in line with manufacturer's recommendations • Emergency procedures in place which staff are trained to implement • Emergency spill kits will be provided at site to contain and address any spillage • Facility drainage will be checked for signs of ingress and if necessary interceptor will be isolated and material removed by suction plant for off-site disposal • Total facility inventory limited to lowest practicable volumes to run the plant safely and efficiently • Secondary containment to 110% of single tank volume to be provided	6	1.34

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	**PATHWAY**	**RECEPTOR**	**FREQUENCY**	**CONSEQUENCE**	**RISK**			
						• Minimum of flanged connections • Training in chemical and fuel unloading practices • Deliveries to reduce number of deliveries/unloading operations • Discharge point for the attenuation pond and sewers will be kept locked shut during deliveries etc.		
2. Waste Storage								
Inappropriate waste storage for incoming waste streams	• Water • Land	• Staff • Public	3	1	3	• Wastes accepted at the facility will be off-loaded to the relevant storage area • Wastes accepted will be discharged into designated reception areas within enclosed reception/tipping hall • Facility will implement waste acceptance procedures in accordance with EA guidance • Staff will be trained with respect to waste acceptance procedures • All drivers will receive an induction during their first visit to the site	5	0.6
Fire in tipping hall or fuel bunker	• Air • Water	• Staff • Public	4	2	8	• Turnover of fuel in the bunker • CCTV observation of bunker from control room • Automatic fire and / or smoke detection water deluge system and automated water cannon within the bunker • Fire waters can be contained within the process water system or fuel bunker, and sampled prior to removal by tanker • Emergency procedure in place • Smoke would be contained within the enclosed building • Emergency procedures in place which includes liaison with fire rescue service and communication with offsite stakeholders that could be impacted • Fire prevention plan (FPP) in accordance with EA requirements will be finalised at detailed design and approved by EA	5	1.6
Fugitive release during transport of waste (cranes/conveyors)	• Air • Water	• Staff • Public • Local environment	3	1	3	• Waste movement will be undertaken by overhead gantry cranes within the fully enclosed buildings • Transfer of Incinerator Bottom Ash (IBA) will be undertaken mechanically by an enclosed ash conveyor, IBA will be quenched and material and any associated release will be contained within the enclosed IBA storage bunker inside the main building • Transfer of Flue Gas Treatment (FGT) residue will be undertaken mechanically in enclosed conveyors and contained in storage silos FGT silo fitted with level alarm connected to the control system, over pressure controls and local dust filter • Systems will be subject to routine planned preventative maintenance and inspections in line with manufacturer's recommendations	5	0.6
3. Raw Material / Reagent Storage								
Fugitive release from storage silo	• Air	• Staff	4	1	4	• Silo design is in accordance with appropriate design,	6	0.67

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	PATHWAY	RECEPTOR	FREQUENCY	CONSEQUENCE	RISK			
(powdered reagents)	• Water • Land	• Public				fabrication and safety standards • Silo equipped with local dust filter		
Fire/explosion in activated carbon silo and handling system	• Air • Water • Land	• Staff • Public • Local Environment	2	3	6	• Silo design in accordance with appropriate design, fabrication and safety standards • Plant and equipment is earthed to dissipate electrostatic charge as an ignition source • Activated carbon has a relatively high ignition temperature so explosion risk will be reduced • Systems will be subject to routine planned preventative maintenance and inspections in line with manufacturer's recommendations	5	1.2
Rupture of powdered reagent silo due to accidental damage or spontaneous rupture of tank	• Air • Water	• Staff • Public • Local Environment • Surface and ground water	1	3	3	• Vents on silo are designed to minimise back-pressure problems • Routine inspection and maintenance of silos • Silos will be within an area with appropriately isolated and controlled drainage systems	5	0.6
Uncontrolled release of powdered reagent from mixing tank/ container	• Air • Land • Water	• Staff • Public • Local environment	4	1	4	• Tank design is in accordance with appropriate design, fabrication and safety standards • System equipped with local dust filter • Systems will be subject to routine planned preventative maintenance and inspections in line with manufacturer's recommendations • Emergency procedures in place which staff are trained to implement • Emergency spill kits will be provided at site to contain and address any spillage • Facility drainage will be checked for signs of ingress and if necessary interceptor will be isolated and material removed by suction plant for off-site disposal. • Secondary containment to 110% of single tank volume to be provided	6	0.67
Rupture of liquid (liquid reagent or fuel tank) oil due to accidental damage or spontaneous rupture of tank	• Air • Land • Water	• Staff • Public • Local environment	2	3	6	• Tank design in accordance with appropriate design, fabrication and safety standards for the material being contained • Vents on tanks are designed to minimise back-pressure problems • Routine inspection and maintenance of tanks • silos will be within an area with appropriately isolated and controlled drainage systems Emergency procedures will be in place which staff are trained to implement – specific procedures will be developed for each reagent/fuel to address the specific hazard properties • Emergency spill kits will be provided at the facility to contain and address any spillage • Facility drainage will be checked for signs of ingress and if necessary interceptor will be isolated and material	5	1.2

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	PATHWAY	RECEPTOR	FREQUENCY	CONSEQUENCE	RISK			
						removed by suction plant for off-site disposal. • Total facility inventory limited to lowest practicable volumes to run the plant safely and efficiently. • Secondary containment to 110% of single tank volume to be provided. • Minimum of flanged connections • Training in chemical unloading practices • Deliveries sized to reduce number of deliveries/unloading operations •		
Leak of chemicals (Sodium Hydroxide (NaOH), Hydrochloric Acid (HCl)	• Air • Land • Water	• Staff • Public • Local environment	2	3	6	• Bunded storage vessels • Routine inspection and maintenance programme • Minimum of flanged connections • Tanks fitted with high level alarms • Design standards • Impervious operational areas indoors • Localised catchment volume • Training in chemical unloading practices • Size of deliveries to reduce number of deliveries/unloading operations •	5	1.2
Spill or leak of chemical for boiler feed water dosing	• Air • Land • Water	• Staff • Public • Local environment	2	3	6	• Minimum of flanged connections • Design standards • Impervious operational areas to prevent release to ground. • Training in chemical handling and unloading practices • Reduce size/number of deliveries • Routine operator checks on storage area and containment • Routine inspection and maintenance programme • Appropriate secondary containment provided	5	1.2
4. ERF Combustion Process								
Fire in furnace feed chute/hopper releasing fumes into building	• Air • Water	• Staff	3	2	6	• Feed chute is monitored by operators using CCTV linked to control room • Mixed waste feed in the feed chute effectively acts as a sealing plug • Fire detection and sprinkler system/ water cannons in place • Emergency response procedure in place • Fire water contained within fuel bunker before removal to off-site treatment plant	5	1.2
Back flow of combustion gases into feed chute creating inefficient combustion and potential for fugitive release into tipping hall	• Air	• Staff	3	1	3	• Nominal vacuum within the furnace created by Induced Draught (ID) fan • ID fan provided with auxiliary drive motor • Suction maintained for short period by effect of main stack in event of total ID fan failure. If the ID fan trips and there is an over pressure in the furnace, the plant will most likely trip. • Mixed waste feed in the feed chute effectively acts as a sealing plug • Level detection in feed hopper and alarms set within the	5	0.6

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	PATHWAY	RECEPTOR	FREQUENCY	CONSEQUENCE	RISK			
						automated control system		
Furnace exhaust temperature falls below 850°C leading to incomplete combustion of fuel	• Air	• Local Environment	4	1	4	• Automated control system has alarms linked to activation of auxiliary burners to maintain combustion temperature, with automatic waste feed shutdown in case the auxiliary burners are unable to maintain the minimum temperature. • Temperature and other design basis operating parameters to be monitored continuously • Deviations from specified operating criteria will trigger restorative action via the automated control system	6	0.67
Pressure surge in combustion system affecting combustion efficiency and potential for fugitive releases from system inside the building	• Air • Noise	• Staff	3	4	12	• Pressure monitoring undertaken as part of automated control system and interlocks will be activated as appropriate • Emergency shutdown can be implemented if necessitated	6	2.0
Leak of auxiliary fuel leading ingress of liquid fuels to ground/water or gas to air	• Water • Air	• Staff • Public • Local Environment	3	1	3	• Contained storage within building • Liquids fuel tanks and pipelines designed in accordance with current fuel oil storage regulations • Routine plant checks and maintenance should identify leaks visually for liquid fuels • Emergency procedures will be in place which staff are trained to implement – specific procedures will be developed for final chosen fuel to address the specific hazard properties • Emergency spill kits will be provided at site to contain and address any spillage • Facility drainage will be checked for signs of ingress of liquid fuel and if necessary interceptor will be isolated and material removed by suction plant for offsite disposal • Total site inventory limited to lowest practicable volumes to run the plant safely and efficiently • Secondary containment to 110% of liquid fuel tank volume to be provided • Minimum of flanged connections on tanks and pipework	6	0.5
Fire due to ignition of support fuel	• Air • Water	• Staff • Public • Local Environment	2	3	6	• Contained site storage within building for liquid fuels with tanks, pipelines and containment designed in accordance with oil storage regulations • Appropriate fire detection and protection systems for the fuel – these will be confirmed following detailed design • Routine plant checks and maintenance should identify leaks visually for liquid fuels • Fire water will be contained within the process water system prior to removal by tanker for off-site disposal	6	1
5.Steam System/Power Generation								
Steam leak to process buildings	• Air • Noise	• Staff	3	3	9	• Appropriate design, fabrication and inspection standards for steam systems will be employed • Statutory inspection and maintenance programme in place • Automated control system has controls and alarms for pressure	6	1.5

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	PATHWAY	RECEPTOR	FREQUENCY	CONSEQUENCE	RISK			
						• Routine operator checks should identify increased noise and/or visual leak • Initiate emergency evacuation procedures		
Steam safety valve failure	• Air • Noise	• Staff • Public	2	2	4	• Appropriate design, fabrication and inspection standards for steam systems will be employed • Statutory inspection and maintenance programme in place • Automated control system has controls and alarms for pressure • Routine operator checks should identify increased noise and/or visual leak	6	0.67
Leak of lube or seal oil from generator	• Water • Land	• Staff • Public • Local Environment	2	1	2	• Flanged connections kept to a minimum • Use of appropriate design and fabrication standards • Operator/preventative maintenance checks •	5	0.4
Major vibration due to rotating machinery being out of balance	• Noise	• Staff • Public	2	2	4	• Use of anti-vibration mountings • Vibration monitors installed and automatic plant shutdown for turbine generator • Routine operator checks	5	0.8
Increase noise due to steam leak or operation of safety valves	• Air	• Staff • Public	2	2	4	• Statutory design, fabrication and inspection standards for steam systems • Minimum of flanged connections • Controls and alarms for pressure • Routine operator checks	5	0.8
6. Abatement System								
Significant leak of flue gas to air before abatement (e.g. due to over-pressure, material defect, corrosion)	• Air • Land • Noise	• Staff • Public • Local Environment	3	3	9	• System design in accordance with appropriate design and fabrication standards • System operates under negative pressure • Preventative maintenance strategy comprising routine inspections and planned maintenance • Automated control system has alarms and controls linked to system pressure and continuous emission monitoring • Automated controlled shutdown in the event of emergency situation	5	1.8
Fire/explosion in fabric filter	• Air • Water • Noise	• Staff • Public • Local environment	2	3	6	• Low content of activated carbon (<1%) in the extracted FGT residue • Activated carbon dosing rates confirmed at commissioning and verified with extractive emissions monitoring of relevant species • System monitored for temperature and equipped with automatic fire detection. • Fire control systems would be activated to suppress any fire. • Fire suppression systems on activated carbon systems tends to be inert gas based rather than water based; therefore additional firewater storage is not considered to be required. • Emergency procedures in place which includes liaison with fire rescue service and communication with offsite stakeholders that could be impacted	6	1.0

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	**PATHWAY**	**RECEPTOR**	**FREQUENCY**	**CONSEQUENCE**	**RISK**			
Failure of ID fan	• Air	• Staff	3	1	3	• Loss of flow or suction pressure in the fan will disable the furnace feed system and an immediate controlled shutdown of the plant will occur • ID fan provided with auxiliary motor	5	0.6
Emission limit values exceeded	• Air • Land • Water	• Public • Local environment	4	2	8	• Operators will be fully trained in plant operation and emissions control procedures • Emissions are continuously monitored in line with Industrial Emissions Directive (IED) requirements • Process will be operated in strict compliance with start-up, operating and shutdown procedures • Automated control system is programmed with alarms and interlocks on main items of plant • Operators will implement defined emissions controls procedures to reduce emissions and return levels to compliance. If control not achieved within 4 hours as per IED requirements, the plant will be shutdown in a controlled manner	5	1.6
7. Ash Handling and Disposal								
Failure of ash discharger water seal	• Air • Water	• Staff	1	2	2	• Negative pressure is maintained in furnace system at the ash discharger • Low water level alarm in ash discharger • Dual water supply from recirculated process water and mains	6	0.33
Fire Risk	• Air • Water	• Staff • Local Environment	2	2	4	• Level alarms for water and ash in the discharger to prevent overfilling and heat sensors used with temperature alarms to prevent over-heating • Ash quenching system to cool ash • Conveyor discharges directly into ash bunker • Fire water contained in ash bunker or process water system before removal from site for disposal	6	0.6
Overflow of water from ash quench	• Water	• Staff	2	1	2	• Use of impervious concrete floor slabs • Level monitoring will be employed within the bottom ash bunker • Routine operator inspections • Excess water will be contained within the process water system for reuse or excess and can be removed by tanker form site	5	0.4
Spillage of bottom ash resulting in fugitive dust release	• Air • Water • Land	• Staff • Local environment	5	1	5	• Low levels alarms will be employed for water in the ash discharger • Routine operator checks • Clean-up response procedures and equipment will be in place • Use of impervious concrete floor slabs • For spillage in the locality of facility drains, the drainage system will be checked for ash ingress and if necessary the interceptor will be isolated, and the drainage system cleaned, and waste sent off-site for disposal	5	1
Spillage of FGT residue	• Air • Water • Land	• Surface or ground water	3	2	6	• Material transported by enclosed conveyor systems between bag filter and storage silo • Dedicated storage silos equipped with level alarms and	5	1.2

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	**PATHWAY**	**RECEPTOR**	**FREQUENCY**	**CONSEQUENCE**	**RISK**			
		• Staff				local dust filter • Discharge to road tanker via dedicated discharge points and in accordance with supervised discharge procedures • Discharge area enclosed • Impervious surfaces • Routine operator check • Clean up response team • For spillage in the locality of facility drains, the drainage system will be checked for FGT ingress and if necessary the interceptor will be isolated, and the drainage system cleaned, and waste sent off-site for disposal		
8. General Site Issues								
Ineffective firewater containment	• Water	• Surface or ground water	2	3	6	• Firewater can be contained within the facility so that potentially contaminated firewater can be contained, tested and removed by tanker if not suitable for discharge • Internal buildings will be equipped with perimeter thresholds for containment of process/fire waters to facilitate collection and testing of the water, prior to discharge to sewer or transfer off-site by tanker in the event that discharge to sewer cannot be undertaken	5	1.2
Flood Risk	• Water	• Surface or ground water	1	4	4	• The outline Site drainage strategy (subject to detailed design) has been designed taking the 1:100 year plus climate change flood event into account, including consideration of a high tide scenario to ensure sufficient attenuation storage will be provided • Flood risk assessment undertaken to verify flood risk status which identified that the facility is at risk from tidal flooding under certain conditions and has identified a number of mitigation measures to be employed including safe place of refuge and raising level of critical equipment - further mitigation will be considered at detailed design • A flood evacuation plan will also be developed based on the use of the Environment Agency's flood warning system	6	0.67
Wrong connection in drainage system	• Water	• Surface or ground water	1	4	4	• Drainage design undertaken by suitably qualified engineers • Drainage design has been completed using appropriate modelling software • Construction of drainage will be undertaken in accordance with the specified designs and inspected and tested.	6	0.67
Main services failure	• Air • Water	• Staff • Public	4	1	4	• Facility can operate in island mode on loss of grid connection • Failure of facility generating capacity will result in power being drawn from either the distribution or transmission network • Failure of both site generating capacity and service from	5	0.8

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	PATHWAY	RECEPTOR	FREQUENCY	CONSEQUENCE	RISK			
						the network will result in an auxiliary generator being utilised • Control systems will be supplied from an Uninterruptable Power Supply (UPS system) to ensure power supply whilst the generator starts up. • Automated control system will operate an independent emergency shutdown programme to effect shutdown of the facility in safe mode in the event of long term service failure		
Contamination carried onto highway	• Water • Land	• Public	5	1	5	• All incoming and outgoing loads will be appropriately covered • All internal roads, storage and processing areas will be hard-surfaced with concrete or tarmac, and swept regularly	5	1
Operator Error	• Air • Water • Land	• Staff • Public • Local environment	4	3	12	• Automatic process control minimises likelihood and consequences of operator error • Provision of appropriate operator training • Technically competent person available at the facility • Internal operational control procedures • Strict compliance with facility integrated management system	5	2.4
Site Security Breach resulting in vandalism/plant damage/accidental releases	• Air • Water • Land	• Staff • Public • Local environment • Surface / ground water	4	3	12	• Facility secured by a perimeter fence and lockable gates • Facility monitored by CCTV • Facility manned 24 hours a day and 7 days per week • All process buildings utilise lockable doors and security access system	5	2.4
Failure of odour control systems	• Air	• Staff • Public	2	3	6	• Routine odour checks by staff • • Tipping hall will be equipped with fast acting roller doors • Tipping hall and fuel bunker will be maintained under slight negative pressure • Air extraction system maintenance and checking	5	1.2
Fire/ explosion risk	• Air • Water • Land • Noise	• Public • Staff • Local environment • Surface or ground water	3	5	15	• The facility has been designed in accordance with the Regulatory Reform (Fire Safety) Order 2005 and comprehensive fire detection and protection systems will generally be installed to NFPA 850 or equivalent standards • The facility will operate a defined emergency management procedure and drills/tests will be completed at defined intervals • All fire detection and control systems will be routinely inspected and maintained • Plant automated control system is designed with an independent emergency control system that will automatically shut down the plant in safe mode minimising the potential for risk to human health • Plant/equipment will be designed in accordance with relevant design and fabrication standards • Preventative maintenance will include regulator	5	3

Hazardous Event			Risk Assessment			Controls and Mitigations	Mitigation Factor	Residual Risk
EVENT	PATHWAY	RECEPTOR	FREQUENCY	CONSEQUENCE	RISK			
						inspection and maintenance regimes • Local fire extinguishers will be provided where identified in the fire risk assessment		
Release of effluent before monitoring checks have been completed	• Water	• Local Environment • Surface or ground water	2	3	6	• Normal procedure will be for contaminated surface, process or fire waters to be stored within containment systems on site and are then tested prior to removal by tanker if significantly contaminated or via discharge to foul sewer if within acceptable discharge limits • Surface water and process water will be reused at the facility where practicable	4	3
Presence of gas bottles/other pressurised containers	• Air • Water • Land	• Public • Staff	4	4	16	• Pressurised containers used for calibration or maintenance purposes will be stored in designated secure storage area • Storage area will be designed in accordance with the relevant design standard	6	2.67
Explosives, bombs, ammunition found in waste load	• Air • Land	• Staff • Public	3	4	12	• Waste acceptance procedures in place to minimise risk of material being accepted • Non-conforming waste and emergency procedures to be implemented • Waste to be isolated and evacuation to take place if necessary	5	2.4
Exposure to chemical / unknown substances	• Air • Water • Land	• Staff	4	4	16	• Waste acceptance procedures in place to minimise risk of material being accepted • Non-conforming waste to be implemented if chemical/substance arrives in a waste load - waste to be isolated and alternative treatment route to be identified • For chemicals used within the process these will be discharged into designated storage silos which are designed in accordance with appropriate design, fabrication and safety standards • Silos equipped with local filtration and over-pressure protection • Load discharge supervised in accordance with operational procedures	6	2.67
Release of leachate into groundwater (from incoming waste streams and bottom ash run off)	• Water	• Ground water	1	5	5	**8.1** Fuel storage bunker will be designed as a liquid containing structure in accordance with BS EN 1992-3. This will prevent the ingress of ground water or the seepage of leachate from the waste to ground. The depth of the fuel bunker will be above the bedrock level. **8.2** 5-yearly structural inspections will be completed to ensure bunker integrity is maintained. • IBA storage will be within dedicated storage area with concrete floor and walls. • Any excess water which can't be reused in the process being tankered away or discharged to the public foul sewer network. • Concrete drainage and storage structures will be subject to an inspection and maintenance programme.	5	1