Appendix 19 – Preliminary Hazard Analysis

Preliminary Hazard and Safety Assessment							
Activity: MSW Supply, Bunker and Crane Feed System Operation							
NO.	**HAZARD**	**HAZARD EFFECT**	**SEVERITY**	**PROBABILITY**	**RISK**	**MINIMISE RISK BY**	**RESIDUAL RISK**
1	Arrival, discharging MSW and dispatch of trucks from MSW feed pit driveway and arrivals hall.	Collisions causing injury, Backing into MSW pit causing injury	Medium	Possible	Medium	Strictly enforced traffic controls, painted guidelines for truck movements, backing bunds to prevent trucks enering pit	Low
2	Generation of odourous gases in MSW feed pit	Odour escape impacts on emenity of site, health of personnel and possibly impacts on neighbours	High	Possible	High	Tipping area and pit within a building, building under negative pressure as air drawn to gasifier, fast acting doors, Installed deodouriser, 6 gasifiers and 3 processing trains means it is unlikely that all systems suffer an outage together so negative pressure maintained, in unlikley case of all gasifiers and trains down draft fan will still operate to induce a negative pressure in waste pit, in case of total electrical outage backup generator will operate emergency systems and draft fan.	Medium
3	Generation of hazardous gases in MSW feed pit	Methane is a Class A combustible gas which can mix with air to form an explosive mixture injuries to personnel	High	Possible	High	Air drawn from pit to gasifier creating a negative pressure in pit area, methane concentration detection alarm, 6 gasifiers and 3 processing trains which can all be operated independently which means it is unlikley that whole system would suffer an outage similtaneously so negative pressure maintained in waste pit area, even in case where all gasifiers down then draft fan can still draw air to continue negative pressure , Pit treated as closed space and work on tank requires permitting and appropriate PPE	Medium
4	Leakage of odourous from leachate collection tank	Odour escape impacts on emenity of site, health of personnel and possibly impacts on neighbours	Medium	Possible	Medium	Leachate collection tank is capped with forced ventilation to gasifier causing negative presure in air space in tank, tank treated as closed space and work on tank requires permitting and appropriate PPE	Low
5	Heating of MSW in pit by composting/fermentation causing a fire	Fume generated, potential for personnel injury	Medium	Possible	Medium	Infrared heat detectors installed in pit, grabs used to continually mix MSW in pit to reduce temperatures, fire fighting system installed, employees all trained in fire fighting techniques, Fire management plan developed.	Low
6	Leakage of hazardous gases from leachate collection tank	Methane is a Class A combustible gas which can mix with air to form an explosive mixture injuries to personnel	High	Possible	High	Leachate collection tank is capped with forced ventilation to gasifier causing negative presure in air space in tank, tank treated as closed space and work	Medium

NO.	HAZARD	HAZARD EFFECT	SEVERITY	PROBABILITY	RISK	MINIMISE RISK BY	RESIDUAL RISK
Activity: Gasifier and Secondary Combustion Chamber							
1	Leakage of hazardous gases from Gasifier	If syngas escaped gasifier could cause fire or explosion - result in injuries to personnel. Other gases could impact on health of employees and possible on neighbours.	High	Low	High	Water seals, step feeder and choke feed system to gasifier prevent the escape of syngas,	Medium
2	Overpressure, over temperature in gasifier	Explosion risk in gasifier - injury to personnel	High	Low	High	Alarms installed to indicate pressure and temperature in gasifier, feedback loops to control room, pressure and temperature controlled by adjusting air volume into furnace, individual gasifiers easily shut down.	Medium
3	High temperatures of the gasifier, secondary combustion chamber and exit flue.	Burns to employees or contractors	Medium	Possible	Medium	Inlet and outlet temperature controls with feed back to control room, temperature controlled by adjusting air intake.	Low
4	Dust from gasifier slag transfer	Impacts respiratory system of employees or contractors	Medium	Possible	Medium	Gasifier slag discharges into a water bath so that dust cannot escape, slay removed by bucket conveyor from slag bath is wet, transferred by closed conveyor system to enclosed slag storage tank	Low
5	Mechanical and noise hazards	Injury to employees or contractors, auditory impacts to employees or contractors.	Medium	Possible	Medium	Protective covers on equipment to prevent mechanical injury, Appropriate PPE worn by Operators and contractors	Low

NO.	HAZARD	HAZARD EFFECT	SEVERITY	PROBABILITY	RISK	MINIMISE RISK BY	RESIDUAL RISK
Activity: Boiler System							
1	Overpressure, over temperature in boiler	Explosion risk - injury to personnel	High	Low	High	Temperature and pressure monitoring with interlocks on boiler feed water increasing and decreasing water as appropriate to adjust temperature. Water levels are controlled by three feedback loops -drum, feed water flow and superheater steam flow. Water supply is automatically adjusted by feedback loops. Pressure monitoring is installed on the drum and safety valve on the outlet of the boiler and superheater. Any of the 3 processing lines can be shut down	Medium
2	High temperatures of the boiler and steam pipelines	Burns to employees or contractors	Medium	Possible	Medium	Appropriate training of employees. Inductions and permits for contractors	Low
3	Lack of water causes boiler to burn dry	Damage to integrity of boiler - potential for steam leaks, requirement to rebuild boiler. Potential for injury and large capital cost.	Medium	Low	Medium	Backup water supply system installed, Water supply system levels monitored with feedback loop to control room	Low
4	Steam leakage from steam pipes	Burns to employees or contractors	High	Possible	High	Scheduled maintenance system operates, Appropriate training for employees and contractors, permit to work systems in place,	Medium

NO.	HAZARD	HAZARD EFFECT	SEVERITY	PROBABILITY	RISK	MINIMISE RISK BY	RESIDUAL RISK
Activity: Steam Turbine System and Air Cooling Island							
1	Steam leakage from steam pipes	Burns to employees or contractors	High	Possible	High	Scheduled maintenance system operates, Appropriate training for employees and contractors, permit to work systems in place,	Medium
2	Contact between turbine oil and superheated steam	Fire causing injury to personnel and damage to facility	High	Possible	High	Steam turbine lubricating oil piping is placed below high temperature steam pipe, protective covers	Medium
3	Rotating equipment	Injury to employees or contractors.	Medium	Possible	Medium	Protective covers on equipment to prevent mechanical injury, Appropriate PPE worn by Operators and contractors	Low
4	Electrocution	Injury to employees or contractors.	High	Possible	High	All electrical equipment is installed to appropriate standards, includes approriate grounding protection, leakage protection and approriate insulation.	Medium
5	Noise from turbines	Auditory impacts to employees or contractors.	Medium	Possible	Medium	Turbines are enclosed within sound proofed building, operators and contractors working on or near equipment use approriate PPE	Low

NO.	HAZARD	HAZARD EFFECT	SEVERITY	PROBABILITY	RISK	MINIMISE RISK BY	RESIDUAL RISK
Activity: Flue Gas Treatment System							
1	Alkali dust from loading and use of lime from lime silo	Impacts respiratory system of employees or contractors	Medium	Possible	Medium	Lime bin includes a dust removal devise, operators transferring lime into silo or working near lime silo wear approriate PPE, Safety showers located in close	Low
2	Powdered activated carbon dust when loading hopper	Impacts respiratory system of employees or contractors	Medium	Possible	Medium	Activated carbon bin and feeder are enclosed, includes a dust removal devise, operators transferring activated carbon into silo or working	Low
3	Handling of liquid caustic in IBC's and loading lime to silo	Burns to employees or contractors	Medium	Possible	Medium	Operators unloading, moving or installing caustic containing IBC's wear appropriate PPE. Safety	Low
4	Breakdown in alkali supply to acid tower	Acid gas emissions - impacts on health and emenity of neighbours and environment	High	Possible	High	Operations personnel monitor alkali use in real time, issues identified early and corrected, alkali delivery system has standby pump and level alarm installed with feedback loop to control room. A primary and secondary acid gas scrubbing system are incorporated into the design. The secondary system acts as a backup if failure is detected in the primary system. Individual processing lines can be shut down for corrective measures if a problem is found to persist.	Medium
5	Breakdown in activated carbon supply to acid tower	Volitile base metal emissions - impacts on health and emenity of neighbours and environment	High	Possible	High	Activated carbon system has level alarm installed with feedback to contol room, operations personnel monitor activated carbon use in real time, issues identified early and corrected, can shut processing line if issue persists.	Medium
6	Dust from bag house filtration system	Impacts respiratory system and general health of employees or contractors	High	Possible	High	Dust removed from the bag house is discharged into an enclosed hopper and transferred by enclosed screw feeders to an enclosed air transfer system which deposits ash into an enclosed tank with dust control devises fitted. Stabilisation of ash is a wet process to prevent dust generation.	Medium
7	Electrocution	Injury to employees or contractors.	High	Possible	High	All electrical equipment is installed to appropriate standards, includes approriate grounding protection, leakage protection and approriate insulation.	Medium
8	Dew point reached in bag house	Reduced efficiency of bag house, emissions to atmosphere - impacts on health and emenity of neighbours and environment	Low	Possible	Medium	The bag house includes a heating control system with temperature monitoring to prevent the dew point being reached	Low

NO.	HAZARD	HAZARD EFFECT	SEVERITY	PROBABILITY	RISK	MINIMISE RISK BY	RESIDUAL RISK
Activity: Compressed Air System							
1	Overpressure of compressed air reciever	Explosive destruction - injury to personnel	High	Possible	High	Installed pressure recording and feedback to control room, over pressure safety valves installed.	Medium
2	Noise from compressors	Auditory impacts to employees or contractors.	Medium	Possible	Medium	Compressors are enclosed within sound proofed building, operators and contractors working on or	Low
3	Mechanical injury from rotating equipment	Injury to employees or contractors.	Medium	Possible	Medium	Protective covers on equipment to prevent mechanical injury, Appropriate PPE worn by	Low
4	Electrocution	Injury to employees or contractors.	High	Possible	High	All electrical equipment is installed to appropriate standards, includes approriate grounding protection, leakage protection and approriate insulation.	Medium