

Risk Assessment - Hull Waste Water Treatment Works Sludge Treatment Facility (STF)

Document Number

Facility:	Hull STF
Location:	Hull, West Yorkshire
Location of environmentally sensitive sites (km / m):	Greater than 500m (see below)
Risk assessment carried out by:	Mott MacDonald Ltd
Date:	31-Jan-19

The scope of the permit and associated rules is defined by the following risk criteria:

- Parameter 1 Permitted activities - The import, storage and treatment of non hazardous sludge, digestate and liquor (R13, R3).The storage and use of biogas as a fuel (R13, R1) and incineration on land (D10)
- Parameter 2 Permitted waste types - non hazardous sludge.
- Parameter 3 Quantity of waste accepted at the facility: Operational treatment capacity 19,300 IDS/annum - Max throughput capacity 28,141 IDS/annum.
- Parameter 4 Rated thermal input between 3MW and 50MW
- Parameter 5 All waste shall be stored and treated on an impermeable surface with sealed drainage system
- Parameter 6 CHP engines are located 200m from buildings used by the public.
- Parameter 7 The only point source discharges to controlled waters or groundwater, are surface water from the roofs of buildings and from areas of the facility not used for the storage or treatment of wastes.
- Parameter 8 The activities are not carried out within 250 metres of any off-site building used by the public, including dwelling houses.
- Parameter 9 The permitted activities shall not be carried out within 500m of a European Site (candidate or Special Area of Conservation, proposed or Special Protection Area or Ramsar site) or a Site of Special Scientific Interest (SSSI).
- Parameter 10 The activities shall not be carried out within Groundwater Source Protection Zone 1, or if a Source Protection Zone has not been defined then within 50m of any well spring or borehole used for the supply of water for human consumption. This must include private water supplies.
- Parameter 11 The activity is not carried out within an Air Quality Management Area designated for NO_x.
- Parameter 12 The activities are not carried out within 250 metres within the presence of Great Crested Newts where it is linked to the breeding ponds of the newts by good habitat, 50 metres of a National Nature Reserve (NNR), Local Nature Reserves(LNR), Local Wildlife Site (LWS), Ancient woodland or Scheduled Ancient Monument or 50 metres of a site that has relevant species or habitats protected under the Biodiversity Action Plan that the Environment Agency considers at risk to this activity .

Abbreviations: NO_x - Oxides of Nitrogen
 CO - Carbon Monoxide
 CHP - Combined heat and power
 DSEAR - Dangerous Substances and Explosive Atmospheres Regulations 2002

Data and information				Judgement				Action (by permitting)	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).
Local human population.	Releases of particulate matter (dusts) and micro-organisms (bioaerosols).	Harm to human health - respiratory irritation and illness. Nuisance - dust on cars, clothing etc.	Air transport then inhalation.	Medium	Medium	Medium	The permitted waste is non-hazardous sludge in liquid and cake form. The risk of dust creation is low but the risk of bioaerosol creation is medium. Overall a medium magnitude risk is estimated.	Liquid imports are controlled by a logging system and only pumped when pipes are connected via bauer coupling. There is only a risk if there is a spillage to hardstanding areas during delivery which is considered unlikely. If a spillage occurs there are local wash-down facilities and local drainage pipes to take the wash-down to the inlet of the sewage treatment works. Sludge cake deliveries are controlled by an interlocked key system that only allows discharge of the contents of the cake wagon into the cake reception unit once the control systems opens the roller shutter door and starts the cake conveyor. After delivery the roller shutter door is closed. Bioaerosols associated with the sludge cake are unlikely to occur as this is a solid state. If bioaerosols do occur then the cake is either enclosed in a truck or in a covered and odour controlled cake reception unit where there is no access for personnel. As such any bioaerosols produced are contained. Operations take place within a closed system, including covered tanks, pipework and machinery. The anaerobic digestion vessels are sealed and biogas is extracted from the vessels. The biogas gas generated is piped to storage and then to combustion in either CHP engines (to produce electricity), boilers (to produce heat for the anaerobic digestion process) or wasted via a waste gas burner (if excess gas is produced). The digested sludge tanks are covered with odour extraction to the odour treatment unit. This minimises the risk of bioaerosols affecting operational staff. Centrate liquors produced from the dewatering of digested sludge flows by gravity in pipes to an underground pumping station from where it is pumped back to the treatment process. Dust nuisance is not a risk because all processes involve liquid sludge or sludge cake which does not create dust. Liquid lime is used and polymer powders are stored and mixed with liquids in sealed systems. The Hull STF is considered to pose a low risk of bioaerosol release. Normal STF activities are unlikely to lead to significant human health exposure to bioaerosols. Please see the bioaerosols technical note attached to the permit application.	Very Low
Local human population.	Releases of NO _x .	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Low	Medium	Medium	Air dispersion modelling assessment (Appendix D of supporting information VS03-STA-00-ZZ-RP-Z-0375 Hull STF Dispersion Modelling Report) concluded the effect on local human population from the new STF is not significant.	Activities will be managed and operated in accordance with an Environmental Management System. This will include regular inspection and maintenance of associated equipment. Point source emissions to air will be monitored in line with the permit requirements for NO _x . The activities are not carried out within an AQMA designated for NO _x . CHP engines will be managed using a sub-contract. All routine and interval maintenance will be carried out on the engines at intervals specified by the manufacturer. The boilers will be maintained by Yorkshire Water in accordance with the manufacturer's instructions and the emissions monitored in line with permit requirements.	Low
Local human population.	Releases of CO.	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Low	Medium	Medium	Air dispersion modelling assessment (Appendix D of supporting information VS03-STA-00-ZZ-RP-Z-0375 Hull STF Dispersion Modelling Report) concluded the effect on local human population from the new STF is not significant.	As above	Low
Local human population.	Odour.	Nuisance, loss of amenity.	Air transport then inhalation.	Medium	Medium	Medium	Local residents often sensitive to odour, hence control measures are in place.	The STF has been designed so that all potentially high odorous sources are covered and air is extracted to an odour control unit. An odour dispersion model demonstrated that the odour levels at receptors will be reduced after completion of the new STF. YW shall maintain and implement an Odour Management Plan. All pre-digestion sludge treatment and storage activities are covered and the air extracted to an odour control unit. Anaerobic digestion vessels are sealed tanks with the associated biogas generated piped to storage and then to combustion in either CHP engines, boilers or a waste gas burner. Specific odour emission rates have been measured at digestate storage, digestate cake handling and liquor treatment. These rates have been used in the odour modelling for the site. Emissions from burning of biogas shall be free from odour. Biogas storage and pipelines are all monitored for pressure and alarm on low pressure which would indicate a leak. There are fail safe slam shut valves to the users that close on detection of a leak via pressure. Lime will be added to maintain a pH in the sludge cake of between 9 and 10 at the STF site. Liming is used to improve pathogen removal in the digested sludge and has a positive effect of reducing odour release from the sludge cake.	Low
Local human population.	Noise and vibration due to machinery and truck movements.	Nuisance, loss of amenity, loss of sleep.	Noise through the air and vibration through the ground.	Low	Low	Low	Local residents often sensitive to noise and vibration but there is low potential for exposure.	The design has been developed to minimise noise off-site. The site does not have a history of noise complaints and the scheme is likely to have a negligible impact on the background noise level in the area due to the site's proximity to other industrial facilities and the busy A63. The facility is located towards the centre of an extensive WwTW. The nearest residential receptor to the site is approximately 200 m west at along Hull road. The closest sensitive receptors are considered to be the industrial sites to the east of the WwTW (around 100 m distance). YW will conduct a pre and post scheme noise survey. The operator will maintain all equipment either in house or by a sub-contract such that noise and vibration are maintained within the limits of the inputs to the sound model. The main truck movements are away from residential housing. There is no equipment on site that can cause vibration nuisance at the local receptors.	Low
Local human population.	Scavenging animals and scavenging birds.	Harm to human health - from waste carried off site and faeces. Nuisance and loss of amenity.	Air transport and over land.	Low	Medium	Medium	Permitted wastes unlikely to attract scavenging animals and birds.	The plant is designed with very few open surfaces for scavengers and therefore there is a low risk of harm to human health.	Low
Local human population, livestock and wildlife.	Litter.	Nuisance, loss of amenity and harm to animal health.	Air transport then deposition.	Low	Low	Low	Local residents often sensitive to litter, but these activities will not generate litter.	As above. Sludge screening skips are emptied regularly and screens are maintained in accordance with the manufacturers instructions.	Very low
Local human population.	Waste, litter and mud on local roads.	Nuisance, loss of amenity, road traffic accidents.	Vehicles entering and leaving site.	Medium	Medium	Medium	Road safety, local residents often sensitive to mud on roads.	As above. Washwater hose is available in the bundled offloading bays to enable wheel washing.	Low
Local human population.	Pests (e.g. flies)	Harm to human health, nuisance, loss of amenity.	Air transport and over land.	Medium	Medium	Medium	Insects can multiply on permitted wastes, particularly in summer months.	The plant is designed with very few open surfaces and tanks are mixed to avoid stagnant surfaces. Flies are not known to be a problem on similar sludge treatment facilities.	Low

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What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?		What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).
Local human population and / or livestock after gaining unauthorised access to the installation.	All on-site hazards: machinery & vehicles.	Bodily injury.	Direct physical contact.	Low	Medium	Medium	Direct physical contact is minimised by activities being carried out within the sewage treatment works and in containerised units or locked buildings so only a low magnitude risk is estimated.	The plant will be surrounded by security fencing in accordance with Yorkshire Water's "Enhanced Plus" security rating. CCTV cameras will be in operation and security lighting will be installed. Security alarms are installed on all kiosks and buildings. Access to site is by an electronically controlled pass system. Activities shall be managed and operated in accordance with the Environmental Management System which will include site security measures to prevent unauthorised access.		Low
Local human population and local environment.	Arson and / or vandalism causing the release of polluting materials to air (smoke or fumes), water or land.	Respiratory irritation, illness and nuisance to local population. Injury to staff, firefighters or arsonists/vandals. Pollution of water or land.	Air transport of smoke. Spillages and contaminated firewater by direct run-off from site and via surface water drains and ditches.	Medium	High	High	Although biogas is flammable, risk of direct physical contact is minimised by activity being carried out within the sewage treatment works and in containerised units or locked buildings.	As above. Fire detection equipment is installed in the CHP containers and the boiler building which alarm on detection of a fire. Slam shut valves on natural and biogas lines will automatically close on detection of a fire to prevent any fuel being supplied the CHP engines or boilers.		Low
Local human population and local environment.	Accidental fire causing the release of polluting materials to air (smoke or fumes), water or land.	Respiratory irritation, illness and nuisance to local population. Injury to staff or firefighters. Pollution of water or land.	As above.	Low	Medium	Medium	Risk of accidental combustion of waste is moderate.	As above and safety zoning of areas under DSEAR.		Low
All surface waters close to and downstream of site.	Spillage of non hazardous sludge, biogas condensate, engine oil, refrigerant for chillers, glycol in engine cooling circuit and corrosion inhibitor in hot water boilers.	Acute effects: fish kill	Direct run-off from site across ground surface, via surface water drains, ditches etc.	Medium	High	High	Permitted waste types are non hazardous sludges, however the volumes in question are significant hence why a high magnitude of risk is estimated. Quantities of the other liquids are low.	The STF will comply with the BAT justification document (Document Ref. 23). The digester compound will have a new impermeable concrete surface installed with all the drainage returned to the treatment process via the liquor returns pumping station. All new underground pipework containing sludge or centrate shall be dual contained and shall be designed to either: 1. Be installed within a culvert which is accessible for inspection for leaks. 2. In double skinned pipework with a suitable leak detection system 3. Where under new structures - fully encased in concrete and structurally tied into the structure above The pipelines are constructed in good ground conditions and in accordance with the manufacturer's recommendations. The pipelines are installed and tested in accordance with standard water industry specifications and YWS engineering specifications. Following review of the ground conditions, and the pipeline product data sheets, it is determined that there is a very low risk of leakage. In the unlikely event of overflow of contaminants from process streams it is possible that sludge could flow across paved areas to grassed / stone areas. If this occurs then YW will react with an emergency spill response and clean up the area that has been contaminated. Biogas condensate - Condensate is captured in condensate pots and overflows to drains which are directed to pumping stations which pump back the liquors to the sewage treatment works. Corrosion inhibitor - small quantities of corrosion inhibitor are used in the boiler hot water circuit. The area where the boilers stand drains to the pumping station that directs the liquors back to the sewage works. The quantity is diluted by a very large flow of sewage at the sewage treatment works.		Low
All surface waters close to and downstream of site.	As above.	Chronic effects: deterioration of water quality.	Direct run-off from site across ground surface, via surface water drains, ditches etc. Indirect run-off via the soil layer.	Medium	High	High	Permitted waste types are non hazardous sludges, however the volumes in question are significant resulting in a overall high magnitude of risk. Quantities of the other liquids are low.	As above		Low
Abstraction from watercourse downstream of facility (for agricultural or potable use).	As above.	Acute effects, closure of abstraction intakes.	Direct run-off from site across ground surface, via surface water drains, ditches etc. then abstraction.	Very low	Medium	Medium	Watercourse must have medium / high flow for abstraction to be permitted, which will dilute contaminated run-off.	As above		Low
Groundwater.	As above.	Chronic effects: contamination of groundwater, requiring treatment of water or closure of borehole.	Transport through soil/groundwater then extraction at borehole.	Medium	High	High	Permitted waste types are non hazardous sludges, however the volumes in question are significant hence why a high magnitude of risk is estimated. Quantities of the other liquids are low.	As above. Activities will not take place within Groundwater Source Protection Zone 1.		Low
Local human population.	Contaminated waters used for recreational purposes.	Harm to human health - skin damage or gastro-intestinal illness.	Direct contact or ingestion.	Low	Medium	Medium	Unlikely to occur, but might restrict recreational use.	As above.		Very low
Local human population and local environment.	Flooding of site.	If waste is washed off site it may contaminate buildings / gardens / natural habitats downstream.	Flood waters.	Low	Medium	Medium	Permitted waste types are non-hazardous so any waste washed off site will add to the volume of the local post-flood clean up workload.	All critical assets have been designed to be raised above a 1 in 100yr fluvial + 1 in 200yr tidal flood level + climate change and freeboard. Drainage is designed to contain a 1 in 30yr flood and a 1 in 100 flood will see no water pass the site boundary.		Very low
Local human population and local environment.	Accidental explosion of biogas.	Respiratory irritation, illness and nuisance to local population. Injury to staff, fire fighters or arsonists/vandals. Pollution of water or land.	Air transport . Spillages and digestate direct run-off from site and via surface water drains and ditches.	Very Low	High	Medium	Unlikely to happen - reduced by effective management systems.	HSE guidance "Methane Gas Holders Safety Report Assessment Guide: Methane (Gas Holders)" states that an explosion from low pressure gas holders is not a credible scenario. Management systems are in place to ensure all biogas storage and usage plant and equipment are monitored and maintained.		Very Low
Protected sites - European sites and SSSIs	Any, but principally NOx.	Harm to protected site through toxic contamination, nutrient enrichment, smothering, disturbance, predation etc.	Any.	Low	Medium	Medium	Emissions to air may cause harm to and deterioration of nature conservation sites.	No activities are carried out within 500m of a European Site or SSSI. (Distance criteria as agreed with Natural England/Countryside Council for Wales). An air dispersion model has been carried out - VS03-STA-00-ZZ-RP-Z-0375 Hull STF Dispersion Modelling Report. Predicted concentrations of all pollutants were below the relevant standards at all sensitive locations representative of human exposure within the assessment extents for all modelling scenarios. Nitrogen and acid gas deposition rates were also predicted at relevant ecological sites. Results indicated that emissions from the facility would not significantly affect existing conditions at any designation.		Low

Notes: Red triangle indicates comment containing supporting information
Yellow columns contain drop down menus that allow automatic evaluation of risk in green column