North Beck Energy Centre

ANNEX C: Environmental Risk Assessment

North Beck Energy Limited

Date: September 2018

Our Ref: JER1646

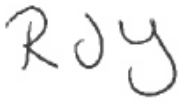
RPS

6/7 Lovers Walk
Brighton
East Sussex
BN1 6AH

Tel: (0)1273 546800
Email: rpsbn@rpsgroup.com

Successful Partners
DELIVERING QUALITY

Quality Management

Prepared by:	Alice Gibbs Graduate Environmental Consultant	
Prepared by:	Rebecca Yates Assistant Environmental Consultant	
Authorised by:	Jennifer Stringer Technical Director	
Date:	12 September 2018	
Revision:	2	
Project Number:	JER1646	
Document Reference:	180912 R JER1646 AG Environmental Risk Assessment rev2	
Document File Path:	\\bris-aw-fs-01\Projects\JER1646 - North Beck Efw\5. Reports\2. Final Report\Annex C_Environmental Risk Assessment\180912 R JER1646 AG Environmental Risk Assessment rev2.docx	

RPS Consulting Services Ltd. Registered in England No. 01470149
20 Western Avenue, Milton Park, Abingdon, Oxfordshire, OX14 4SH
A member of the RPS Group Plc

Amendment Record

Revision No.	Date	Reason for Change	Authors Initials
0	10/08/2018	-	AG
1	15/08/2018	Poyry comments	JS
2	12/09/2018	Finalisation	JS

Contents

Tables, Figures & Appendices

Table

Figures

Appendices

1 Introduction

1.1.1 This Environmental Risk Assessment has been carried out in support of an application for an environmental permit. It includes an assessment of the risk to the environment and human health from an energy from waste activity. The Environment Agency's Risk Assessments for your environmental permit1 covers a range of environmental risks. Those aspects relevant to the operation of the proposed North Beck Energy from Waste (EfW) facility are covered within the following sections

- Amenity and Accidents
- Emissions to Air
- Global Warming Potential

1.1.2 The assessment of emissions to air and global warming potential is supported by the H1 assessment software tool, which can be found in the Appendix to this Environmental Risk Assessment (Appendix C1).

1.1.3 This document provides the relevant risk assessments covering the above aspects.

[1] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit

2 Amenity and Accidents

2.1.1 This section provides an assessment of risks to environmental amenity and from accidents that could arise from operation of the EfW facility. The assessment has been completed in accordance with the EA's *Risk Assessments for your environmental permit [1]*.

2.1.2 The scope of the assessment has covered the following aspects:

- odour;
- noise and vibration;
- fugitive emissions;
- visible emissions; and
- accidents.

2.1.3 For each of the above, the approach to the assessment has followed the following four stage process:

1. identify the hazards;
2. assess the risks (assuming that any control measures proposed are in place);
3. choose appropriate further measures to control these risks (if required); and
4. present the assessment of overall risk.

2.1.4 Results of the assessment are provided in the following tables.

Table 2.1 Assessment of odour risks

Table 2.2 Assessment of noise and vibration risks

Table 2.3 Assessment of fugitive emission risks

Table 2.4 Visible emissions

Table 2.5 Accidents risk assessment and management plan

2.1.5 In completing the assessment, prevention and control measures proposed by North Beck Energy Limited ('NBEL') are assumed to be in place. Where relevant, details of these measures are identified within the assessment.

Table 2.1: Odour risk assessment and management plan

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence.
Odour emissions from the feedstock reception hall and feedstock delivery vehicles	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Air	The following odour control measures are proposed: The primary and secondary (PA and SA) combustion air fans maintain the tipping hall and bunker area under negative pressure and air from this area will be drawn into the furnace for combustion during operation of the plant therefore destroying any potentially odorous compounds. Access to the tipping hall will be via automatic fast acting doors which will remain closed unless vehicles are entering or departing from the Tipping Hall. High standards of housekeeping will be maintained to ensure that the bunker area remains free of build-up of feedstock and that any material which is accidentally deposited outside of the bunker is cleared up promptly. Crane operators will be trained to ensure that the materials in the bunker are well mixed and that incoming feedstock is not being left within the bunker for excessive periods. The bunker is designed to hold up to 5 days supply of feedstock. Odour will be routinely monitored as part of the daily inspections with further monitoring following an odour complaint and records of any such inspections will be kept. As far as practicable planned maintenance will be arranged separately for each of the two lines, ensuring that one line remains in operation and odour control via combustion of air within the tipping hall and bunker area is maintained. For periods of up to one week in the event of a total planned shutdown (e.g. inspection of common pressure parts), fuel deliveries will be stopped ahead of the shutdown so that the bunker contents can be	Low	Minor odour annoyance (at worst)	Not significant

Hazard What has the potential to cause harm?	Receptor What is at risk? What do I wish to protect?	Pathway How can the hazard get to the receptor?	Risk management What measures will you take to reduce the risk? If it occurs – who is responsible for what?	Probability of exposure How likely is this contact?	Consequence What is the harm that can be caused?	What is the overall risk? What is the risk that still remains? The balance of probability and consequence.
			used up as far as practicable. For longer periods odour will be monitored and if remaining fuel deteriorates significantly then it will be removed from the bunker and transported off site for disposal. De-odourising sprays and mist sprays may also be used to control odour levels during the shutdowns to delay the need for removal of the fuel. In the event of a complaint, the complaints procedure will be followed to record and act on the complaint, and instigate appropriate action.			

Table 2.2: Noise and vibration risk assessment and management plan

Hazard What has the potential to cause harm?	Receptor What is at risk? What do I wish to protect?	Pathway How can the hazard get to the receptor?	Risk management What measures will you take to reduce the risk? If it occurs – who is responsible for what?	Probability of exposure How likely is this contact?	Consequence What is the harm that can be caused?	What is the overall risk? What is the risk that still remains? The balance of probability and consequence.
Noise from vehicle movements onsite and offloading (such as reverse warnings)	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Air	Main traffic movements associated with the EfW will occur from 06:00 to 19:00 seven days a week, including bank holidays except Christmas Day, Boxing Day and New Year's Day. However, the majority (circa 95%) of the RFD deliveries would be brought in Monday to Friday between 09:00 and 18:00). Outside of these hours, deliveries and removals will not occur The mechanical loading shovel will only be used for spillages (i.e. infrequent operation limiting associated noise from reverse bleepers). Noise mitigation measures have been incorporated	Low to Medium However, noise would be intermittent and the majority of deliveries will be made between 09:00 and 18:00hours Monday to	Low Noise modelling undertaken demonstrates that the noise effects of operational traffic will not be significant.	Not significant

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence.
			within the design (see Annex N of the main application document for details). In the event of a complaint, the complaints procedure will be followed to record and act on the complaint, and instigate appropriate action.	Friday.		
Noise from main plant generator buildings	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Air	The EfW facility encloses nearly all of the principle plant items within a building, with the exception of the air cooled condenser which needs to be located externally to reject low grade waste heat to the atmosphere Access to the tipping hall will be via fast acting weather tight doors which will remain closed unless vehicles are entering or leaving the tipping hall. In the event of a complaint, the complaints procedure will be followed to record and act on the complaint, and instigate appropriate action	Low due to distance of local residents	Low Unlikely to cause annoyance to sensitive receptors. Noise modelling undertaken demonstrates that the noise effects of plant operation are not significant	Not significant
Vibration from the plant	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Land	Significant vibration effects are not anticipated for the plant. Any vibration issues associated with the plant will be resolved during commissioning. In the event of a complaint, the complaints procedure will be followed to record and act on the complaint, and instigate appropriate action.	Low	Low Noise assessment considered that significant vibration effects from the EfW facility during its operation were unlikely.	Not significant

Table 2.3: Fugitive emissions risk assessment and management plan

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence**.**
To Air						
Dust from feedstock deliveries and handling	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Air	All handling will take place within a building and access to the tipping hall will be via fast acting weather tight doors which will remain closed unless vehicles are entering or leaving the tipping hall. PA & SA fan intakes are located above the bunker to create a slight negative pressure to prevent dust leaving the building. Dust emissions from the feedstock bunker will be inhibited by maintaining the bunker under negative pressure and mist sprays may also be used as an additional measure to supress dust during tipping and when the crane is in operation. Visual dust monitoring procedures will be developed prior to operation.	Low	Low Nuisance, dust on windows, cars etc.	Not significant if dust mitigation measures are managed
Hydrated lime deliveries and handling	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Air	Sealed connection system between the road vehicle and storage tank. Level monitoring will be included and will be linked to a switch to prevent overfilling. Any spillage of material during a delivery, for example during disconnection of the hose would be cleared immediately. Storage vessels will be fitted with a filter to minimise fugitive emissions of dust.	Low	Low Nuisance, dust on windows, cars etc.	Not significant
Powdered activated carbon	Local residents (nearest receptors approx. 560 m from	Air	Deliveries are made using an enclosed road tanker with sealed hose connection to the storage vessel. Level detection will be provided for the storage tank	Very low	Low	Not significant

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence**.**
deliveries and handling	the installation). Industrial units (closest are warehouses located within 50 m of the installation).		which will be linked via a switch to prevent overfilling. Any spillage of material during a delivery, for example during disconnection of the hose would be cleared immediately. Storage vessels will be fitted with a filter to minimise fugitive emissions of dust.		Nuisance, dust on windows, cars etc.	
Ammonia solution deliveries and handling	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Air	Deliveries use a sealed connection system between the road vehicle and storage tank. Level monitoring will be included and will be linked to a switch to prevent overfilling. The storage tank and fill point will be located within a bunded area. Storage vessels will be fitted with a scrubber to minimise fugitive emissions during loading.	Low	Medium Short duration	Not significant
Dust from residue handling and storage	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Air	Incinerator Bottom Ash (IBA) is discharged into the storage bunker in a moist condition so any dust generation from this source is negated. The bunker is also fully enclosed within the main building. Vehicles removing the IBA from the site will be covered and vehicles inspected prior to leaving the building to ensure they are free from deposits. The APCr silo will be filled during normal operation by pneumatic transfer from the bag filter hoppers. Unloading of the silo to the removal tanker will be via a sealed umbilical type connection. The silo and the pneumatic transfer system conveyors are all located within the main building and so any releases through equipment failure will be contained and can be removed by vacuum cleaning.	Low – the APC system is fully contained. During routine plant walkovers, any leakage would be identified.	Medium – material is hazardous and fine.	Not significant

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence**.**
			In the event of a spillage of either residue, Operators will be required to arrange for cleaning promptly. Filter on silo vent is fitted with a differential pressure alarm and automatic cleaning. Removal of APCr from site will be monitored by site personnel and vehicles will be inspected prior to leaving the site to ensure they are free from deposits.			
VOCs from deliveries and storage of low sulphur fuel oil	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Air	Delivery vehicles will offload using a sealed connection. The storage vessel will have a vent to permit tank breathing. Emissions from this source are not considered to be significant since the material being stored will be relatively non-volatile. The integrity of all liquid storage containers will be subject to routine checks as part of daily site inspections.	Low	Low	Not significant
VOCs from deliveries and storage of transformer oils	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Air	Transformer oil top-up will be infrequent and limited in amount. The integrity of transformers will be subject to routine checks as part of daily site inspections.	Low	Low	Not significant
To Water						
Run off from	River Humber, via	Ground/	The feedstock bunker will be designed to be water	Low	Medium – surface	Not significant

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence**.**
feedstock bunker	unnamed drain and North Beck drain. Ground	surface drains	tight and be constructed of thick concrete walls and base. Any leachate released during storage of the feedstock will be fully contained in the bunker. In the event of build-up of leachate, this will be removed by gully sucker/tanker for off-site disposal. During shutdown periods, the bunker will be visually inspected as far as possible, to ensure that it is in a good state of repair. The bunker will be designed to form part of the firewater containment system and therefore is designed to fully contain firewater run-off into this part of the facility.		water/groundwater contamination	
Run off from bottom ash	River Humber, via unnamed drain and North Beck drain. Ground	Ground/ surface drains	Bottom ash is removed on an inclined conveyor where most of the water drains back into the quench bath. In the unlikely event of run off from the bottom ash during storage, this will collect in a sump and can be removed by a gully sucker. Process areas are appropriately surfaced and drains collect waters for re-use.	Low	Low/medium Run off volumes are expected to be low	Not significant
Transfer and removal of bottom ash	River Humber, via unnamed drain and North Beck drain. Ground	Ground/ surface drains	Bottom ash handling and transfer will be undertaken within a building with an impermeable surface. A clamshell type grab will transfer the material from the bunker into road vehicles. Any spillage of bottom ash would be cleaned up immediately using dry techniques. A spillage management plan will be in place. Vehicles will be sheeted and inspected to ensure they are free from deposits of residues prior to leaving the building. Should any IBA enter the building drains this will	Low	Low – any aqueous release would be small	Not significant

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence**.**
			collect within the dirty water tank which itself tops up the bottom ash quench.			
Transfer and removal of APC residues	River Humber, via unnamed drain and North Beck drain. Ground	Ground/ surface drains	APCr transfer and outloading will be handled within a fully enclosed system located within the main plant building. The APCr silo will be filled during normal operation by pneumatic transfer from the bag filter hoppers. Unloading of the silo to the removal tanker will be via a sealed umbilical type connection. The silo and the pneumatic transfer system conveyors are all located within the main building and so any releases through equipment failure will be contained and can be removed by vacuum cleaning. In the event of a spillage of APC residue, Operators will be required to arrange for cleaning immediately. APC residues will not be washed down to drain under any circumstances. A spillage management plan will be in place. In the unlikely event that APC residues enter the internal drainage system the dirty water tank could be isolated and contain the residue and the water would be tested and removed for offsite disposal if required. Removal of APC from site will be monitored by site personnel and vehicles will be inspected prior to leaving the site to ensure they are free from deposits.	Low	Medium	Not significant
Storage and transfer of solid reagents	River Humber, via unnamed drain and North Beck drain. Ground	Ground/ surface drains	Materials are stored and transferred within a building with an impermeable surface. A hard, impermeable surface will underlay all chemical storage areas to prevent fugitive emissions to ground and groundwater should a minor spill occur. A spillage management plan will be in place.	Very low Spillage would be contained within the dirty water system.	Low/medium	Not significant

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence**.**
			Drains within this area collect water and discharge into the dirty water tank. In the event of a spillage of material which enters the drains, the dirty water tank can be isolated and tested and if deemed contaminated for re-use then off-site disposal can be arranged.			
Leak of diesel/fuel oil from storage area	River Humber, via unnamed drain and North Beck drain. Groundwater Ground	Ground/ surface drains	A hard, impermeable surface will underlay all chemical and oil storage areas to prevent fugitive emissions to groundwater should leaks occur. Deliveries are all overseen by a trained member of staff, who will ensure that there is sufficient capacity within the storage vessel for the delivery. The storage tank is within a bund to contain any spillage and a drip tray is provided to contain any minor spillage during connection/disconnection of the delivery hose. Diesel and auxiliary fuel storage area will be appropriately bunded in accordance with oil storage regulations. A hard, impermeable surface will underlay all chemical and oil storage areas to prevent fugitive emissions to groundwater should spills/leaks occur. Surface water run-off from hardstanding areas will be captured by drains that flow into an oil/silt interceptor tank before discharge into one of the two interlinked attenuation basins. Penstock valves are in place on the discharge from the attenuation basins and can be closed in the event of a leak to the surface drains. Spill kits will be available to contain and clean up any spills. A spillage management plan will be in place. A procedure will be designed to ensure that any damaged or leaking containers are dealt with and to allow regular inspections for any signs of deterioration.	Very low. A release would only occur in the event of an accident/incident and would require failure of both primary and secondary containment. Operational management procedures will prevent this from happening.	Medium/high Contamination of local water course	Not significant

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence**.**
Run off/leak from maintenance oils storage	River Humber, via unnamed drain and North Beck drain. Groundwater Ground	Ground/ surface drains	A hard, impermeable surface will underlay all chemical and oil storage areas to prevent fugitive emissions to groundwater should leaks occur. The oil storage areas will be appropriately bunded. Surface water run-off from hardstanding areas will be captured by drains that flow into an oil/silt interceptor tank before discharge into one of the two interlinked attenuation basins. Penstock valves are in place on the discharge from the attenuation basins and can be closed in the event of oil overflow into the drains. Any spillage of material during a delivery would be contained and cleared immediately. Spill kits are located close to the ammonia tank to contain any spillage. A spillage management plan will be in place. A procedure will be designed to ensure that any damaged or leaking containers are dealt with as soon as practicable and to provide for regular inspections to identify as soon as possible any signs of deterioration. Regular visual inspections of the maintenance oil storage area will be completed to allow for early detection of any sign of damage/leaks and trigger immediate remedial action.	Low A release would only occur in the event of an accident/incident and would require failure of both primary and secondary containment. Operational management procedures will prevent this from happening.	Low/medium Small volumes of maintenance oils will be stored on site	Not significant
Leak from ammonia solution tank or during delivery	River Humber, via unnamed drain and North Beck drain Groundwater Ground	Ground/ surface drains	Deliveries use a sealed connection system between the road vehicle and storage tank. Level monitoring will be included and will be linked to a switch to prevent overfilling. The storage tank and fill point will be located within a bunded area. Delivery vehicles will be located in a dedicated surfaced delivery point. Any spillage of material during a delivery would be	Very Low	Medium/high	Not significant

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence**.**
			contained and cleared immediately. Spill kits are located close to the ammonia tank to contain any spillage. Spillage procedures will be in place Penstock valves on the attenuation ponds would be closed in the event of a spillage to contain the spill onsite. These valves can be remotely actuated.			
Litter						
Feedstock release from fuel hall and delivery vehicles	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the installation).	Windblown to air	All feedstock will be transported to the facility contained within vehicles. The feedstock will be delivered to the feedstock bunker and deposited in the bunkers which have been designed to hold the maximum quantities of feedstock required to ensure effective operation of the facility. Good housekeeping procedures will be developed and applied to ensure all feedstock is removed from vehicles before leaving the site. Any unexpected spillage would be cleaned up promptly.	Low Local residents located approximately 560 m from the site border	Low/medium Nuisance to local receptors	Not significant
Pests						
Flies, and other pests or vermin in feedstock storage area	Local residents (nearest receptors approx. 560 m from the installation). Industrial units (closest are warehouses located within 50 m of the	Air	The feedstock bunker will be within an enclosed building. All waste deliveries and storage will be carried out within this building. Good housekeeping procedures will be developed and applied to ensure all feedstock is removed from vehicles before leaving the site. Any unexpected spillage would be cleaned up promptly. Pest control measures will be applied in accordance with recommendations from a specialist pest control	Low Good site management procedures should prevent this occurring.	Low Nuisance	Not significant

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence**.**
	installation).		advisor. In the event of a complaint, the complaints procedure will be followed to record and act on the complaint, and instigate appropriate action.	Closest residential receptors located approx.. 560 m from the site		

Table 2.4: Visible emissions

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence.
Plume from emission stacks	Local residents (nearest receptors approx. 560 m from the installation). Industrial and commercial units (closest are warehouses located within 50 m of the installation).	Visual	Visible plumes are not anticipated to occur for the majority of operational time due to the temperature at which the treated flue gas exits the stack.	Low	Low – Minor visual disturbance	Low

Table 2.5: Accidents risk assessment and management plan

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence.
Operator error	Air/Water/Land - dependent on nature of the error	Variable - dependent on nature of the error	The plant will be automatically controlled under normal operation, thereby minimising the potential for operator error. The automatic control system will include alarms to alert the Operator of potential operational problems and where relevant will be triggered with sufficient safety margin to permit operator intervention to prevent an actual problem	Low	Variable depending upon nature of incident	Not significant provided operating procedures are followed

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence.
			occurring. All operational staff will be fully trained against the site operating procedures. Training will include raising awareness of key plant parameters and the potential implications of failure to control operations as designed and the associated potential impact on the environment.			
Loss of power	None	N/A	In the event of a loss of power during normal operation, the plant will automatically switch to island mode. Under these circumstances the turbine generator provides sufficient power for the site and surplus steam is bypassed directly to the air cooled condenser. If the plant failed to transfer to island mode, then the emergency generator will start automatically and provide sufficient power to inhibit fuel feed and shut down the plant safely. In the event of a loss of power to the site during non-operational periods the plant would not be able to start-up and therefore no operations can commence.	N/A	N/A	N/A
Loss of containment during storage or transfer of reagents, chemicals, fuels and oil (transformer and lubricating oil)	River Humber, via unnamed drain and North Beck drain Groundwater Ground	Site drainage system via SUDS or direct contact with land.	A spillage management plan will be in place. Storage of ammonia solution, fuel oil and boiler water treatment chemicals will be in bunded tanks. The ammonia solution and fuel oil tanks will be located outside whilst boiler water treatment chemicals will be stored within the main building. All bunds will be visually checked each day to ensure that they are empty. Bunds will contain at least 110% of the tank contents and the oil storage tank will be designed to be compliant with the Oil Storage Regulations. All process storage tanks will be built of suitable materials which are resistant to the vessel content. A maintenance programme will be established for the	Very Low – requires multiple failure events	Medium/High Contamination of local water course - dependent on quantity and material released	Not significant as long as delivery procedures are adhered to, and in the event of a spillage, the spill management plan is followed.

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence.
			inspection of all storage tanks. All other reagents, chemicals and residues will be stored within silos inside the main building. Spillage from these silos will be contained , on hardstanding and will be dry materials that will immediately be vacuum cleaned. Spillage from tanker connections or from the storage vessels and transfer pipes will be contained within the building and on concrete hardstanding. These will predominantly be solids therefore easier to clean up. However any liquids or dirty water from cleaning will be collected by the internal drains and supplied to the dirty water tank. Potential release to groundwater would require simultaneous failure of the storage tank and containment (e.g. bunds, interceptor, attenuation basin penstock valves). Bulk deliveries will be overseen by a trained member of staff who will be responsible for checking that there is sufficient capacity in the storage vessel to receive the delivery. A site spill procedure will be developed and followed in the event of a spillage. Spill kits will be available to contain and clean up the spill. Solid raw materials will be cleaned using dry techniques. Incidents will be recorded and investigated appropriately according to the site incident procedure. Significant incidents will be reported to the EA in accordance with the requirements of the permit.			

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence.
Fire in feedstock bunker causing emissions to air	Air	Direct release of combustion gases to air	The plant has been designed such that the feedstock bunker is physically separate from ignition sources. The feed hopper is designed to prevent backflow of material and includes a level alarm to alert the Operator that a low level of feedstock is present in the hopper. Fire protection systems will be in place in accordance with those set out in the fire prevention plan (FPP). These will include automatic fire detection and water cannons in the bunker. Surplus fire water will be captured within the bunker. The aim of the FPP is to as far as practicable minimise the duration of a fire event to less than 4 hours.	Low	Low /Medium Uncontrolled release of combustion gases to air – impacts likely to be short term	Not significant
Failure to contain firewater	River Humber, via unnamed drain and North Beck drain Groundwater Ground	Surface water drainage system	Measures are in place to protect against a fire including measures to manage and contain fire water. These are detailed within the FPP the installed fire response systems should ensure a rapid response thereby addressing the fire at the earliest point to avoid fire spread and therefore minimising the potential volumes of fire waters. Within the main building any spent firewater would first fill the dirty water tank before backfilling the internal drains and spilling out from the external drains. This would flow through the interceptor tank into the attenuation basins. These can be isolated by the penstock valve so the spent firewater could be captured and tested before appropriate means of disposal are determined (e.g. discharge to drain if the water is clean or disposal by tanker if not). Firewater would be collected in the feedstock bunker. In the event of a fire elsewhere on the site firewater would be collected in the site drains, which lead to	Low – plant designed to contain firewater	Moderate – although firewater would not be discharged to surface water	Low

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence.
			the attenuation basins via the oil interceptor. The penstock valves would be closed to prevent discharge of water from the site. These valves can be remotely actuated. Contained firewater would be tested and disposed of a suitably licensed facility. For full details on firewater containment please see the FPP.			
APC equipment failure	Air	Stack	All abatement plant is continuously monitored (i.e. reagent flow and consumption/bag filter pressure drops) to ensure that it is operating as designed and that the reagent feed systems are working. The APC plant (silo and pneumatic transfer conveyers) are located within the main building therefore any releases due to equipment failure will be contained and can be removed via vacuum cleaning immediately. In addition, emissions to air from the process are continuously monitored for key pollutants which would identify any potential increases in pollutant concentrations. All of these systems will include appropriate alarms to alert the Operator to a potential problem and permit appropriate action to be taken. Operational staff will be trained in the actions to take in the event of control system alarms being triggered.	Low	Low/medium – potential for increased air emissions	Not significant

Hazard What has the potential to cause harm?	**Receptor** What is at risk? What do I wish to protect?	**Pathway** How can the hazard get to the receptor?	**Risk management** What measures will you take to reduce the risk? If it occurs – who is responsible for what?	**Probability of exposure** How likely is this contact?	**Consequence** What is the harm that can be caused?	**What is the overall risk?** What is the risk that still remains? The balance of probability and consequence.
Vandalism	Air/water/land	Various	The site will be fenced and the plant manned 24/7. CCTV cameras are in operation.	Low due to security measures in place	Low to Medium - depending on nature of the event. Potential contamination of local water course/air/land and/or local nuisance depending on nature of event.	Not significant, given the very low probability of any unauthorised access to the site
Flooding	River Humber, North Sea,, structures on site; neighbouring land	Surface water drainage system	The top of the feedstock and IBA bunkers will be at +4.3m AOD, sufficient to resist ingress during a possible future flooding or during an extreme storm event. This level is 0.46m above the 1 in 200 year in 2077 water level of 3.84m AOD arising from an extreme flooding event from the North Sea. The existing drainage system using two attenuation basins and penstock valves ensures that overland flow generated on-site can be retained on-site and combined the two basins can store excess surface water volumes of approximately 2,350m^3. The basins have been sized to enable buffer storage from a 1 in 100 year storm event to prevent overloading the existing drain. The plant layout and storage facilities for reagents and fuels are designed to ensure all materials are contained and in the event of a flood, materials would not be released. As part of the site's emergency procedures, the appropriate procedures for responding to, reporting and investigation in the event of a flood will be assessed.	Very Low	Medium Potential contamination of flood waters.	Not significant

3 Emissions to Air

3.1.1 This section provides the relevant screening assessments of point source emissions to air that could arise from operation of the EfW Plant. The assessment has been completed in accordance with the EA's Risk Assessments for your environmental permit [1].

3.1.2 The scope of the assessment has covered the following aspects:

- Release point characteristics;
- Air emissions inventory and mass flows;
- Emissions screening for further assessment;
- Photochemical Ozone Creation Potential (POCP).

3.1.3 Air emissions screening using the H1 software has identified a subset of emissions whose significance warrants further modelling. The results of that modelling for these and a range of other emissions are presented in the air quality report in Annex D to the main application document.

Emissions release point

3.1.4 Point-source emissions to air from the proposed facility will be from a single 90 m stack, at an efflux velocity of 20.24 m/s, and a normalised volumetric flow rate of 449,676 m^3/hr.

3.1.5 The H1 screening assessment has considered both long-term and short term emissions at IED limits.

Emissions screening

3.1.6 Estimated emissions have been screened for significance against appropriate environmental standards for long-term and short-term exposure. Emissions standards are based on statutory air quality limits where available, and upon human health protection Environmental Assessment Levels (EALs) as given in H1 guidance.

3.1.7 Modelled concentrations have been included based on the data presented in the Air Quality Assessment (Annex D to the main application document).

3.1.8 Process contributions (PCs) have been calculated using atmospheric dispersion modelling, details of which are given in Annex D. Emissions which are lower than 1% of the relevant emissions standard for long-term exposure and lower than 10% of the relevant limit for short-term exposure are screened out as insignificant. Figure 3.1 below shows the emissions screening. Nitrogen dioxide, cadmium, sulphur dioxide, hydrogen fluoride mercury, PCBs, PAH, arsenic, manganese, lead, chromium, antimony, vanadium and nickel are all potentially significant.

Figure 3.1: Air Impact Screening Stage One

Number	Substance	Long Term EAL	Short Term EAL	Long Term			Short Term		
				PC	% PC of EAL	> 1% of EAL?	PC	% PC of EAL	> 10% of EAL?
		µg/m3	µg/m3	µg/m3	%		µg/m3	%	
1	Nitrogen Dioxide	40.0	200	2.06	5.16	**Yes**	19.5	9.73	**No**
2	Sulphur Dioxide (Oth	20.0	-	4.68	23.4	**Yes**	27.8	-	
3	Carbon monoxide	-	10,000	1.53	-		22.8	0.228	**No**
4	Particulates (PM10) (	-	50.0	0.151	-		0.441	0.881	**No**
5	Hydrogen chloride	-	750	0.305	-		12.0	1.60	**No**
7	Hydrogen fluoride (as	-	4.91	0.01001	-		0.801	16.4	**Yes**
8	Ammonia (human he	180	2,500	0.151	0.0834	**No**	2.00	0.0797	**No**
9	Cadmium and its com	0.00500	-	0.371	7,400	**Yes**	5.00	-	
10	Mercury and compou	0.251	7.51	0.741	296	**Yes**	9.98	133	**Yes**
12	Polychlorinated biphe	0.201	6.00	1.56	775	**Yes**	0.0701	1.17	**No**
13	Manganese and com	0.151	1,500	7.37	4,907	**Yes**	99.8	6.65	**No**
14	Antimony and compc	5.00	150	7.37	147	**Yes**	99.8	66.5	**Yes**
15	Arsenic and compou	0.00301	-	7.37	245,333	**Yes**	99.8	-	
16	Lead	0.501	-	7.37	1,472	**Yes**	99.8	-	
17	Chromium (VI) compc	0.000201	-	7.37	3,680,000	**Yes**	99.8	-	
18	Nickel (total Ni comp	0.0201	-	7.37	36,800	**Yes**	99.8	-	
19	Vanadium	5.00	1,000	7.37	147	**Yes**	99.8	9,971	**Yes**
20	Polycyclic aromatic h	1.000	-	1.000	100.0	**Yes**	0.426	-	

3.1.9 A second stage of screening assesses the predicted environmental concentration (PEC) against emissions limits. Assumed background concentrations are taken from the air quality modelling, details of which are given in Annex D to the main application document. PECs which are lower than 70% of the relevant long-term emissions standard and lower than 20% of the relevant short-term standard minus 2 * the background concentration are screened out as insignificant, as shown in

3.1.10 Figure 3.2 below. Those not screened out as insignificant are recommended for further detailed assessment. The results for nitrogen dioxide, sulphur dioxide, hydrogen fluoride, cadmium, mercury, PCBs, PAH, manganese, antimony, arsenic, lead, chromium, nickel and vanadium are all potentially significant. Detailed modelling has been carried out for all expected emissions, and the results are given in Annex D.

Figure 3.2: Air Impact Screening Stage Two

Number	Substance	Air Bkgrnd Conc. µg/m3	Long Term PC µg/m3	Long Term % PC of headroom (EAL - Bkgrnd)	Long Term PEC mg/m3	Long Term % PEC of EAL %	Long Term % PEC of EAL >=70?	Short Term PC µg/m3	Short Term % PC of headroom (EAL - Bkgrnd)	Short Term % PC of headroom >=20?
e.g.		12								
1	Nitrogen Dioxide	31.54	2.06	24.4	33.7	84.0	Yes	19.5	14.3	No
2	Sulphur Dioxide (Other Ecology)	16.7	4.68	142	21.4	107	Yes	27.8	-	
7	Hydrogen fluoride (as F) (Ecological - Daily Mear	2.35	0.01001	-	0	-		0.801	400	Yes
9	Cadmium and its compounds (as Cd)	0.83	0.371	-44.8	1.21	24,000	Yes	5.00	-	
10	Mercury and compounds, except mercury alkyls,	20.01	0.741	-3.74	20.8	8,300	Yes	9.98	-30.6	No
12	Polychlorinated biphenyls	127.46	1.56	-1.21	129	64,505	Yes	0.0701	-0.0281	No
13	Manganese and compounds (as Mn)	28.31	7.37	-26.1	35.7	23,780	Yes	99.8	6.91	No
14	Antimony and compounds (as Sb) except antimo	0.78	7.37	174	8.15	163	Yes	99.8	67.2	Yes
15	Arsenic and compounds (as As)	0.81	7.37	-912	8.18	272,333	Yes	99.8	-	
16	Lead	22	7.37	-34.2	29.4	5,872	Yes	99.8	-	
17	Chromium (VI) compounds (as Cr)	12	7.37	-61.3	19.4	9,680,000	Yes	99.8	-	
18	Nickel (total Ni compounds in the PM10 fraction)	8.65	7.37	-85.2	16.0	80,050	Yes	99.8	-	
19	Vanadium	2.66	7.37	315	10.0	200	Yes	99.8	-2,308	No
20	Polycyclic aromatic hydrocarbons (PAH)-total co	3.87	1.000	-34.8	4.88	487	Yes	0.426	-	

Photochemical ozone creation potential

3.1.11 The photochemical ozone creation potential (POCP) has been calculated in accordance with the H1 guidance. Three substances emitted to air by the facility are identified as having the potential to form ozone: nitrogen dioxide, sulphur dioxide and carbon monoxide. The total POCP score for the facility is calculated as 3,683.

3.1.12 The facility will be controlled to ensure that IED limits for the POCP pollutants are met; the Supporting Information Report details the proposed measures for preventing and minimising the release of these pollutants and concludes that the proposed measures are BAT.

4 Global Warming Potential

4.1.1 The global warming potential (GWP) has been calculated in accordance with the H1 guidance. The total GWP score of 329,983 comprised three main sources: carbon dioxide emissions from combustion of feedstock (direct); electricity used during start-up (indirect) and diesel/fuel oil used in auxiliary firing and in the emergency generator (direct).

4.1.2 Of these sources, carbon dioxide emissions from the combustion of feedstock is by far the most significant, accounting for over 99% of the total GWP score calculated.

4.1.3 The direct releases from burning feedstock are consistent with BAT, which promotes maximising efficient burnout of the material and the conversion of its carbon content to carbon dioxide. These releases are therefore determined by the carbon content of the incoming feedstock and the desire to achieve BAT.

4.1.4 Only a small percentage of the GWP is associated with emissions from the emergency generator and supplementary burners. Supplementary burners are essential to ensure that the facility meets IED limits for emissions at all stages of operation and their use is considered BAT.

5 Conclusions

5.1.1 The environmental risk assessment (ERA) report has been undertaken to assess the likelihood of risk from amenity and accidents, air emissions and global warming potential associated with the proposed EfW.

5.1.2 The results of the ERA have shown that the risk of odour, noise and vibration, fugitive emissions, visible plumes, and accidents ranges from ‘not significant’ to ‘low’.

5.1.3 Stack emissions to air for some air pollutants have not been screened out to be insignificant. Consequently detailed dispersion modelling has been carried to demonstrate no significant effects from emissions to air from the EfW facility. A copy of this assessment is provided in Annex D to the main application document.

5.1.4 There will be no process emissions to land or water from the EfW facility.

5.1.5 The POCP for the facility is calculated as 3,683. The use of BAT to control emissions, as set out in the Supporting Information document, minimises the POCP from the facility.

5.1.6 The total GWP score of 329,983 is almost wholly contributed by carbon dioxide emissions from the combustion of the Feedstock (note. GWP excludes fossil-derived carbon dioxide).

References

1. Environment Agency Guidance on Risk Assessments for your Environmental Permit. Online source accessed July 2018: https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit

Glossary

AOD	Above Ordnance Datum
APC	Air Pollution Control
BAT	Best Available Techniques
EfW	Energy from waste
ERA	Environmental Risk Assessment
GWP	Global Warming Potential
IBA	Incinerator Bottom Ash
IED	Industrial Emissions Directive
PC	Process Contribution
PEC	Predicted Environmental Concentration
POCP	Photochemical Ozone Creation Potential
feedstock	Refuse Derived Fuel
SNCR	Selective Non-Catalytic Reduction
VOC	Volatile Organic Compounds

Appendices

Appendix C1

H1 Assessment

RPS

Contact

Jennifer Stringer
Technical Director

RPS Consulting Services

6-7 Lovers Walk
Brighton
East Sussex
BN1 6AH

T: +44 (0) 1273 546 800
stringerj@rpsgroup.com